

Mech-Mind Robotics



AI+3D Vision Solutions for Logistics



Mech-Mind has implemented nearly **1,000** actual projects in the fields of logistics storage.

Mech-Mind AI+3D Vision Pioneer in Logistics

Aiming to drive the ubiquity of intelligent robots, Mech-Mind is committed to leverage technical strength to pioneer the next frontier of manufacturing. Mech-Mind has developed a full R&D infrastructure and product portfolio including 3D cameras, machine vision algorithms and software, Mech-DL Kit Offline Deep Learning Tool, and intelligent robot programming environment.

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

We have already deployed thousands of our intelligent industrial robot solutions in many industries, such as food, FMGG, supermarkets, pharmacy, beverages, banking, warehousing and other fields.

Solution Advantages

- **High Intelligence:** Our solutions can handle different objects like cartons, sacks, containers, goods, express parcels, etc. and deal with various complex situations like tightly-packed cartons, randomly-piled sacks, parts with considerably reflective or dark surfaces.
- **Cost-Effectiveness:** The price is only half of the same type of typical products.
- **Efficient and Straightforward Deployment:** The plug-and-play solutions save a lot of deployment time. The fully visualized, code-free programming interface dramatically reduces the usage difficulty and deployment costs.
- **Strong Openness:** Our solutions can be adapted to various mainstream robot brands and support integrating with automatic system integrating and the secondary software development.
- **Various application cases:** The scope of application covers mixed-carton palletizing and depalletizing, order picking, logistic parcels picking assembly. Our solution has been successfully deployed in hundreds of leading companies in China, the United States, South Korea, Japan, Germany, Spain, Singapore, Australia and other countries.





Typical Solutions and Applications

Vision-Guided Depalletizing

Vision-Guided Depalletizing: The vision-guided robot grabs sacks and cartons from the pallet one by one and places them on the conveyor line.

Mech-Mind Vision-Guided Palletizing & Depalletizing solutions have been widely used in logistics, express delivery, pharmaceutical, beverages, bank warehouses and other industries.

Solution Advantages

- Industrial 3D Camera with high precision and extended field of view, which is suitable for various common pallet pattern sizes (e.g. 1.2 m × 1.2 m × 1.8 m).
- Support tightly-packed cartons. Able to handle various complex situations such as express bills, cable ties, tapes, patterns, reflective films, etc.
- Able to handle various complex situations such as sack deformation, wrinkles, surface patterns, text, etc.
- Can identify massive cartons. Through deep learning model iteration, accurate recognition of newly added objects can be quickly realized.
- The recognition success rate is higher than 99.99%, and an alarm signal can be output for abnormal situations.
- Intelligent identification and planning algorithms, which can grab single or several cartons/turnover boxes at a time according to the actual situation.
- Supports the identification and disassembly of the stack type of the mixed carton, without specifying the stack type in advance.

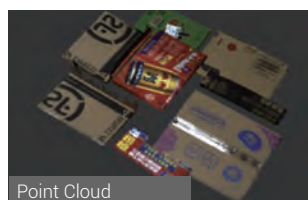


Specification

Accuracy	1 mm @ 3 m, 3 mm @ 3 m (the long-distance high-precision camera can be customized as required).
Speed	Up to 900 cartons/hour (actual speed is related to the layout and end effector).
Pallet Patterns	Support various different stack types (such as dimension of 1.2 m × 1.2 m × 1.8 m).
Stability	Able to handle a certain degree of reflection, black surfaces, complex structures, closely fitting or overlapping, etc; Intelligent path planning and grabbing algorithms to ensure stability.
Working Distance	1500 mm - 3500 mm
Objects	Support different objects such as cartons, sacks and containers. Depalletizing Situation: tightly-packed(the minimum distance is 0) or obliquely placed objects (cartons, sacks). Support complex situations such as objects with patterns/tapes/express bills.
Robot Brands	Adaptable to various major robot brands, such as ABB, KUKA, YASKAWA, Kawasaki, Rokae, Peitian, Techman, Estun, etc.
Communication Interface	The communication between vision systems and various PLC is done via TCP/IP using Mech-Mind native command.
Common Camera Models	Mech-Eye Laser, Mech-Eye Enhanced Series

Point Cloud and Recognition Result

Tightly-Packed Cartons with Patterns

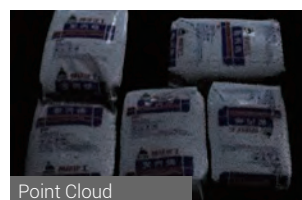


Point Cloud



Recognition Result

Tightly-Packed Sacks with Patterns



Point Cloud



Recognition Result

Typical Solutions and Applications

Vision-Guided Mixed Palletizing & Depalletizing

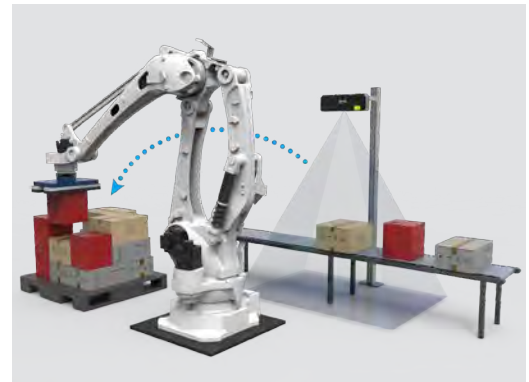
Mixed-Carton Palletizing

Offline Palletizing Solution

- Get all the specifications and quantities of the boxes in the order in advance, the intelligent palletizing algorithm calculates the optimal pallet type (the pallet is stable and makes full use of the pallet space), and outputs the order of incoming cartons.
- Complete code-free visual debugging and deployment environment.

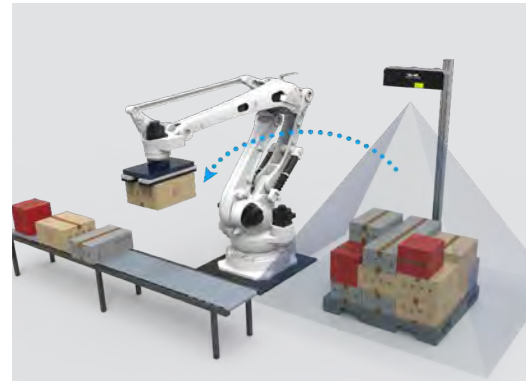
Online Palletizing Solution

- Mech-Eye 3D Camera can measure cartons quickly and accurately. Support mixed carton palletizing of various specifications and order.
- Intelligent path planning automatically selects the appropriate robot motion path and entry angle to avoid collision.
- Stable pallet patterns can be ensured to allow full usage of space.

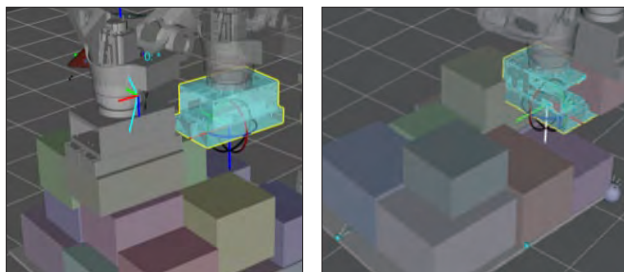


Mixed-Carton Depalletizing

- Mech-Eye Industrial 3D Camera with high precision, big field of view and deep depth of field, is specially designed for depalletizing.
- AI algorithm can identify cartons with different patterns and sizes and unload them from the pallet one by one.
- No specific pallet pattern is required before depalletizing. The cartons can be tightly packed or randomly placed. The speed can up to 900 cartons/hour.
- Complex situations such as inclination, bonding, and cartons with express bills/tapes/cable ties can all be solved.



Mixed-Carton Palletizing Algorithm



The self-developed mixed-carton palletizing algorithm allows the robot to find a proper stacking position and entry angle according to the carton size and pallet pattern, which avoids collision and ensures stability.

Cage Trolley Loading



The robot grabs the express cartons of different sizes one by one from the chute and palletizes them in proper positions in the cage.

- Can fully leverage the space in the cage trolley.
- Intelligent path planning algorithm can help avoid collision within limited space.

Typical Solutions and Applications

Vision-Guided Mass SKU Goods Picking (Model-free)

The vision-guided robot grabs the corresponding quantity of goods from the bin one by one according to the order and places them in the designated position. It is widely used in the order picking scenario in logistics, e-commerce and other fields.

Solution Advantages

- A variety of AI algorithms that can quickly and accurately identify objects with box shape, bag shape, and bottle shape without registration.
- Built-in collision detection, path planning and other advanced algorithms to avoid problems such as self-collision and environmental collision.
- Visualized and code-free programming interface with only one-click simulation of robot movement. Code-free programming enables a low threshold for robot operators.
- Can be seamlessly integrated with the WMS system allowing goods picking on demand.

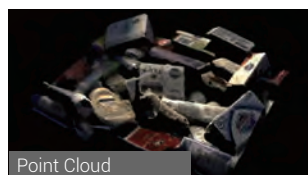


Specification

Objects	Support a large number of different SKUs; Objects can be packed tightly or piled randomly in the bin; Can handle a wide variety of packaging; Support complex situations such as objects with patterns, black/reflective surfaces and irregularities.
Speed	Up to 1200 pieces/hour for small light pieces (actual speed is related to the layout and end effector).
Registration	No need to pre-register 3D models of goods.
Stability	Intelligent path planning algorithm to ensure stability and avoid collision.
Communication Interface	The communication between vision systems and various PLC is done via TCP/IP using Mech-Mind native command.
Robot Brands	Adaptable to various major robot brands, such as ABB, KUKA, YASKAWA, Kawasaki, Rokae, Peitian, Techman, Estun, etc.
Adaptation	Intelligently switch the TCP of the variable angle end effector, handling objects attached to the sides flexibly; Can be used with logistic equipment such as AMR, automated storage system, etc.
Common Camera Models	Mech-Eye Log S Mech-Eye Log M

Point Cloud and Recognition Result

A Variety of Different Goods

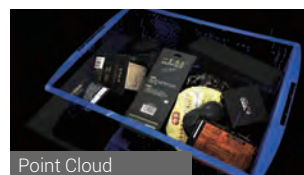


Point Cloud



Recognition Result

Black Goods



Point Cloud



Recognition Result

Typical Solutions and Applications

Vision-Guided Logistic Parcel Picking

The vision-guided robot grabs randomly-piled express parcels (including logistic cartons, poly bags, corrugated rigid packages, jiffy packs, bubble mailers, envelopes, etc.) from the chute one by one, and places them on the conveyor belt or into the cage. This solution is suitable for distribution centers in logistics, express delivery, and other industries.

Solution Advantages

- A variety of AI algorithms to help quickly and accurately identify objects, and support complex situations such as objects with reflective tapes/ intricate patterns/express bills/bar codes.
- Built-in collision detection, path planning, and other advanced algorithms to avoid problems such as self-collision and environmental collision.
- Visualized programming interface with one-click simulation of robot movement.
- Support fast and accurate classification of different objects that are mixed.

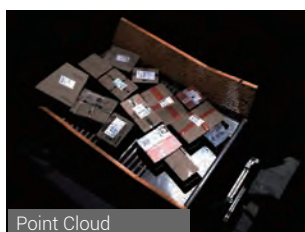


Specification

Objects	Support express parcels (including logistic cartons, poly bags, corrugated rigid packages, jiffy packs, bubble mailers, envelopes, etc.). Parcels can be packed tightly or piled randomly in the chute. Support complex situations such as objects with patterns/express bills/bar codes and black objects.
Speed	Single cycle time can reach 2.2 s
Stability	Intelligent path planning algorithm to ensure stability and avoid collision.
Communication Interface	The communication between vision systems and various PLC is done via TCP/IP using Mech-Mind native command.
Robot Brands	Adaptable to various major robot brands, such as ABB, KUKA, YASKAWA, Kawasaki, Rokae, Peitian, Techman, Estun, etc.
Compatibility	Can be used with logistic equipment such as bar code scanner, AMR system, cross-belt sorter, etc.
Common Camera Models	Mech-Eye Log M

Point Cloud and Recognition Result

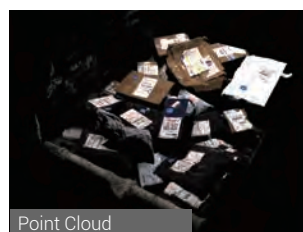
Randomly-piled Parcels



Point Cloud



Recognition Result



Point Cloud



Recognition Result

Typical Solutions and Applications

A large factory

Vision-Guided Carton Depalletizing

Background

The customer of this project is a large supermarket, who needs to deal with a large number of random carton depalletizing needs every day during inbound and outbound. Due to the random palletizing type and the large number of cartons, the traditional robot cannot meet the needs of customers. The process is complicated and requires high speed and stability.



Project Highlights

- Easily handle cartons with more than 25,000 specifications on site. New order can be quickly realized through model iteration.
- Intelligent AI algorithm, which can be based on stacking carton arrangement and the size of the suction cup in real time to support grabbing multiple cartons by one pick, the beat can reach 2000 cartons/hour.
- Our intelligent trajectory planning algorithm can cope with the situation of compact space, stuck trays, serious interference of camera brackets, etc., to ensure the stability.
- Able to deal with various complex situations, like random stacking, tightly-packed cartons, randomly-piled sacks, parts with considerably reflective or cable ties. The recognition success rate is > 99.99%.
- One robot corresponds to two sets of vision systems, which improves efficiency effectively.



Point Cloud

Project Performance

- A single workstation can process 700+ cartons of goods per hour.
- The system has high stability and can operate 24h, which greatly reduce labor costs.



Recognition Result

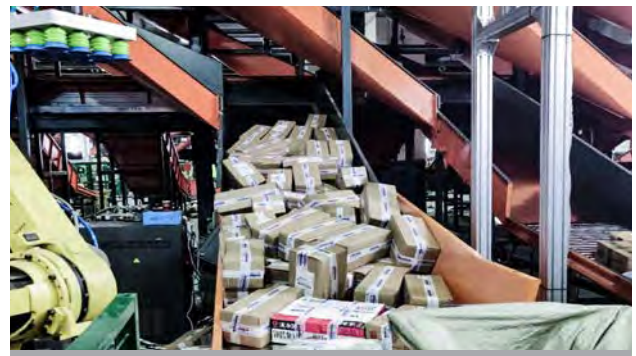
Typical Solutions and Applications

A large delivery company

Vision-Guided Mixed Cage Trolley Palletizing

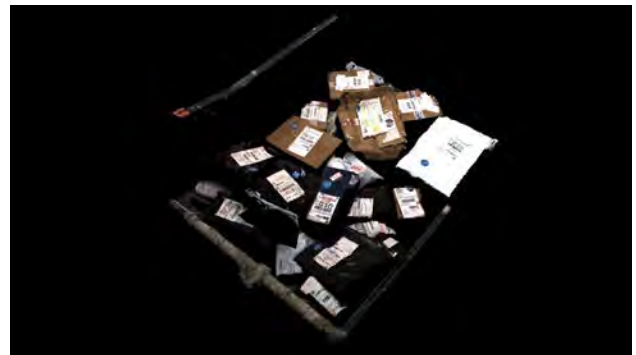
Background

The customer of this project is a large delivery company. In its sorting center, a large number of various express parcels (including cartons, soft bags, etc.) of random sizes need to be processed every day, and the express delivery is transferred by cage truck. The traditional way of mixing yards in the cage is done manually. However, the large number of packages with different sizes, weights and other factors lead to low transfer efficiency. In order to solve the efficiency problem, the customer decided to transform the express delivery process, use industrial robots to complete mixed cage trolley palletizing.



Project Highlights

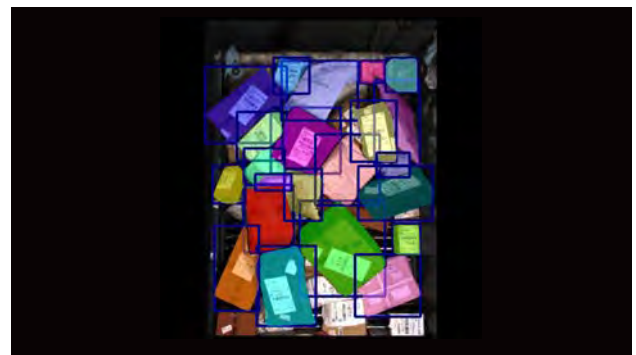
- Make fully use of the cage trolley space to mix palletized the cartons and load them efficiently.
- Classify and process different types of mail such as soft bags, cartons, small items, and abnormal items.
- Avoid situations like accidental grabs, collisions, crimping, etc., able to avoid mail damage.
- The system has high stability and speed, the operating beat can meet the needs of customers.
- Intelligent path planning algorithm to ensure stability and avoid collision.
- Adapt to logistic equipment such as AGV/AMR.



Point Cloud

Project Performance

- Greatly reduce labor costs and operating beat, stability and other parameters could meet customers' needs.
- Stable operation, able to handle thousands of express per day.
- Help customers Make fully use of the cage trolley space and improve the efficiency of the entire process of express sorting.



Recognition Result

Typical Solutions and Applications

A large international express company Vision-Guided Mixed Depalletizing

Background

Express companies usually deal with a large number of cartons with random sizes every day. The carton size and pallet pattern are completely random, and the surface of the box is complicated, yet the depalletizing speed is high, so that the traditional industrial robots cannot meet the demand.

In order to solve the problems above, the customer decided to automate the transformation of the express warehouse to improve the overall logistics and transportation efficiency.

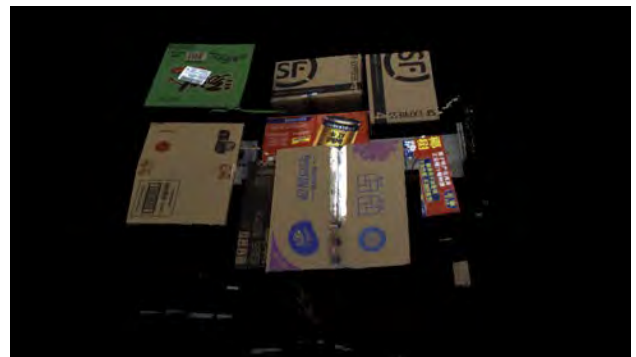


Project Highlights

- One capture can be used to grab multiple times, which greatly improves the operating beat.
- Able to deal with various different size of cartons and pallet patterns.
- Able to deal with various complex situations, like tightly-packed cartons, randomly-piled sacks, parts with considerably reflective or cable ties.
- Able to deal with various complex situations, like random stacking, tightly-packed cartons, randomly-piled sacks, parts with considerably reflective or cable ties. The recognition success rate is > 99.99%.
- Intelligent path planning algorithm to ensure stability and avoid collision.
- Quickly grab the box, use intelligent path planning algorithm to measure the height of the carton and place them exactly.

Project Performance

- The overall efficiency is significantly improved, and the parameters such as operating beat and stability can meet the needs of customers.
- A single workstation can process 900+ cartons of goods per hour.



Point Cloud



Recognition Result

Typical Solutions and Applications

A large cosmetics e-commerce company Vision-Guided Order Picking

Background

The cosmetics e-commerce company has thousands of SKUs and numerous online orders to deal with every day. There're many cosmetics types, so manual picking is usually with low efficiency and high error rate. To solve the problems above, our customers decided to use industrial robots and 3D vision to improve delivery efficiency.



Project Highlights

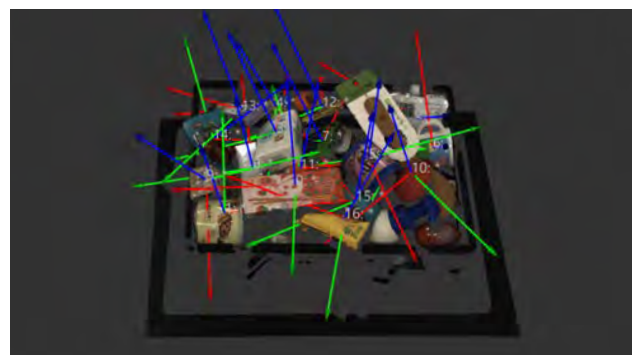
- The vision-guided order picking solution can help pick numerous types of goods with a speed of 1200 pieces/hour.
- Support a large number of different SKUs; Objects can be packed tightly or piled randomly in the bin.
- No need to pre-register 3D models of goods.
- Intelligent path planning algorithm to ensure stability and avoid collision.
- Variable-angle end effector, handling objects attached to the sides flexibly.
- Can be used with logistic equipment such as AMR, automated storage system, etc.



Point Cloud

Project Performance

- With automatic system, our solution can deal with various complicated conditions to improve stability.
- The system has high stability and speed, the beat can reach 1200 pieces/hour, which improves the overall efficiency.



Recognition Result

Typical Solutions and Applications



A large pharmaceutical enterprise Vision-Guided Carton Depalletizing

Workflow : The vision-guided robot recognizes the cartons from the pallet and grabs the corresponding number according to the order requirements and places them on the conveyor belt.

- There're more than 500 types of cartons in the pharmaceutical logistic warehouses.
- Able to recognize cable ties, tapes, patterns, etc.
- The number of cartons to be depalletized is counted while being depalletized with high intelligence.
- With extended field of view and deep depth of field, our solution can handle different kinds of pallet patterns.



A large brewery Vision-Guided Cardboard Depalletizing

Workflow : The robot grabs the corresponding quantity of cardboards according to the order and places them in the designated position.

- There're more than 10 types of cardboards in the brewery.
- Able to recognize cable ties, tapes, patterns, etc.
- Vision-detected cable ties locating, guiding robot cut the cable tie and placing them on the assembly line with high intelligent.
- With extended field of view and deep depth of field, our solution can handle different kinds of pallet patterns.



A large integrated ceiling plant Vision-Guided Carton Depalletizing

Workflow : The vision-guided robot recognizes the cartons from the pallet and grabs the corresponding number according to the order requirements and places them on the conveyor belt.

- There're more than 1000 types of cartons in the ceiling plant.
- Able to recognize cable ties, tapes, patterns, etc.
- The number of cartons to be depalletized is counted while being depalletized with high intelligence.
- Adapt to logistic equipment such as stereoscopic warehouses, AGV, conveyor belt with high automation.



A large steel mill Vision-Guided Sack Depalletizing

Workflow : The robot grabs the corresponding quantity of sacks in different size according to the order and places them on the conveyor belt.

- Complicated conditions such as wrinkles, deformation, and patterns on the surface of sacks can be dealt with.
- When the camera is mounted on the flange, it can be adapted to any pallet pattern.
- It can be adapted to a variety of different robots such as four-axis, six-axis, truss, etc.

Typical Solutions and Applications



A large steel mill

Vision-Guided Sack Depalletizing

Workflow : The robot grabs the corresponding number of sacks according to the order requirements and places them on the bag-breaking machine.

- Complicated conditions such as wrinkles, deformation, and patterns on the surface of sacks can be dealt with.
- It can be used with equipment such as bag-breaking machine, and the beat can fully meet the needs of users.
- It can be adapted to a variety of different robots such as four-axis, six-axis, truss, etc.



A large chemical factory

Vision-Guided Sack Depalletizing

Workflow : The robot grabs the corresponding number of sacks according to the ingredient requirements and places them on the bag-breaking machine to break the bags and shake off the materials.

- Able to recognize various sizes of sacks.
- Able to handle various complex situations such as sack deformation, wrinkles, surface patterns, text, etc.
- With high precision and deep depth of field, Mech-Eye can adapt to pallet patterns in different heights, when the camera is mounted on the flange.



A large food factory

Vision-Guided Carton Depalletizing

Workflow : The vision-guided robot grabs the corresponding number of cartons according to the order requirements and places them in the designated position.

- Able to recognize various cartons of different sizes and poses.
- With high precision, our solution allows multiple cartons to be picked at once.
- Support tightly-packed cartons with patterns and tapes.
- With extended field of view, deep depth of field and high speed, Mech-Eye can meet the beat requirements when the camera is mounted on the flange.



A large airline company

Vision-Guided Containers Depalletizing

Workflow : The vision-guided robot recognizes the containers from the pallet on by one and places them on the conveyor belt.

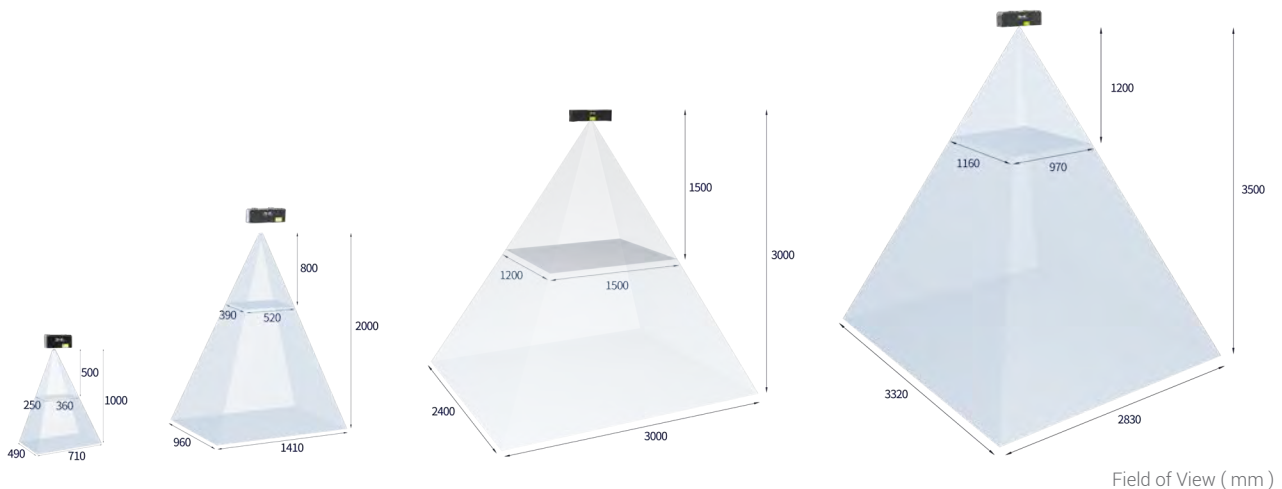
- Supports stacking, tightly-packed and containers in different colors.
- With high precision, the working beat can meet the requirements of users.
- Able to handle different kinds of pallet patterns.

Mech-Eye Industrial 3D Camera

Delicate Offering with High-performance and Cost-effectiveness

Product Parameters	Log S	Log M	Laser L	Deep
Optimal Scanning Range (mm)	500 - 1000	800 - 2000	1500 - 3000	1200 - 3500
Near FOV (mm)	360 × 250 @ 0.5 m	520 × 390 @ 0.8 m	1500 × 1200 @ 1.5 m	970 × 1160 @ 1.2 m
Far FOV (mm)	710 × 490 @ 1.0 m	1410 × 960 @ 2.0 m	3000 × 2400 @ 3.0 m	2830 × 3320 @ 3.5 m
Resolution	1280 × 1024	1280 × 1024	2048 × 1536	2048 × 1536
Megapixels (MP)	1.3	1.3	3.0	3.0
Z Repeatability(σ)	0.1 mm @ 1 m	0.3 mm @ 2 m	0.5 mm @ 3 m	1.0 mm @ 3 m
Accuracy	0.2 mm @ 1 m	0.3 mm @ 2 m	1.0 mm @ 3 m	3.0 mm @ 3 m
Typical Capture Time (s)	0.3 - 0.5	0.3 - 0.5	0.6 - 1.3	0.8 - 1.3
Baseline (mm)	150	280	400	400
Dimensions (mm)	270 × 72 × 130	387 × 72 × 130	459 × 89 × 145	481 × 98 × 145
Weight (kg)	2.2	2.4	3.7	4.3
Operating Temperature	0 - 45°C		-10 - 45°C	0 - 45°C
Communication Interface	Ethernet			
Power Supply	24V DC			
Safety and EMC	CE / FCC / VCCI			
Protection Class	IP65			
Cooling	Passive			

Mech-Eye Log S	Mech-Eye Log M	Mech-Eye Laser L	Mech-Eye Deep
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Mech-Eye Industrial 3D Camera

High-quality Imaging of Many Objects

Tightly-packed Cartons with Patterns and Tapes



Tightly-packed Sacks with Patterns



Various Common Goods



Randomly-placed Real Express Parcels



High-quality Imaging of Many Objects(Metal, Wood, Plastic)

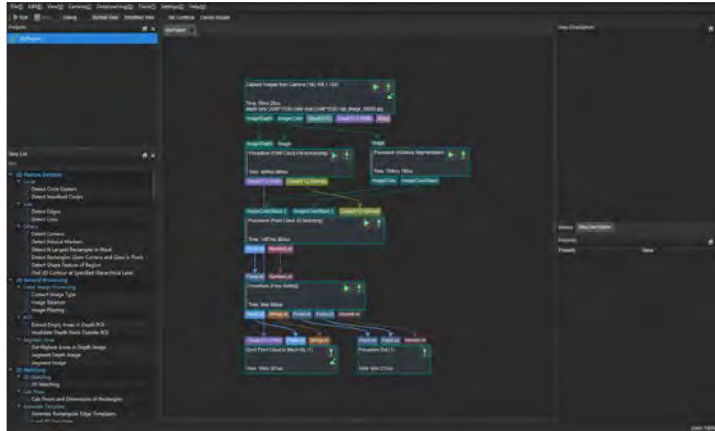




Mech-Vision

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.

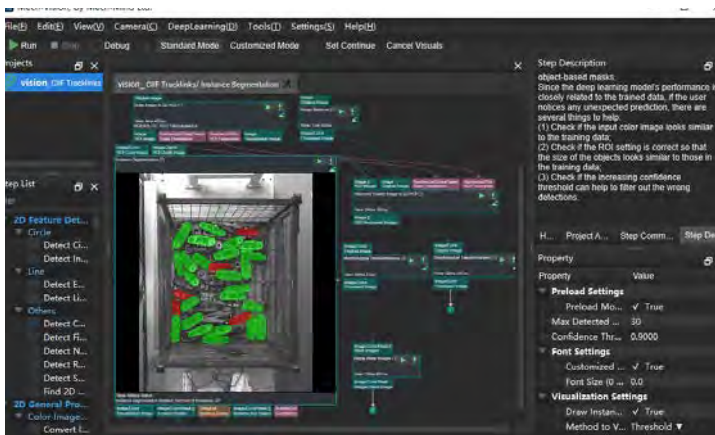


Graphical Interface with No Code, Easy to Use

Graphical interface with no code, concise UI design, and clear-cut functional partitions.

Professional programming skills are not required for users to realize visual engineering construction.

The software enables integrators to develop models autonomously.

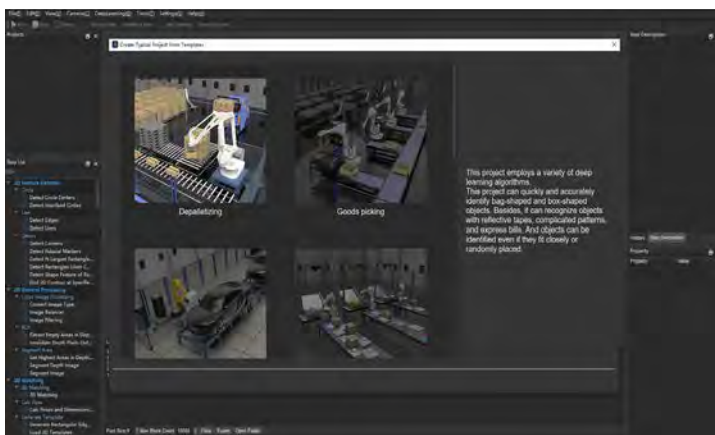


Built-in Advanced Algorithm Modules

Built-in advanced algorithm modules such as deep learning, which can meet complex and diverse practical needs.

Handle situations such as randomly-placed real objects, considerably reflective or dark objects.

Can complete visual functions such as recognition, positioning, and measurement under complex conditions.



Various Built-in Typical Application Plug-ins

With integrated various application plug-ins such as random feeding, carton depalletizing, express parcel feeding, registration-free goods grasping, high precision positioning, guided gluing, etc.

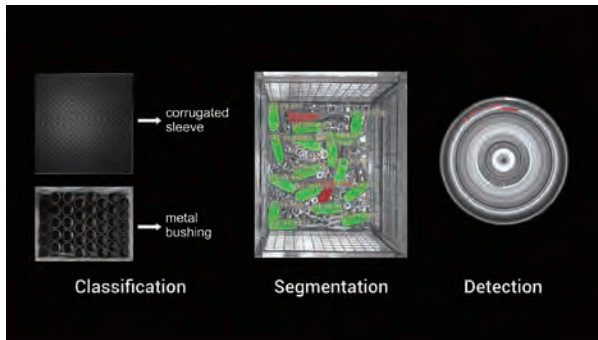
Users can easily deploy multiple typical applications of intelligent robots.



Mech-DL Kit

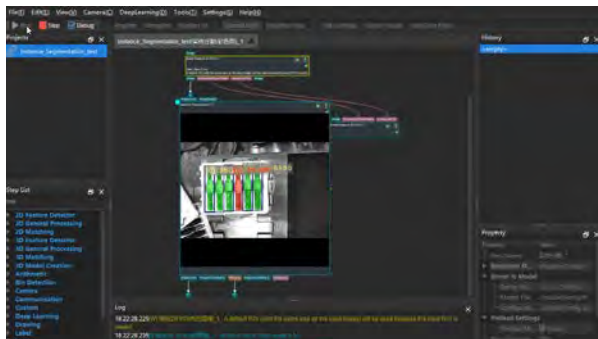
Offline Training Tools for Deep Learning

Mech-DL Kit is a newly launched deep learning autonomous training tool, which integrates the entire process of data collection, screening, import, 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.



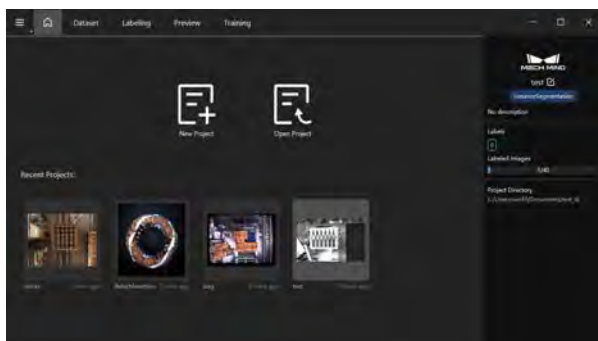
All-In-One Solution

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

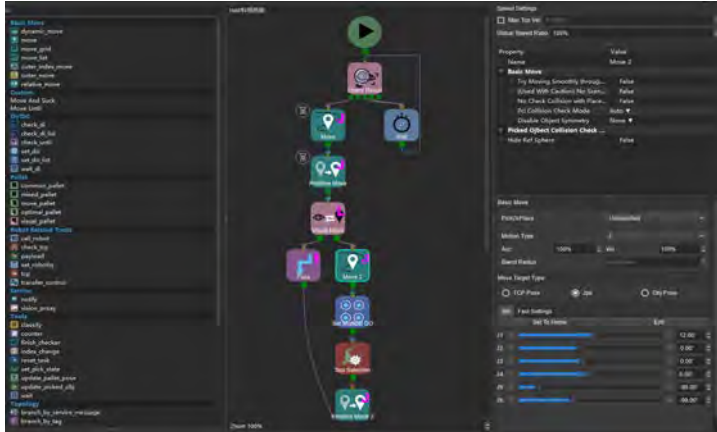
The deep learning algorithm's internal analysis process enhances quality upstream to reduce overkill and under kill rates to optimize quality and yield.



Mech-Viz

Intelligent Robot Programming Environment

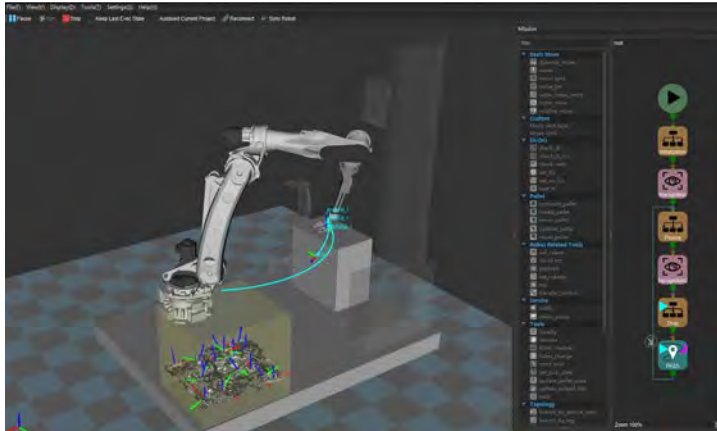
Equipped with a visualized and code-free programming interface, the new generation intelligent robot programming environment can realize one-click simulation. Intelligent algorithms such as path planning, collision detection and picking planning are built in. The environment can be adapted to various 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.

Users without code programming experience can operate the robots.



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.

The of a new brand robot only needs 3-5 days.



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, TOP3 Enterprise in AI Field in 2020 Zhongguancun International Frontier Technology Innovation Competition, 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 almost 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 partnership



DRIVE THE UBIQUITY OF INTELLIGENT ROBOTS



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