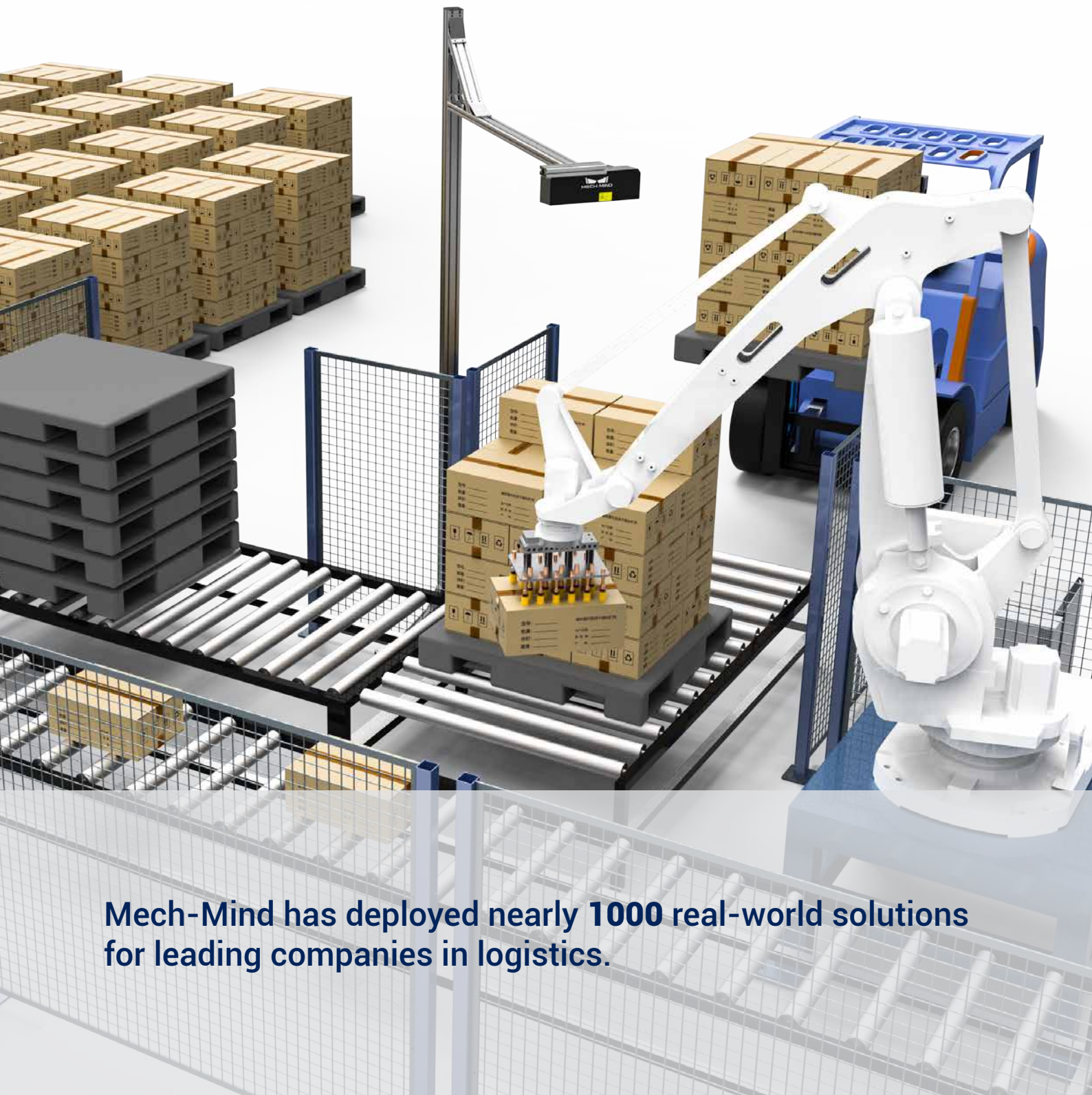Mech-Mind Robotics

AI+3D Vision
Solutions for Logistics

MECH MIND

Mech-Mind has deployed nearly 1000 real-world solutions for leading companies in logistics.

Mech-Mind
AI+3D Vision Pioneer in Logistics

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-DL Kit offline training tool, Mech-Viz intelligent robot programming environment, etc.

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

We have already provided more than **1000** our intelligent industrial robot solutions for companies in food and beverages, daily chemicals, supermarket, medical, and banking industries.

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 lowers the threshold for operators to deploy.

- **Strong Openness:** Our solutions can be adapted to various mainstream brands' robots and support integrating with automatic system.

- **Various Application Cases:** The scope of application covers mixed-carton palletizing and depalletizing, order picking, logistic parcels picking, and assembly. Our solutions have been successfully applied in hundreds of leading companies in China, the United States, South Korea, Japan, Germany, Spain, Singapore, Australia and other countries.

Typical Solutions

Vision-Guided Depalletizing

Vision-Guided Depalletizing: The vision-guided robot grabs sacks and cases 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

- With high precision and an extended field of view, our industrial 3D camera is suitable for various common pallet pattern (e.g. 1.2 m × 1.2 m × 1.8 m).

- Support tightly-packed cases;
  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 deformed sacks, or sacks with wrinkles, patterns, and text.

- Can identify various cases: Through deep learning model iteration, accurate recognition of newly added objects can be quickly realized.

- The recognition success rate is higher than 99.99%, abnormal situations can be alarmed immediately.

- Intelligent identification and planning algorithms, which can grab single or several cases/turnover boxes at a time according to the actual situation.

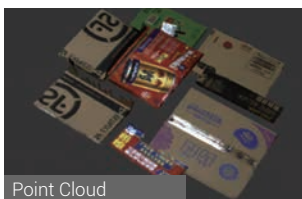- The robot can recognize the random-piled cases in real time and complete depalletizing.

Specification

Accuracy	1 mm @ 3 m, 3 mm @ 3 m
Speed	Up to 900 cases/hour (actual speed is related to the layout and end effector).
Pallet Patterns	Support various pallet patterns (such as dimension of 1.2 m × 1.2 m × 1.8 m).
Stability	Intelligent path planning and grabbing algorithms are developed to ensure stability.
Common Distance	1500 mm - 3500 mm
Objects	Support different objects such as cases, sacks and containers. Depalletizing Situation: tightly-packed(the minimum distance is 0) or obliquely placed objects (Cases, 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	TCP/IP
Common Camera Models	Mech-Eye Laser, Mech-Eye Pro Enhanced Series

Point Cloud and Recognition Result

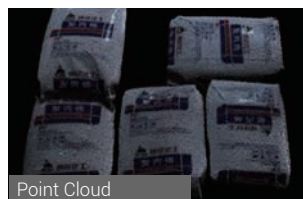Tightly-Packed Cases with Patterns

Point Cloud

Recognition Result

Tightly-Packed Sacks with Patterns

Point Cloud

Recognition Result

Typical Solutions

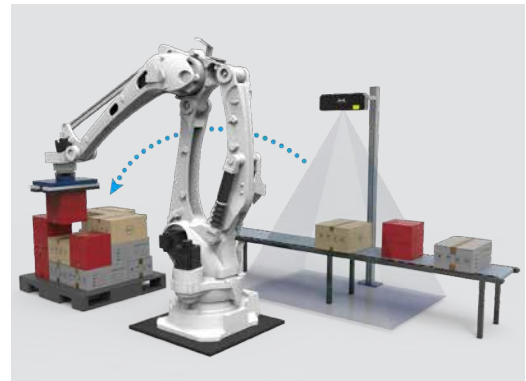## Vision-Guided Mixed Palletizing & Depalletizing

Mixed-Carton Palletizing

Offline Palletizing Solution

- The intelligent algorithm calculates optimal pallet patterns based on the sizes and quantities of the cartons known in advance, and then outputs the order of incoming cartons.

- Operators can complete debugging and deployment through a code-free visual interface.
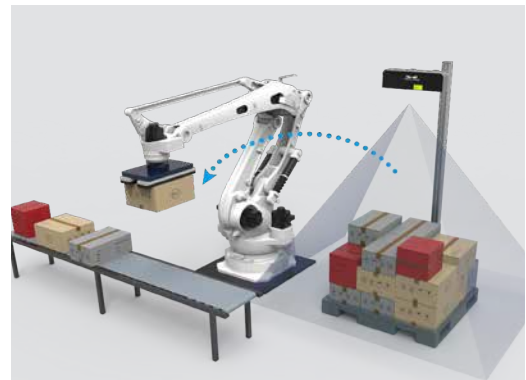
Online Palletizing Solution

- Mech-Eye industrial 3D camera can quickly and precisely measure the sizes of incoming cartons. Though these cartons are in random sizes and orders, Mech-Eye also can execute mixed palletizing as required.

- The intelligent motion planning algorithm automatically calculates an appropriate path and entry angle for robots. So their movement is precise and collision-free.

- It can manage a stable pallet pattern while making full use of the pallet space.
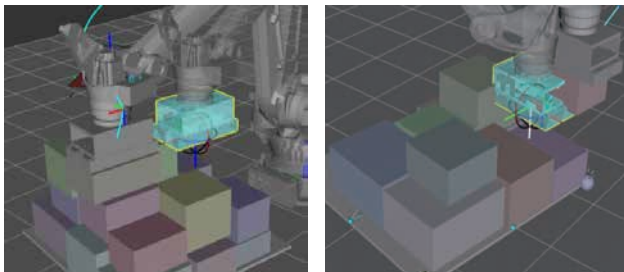

Mixed-Carton Depalletizing

- Mech-Eye high-accuracy industrial 3D camera, which has a big field of view and deep depth of field, is specially designed for palletizing and depalletizing.

- AI algorithm enables robots to identify cartons that vary in patterns and sizes and unload them from the pallet one by one.

- No specific pallet pattern is required. The cartons can be tightly packed or randomly placed. The depalletizing speed can up to 900 cartons/hour.

- Complex situations such as inclination, bonding, and cartons with express bills/tapes/cable ties can all be well handled.

Mixed-Carton Palletizing Algorithm

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

Cage Trolley Loading

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

- It can make full use of the space of cage trolley.

- The intelligent path planning algorithm enables robots to avoid collision within limited space.

Typical Solutions

Vision-Guided Order Picking (Registration Free)

The robot picks randomly-located grocery goods from the bin one by one according to orders. It has been widely used in the order picking scenario in logistics, e-commerce and other fields.

Solution Advantages

- Support for various objects in different sizes and shapes. Registration-free for new objects.
- Built-in advanced algorithms including motion planning and collision detecting help to improve operating stability.
- Code-free visual programming interface provides one-click simulation of robot movement.
- The solution can be seamlessly integrated with WMS system, AMR, and other common logistic device.
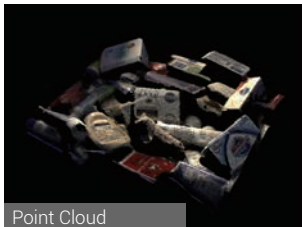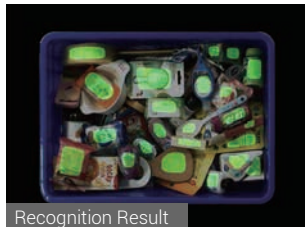

Specification

Objects	Support a large number of different SKUs; Objects can be packed tightly or piled randomly in the bin.
Speed	Up to 1200 pieces/hour for small and light pieces (actual speed is related to the layout of the working station.)
Registration	Registrarion-free for various goods.
Stability	Intelligent path planning algorithm helps to ensure stability and avoid collision.
Communication Interface	TCP/IP.
Robot Brands	Adaptable to various major robot brands, including ABB, KUKA, YASKAWA, Kawasaki, Rokae, Peitian, Techman, Estun, 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

Vision-Guided Logistic Parcel Picking

The vision-guided robot grabs randomly-piled express parcels (including logistic cases, 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 enable the 3D camera to quickly and accurately identify objects, and deal with complex situations such as objects with reflective tapes/intricate patterns/express bills/bar codes.

- Built-in collision detection, path planning, and other advanced algorithms can avoid collision problems and robot singularities.

- Visualized programming interface provides one-click simulation of robot movement.

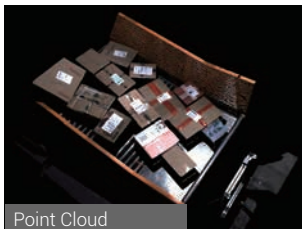- Mech-Eye 3D camera supports fast and accurate classification of different objects that are mixed.

Specification

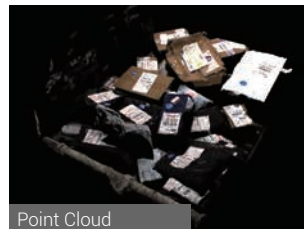|	
Objects	Support express parcels (including logistic cases, poly bags, corrugated rigid packages, jiffy packs, bubble mailers, envelopes, etc.) Parcels can be packed tightly or piled randomly in the chute; Support complex situations such as objects with patterns/express bills/bar codes and black objects.
Speed	Single cycle time can reach 2.2 s
Stability	Intelligent path planning algorithm is developed to ensure stability and avoid collisions.
Communication Interface	TCP/IP
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, crossbelt sorter 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 Use Cases

A Large Factory

Vision-Guided Case Depalletizing

Challenges

The customer is a supermarket company. At the warehouse of this company, there are a large number of cartons to be depalletized every day during inbound and outbound. While it's disappointing that traditional robots can't deal with random pallet patterns and various cartons. Besides, it also has strict requirements on speed and stability during depalletizing. So the customer decides to automate the order fulfillment line with the assistance of Mech-Mind's products.

Highlights

- It can easily handle more than 25000 kinds of cartons . Quick recognition of new cartons is available through applying model iteration.

- According to the real-time imaging of the cartons on pallets and the size of the suction cup, the intelligent AI algorithm can guide the robot to grab several cartons at once. The speed can reach 2000 cartons/hour.

- Our intelligent motion planning algorithm enables robots to work well with complex situations such as compact space, stuck pallets, serious interference from camera brackets, etc.

- Even when it comes to randomly-stacked, or tightly-packed cartons, or sacks with patterns, cable ties, and reflective films, the recognition success rate is still > 99.99%.

- One robot cooperates with two sets of vision systems, which improves efficiency.

Point Cloud

Outcomes

- A single workstation can process 2000 cartons per hour.

- Our device can stably operate 24h a day, which greatly reduces labor costs and improves productivity.

Recognition Result

Typical Solutions and Applications

A Large Delivery Company
Vision-Guided Mixed Palletizing (Cage Trolley)

Challenges

The customer is a large delivery company. In its distribution center, A large number of various express packages (including cartons, bubble mails, parcels, etc.) need to be handled every day, and the express packages needs to be transferred by cage trolley. The traditional mixed palletizing in cage trolley is always manually done, which leads to low efficiency. Lead to low transfer efficiency. In order to solve the efficiency problem, the customer decided to use the intelligent robots.
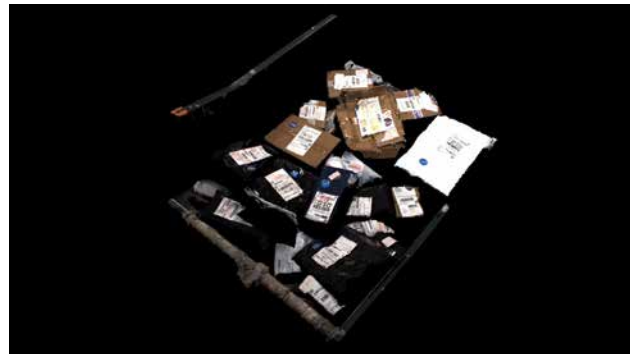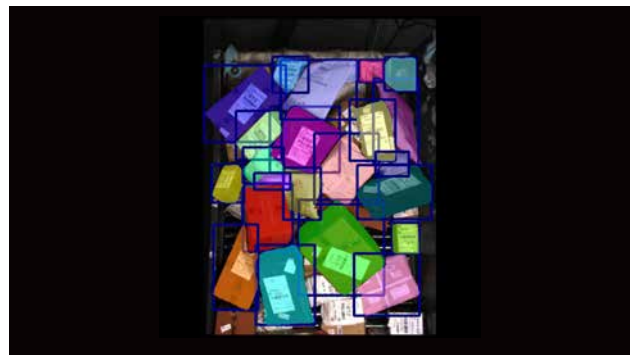

Highlights

- The robot is able to make the full use of space in cage without collisions.
- Support for various real-world logistic packages including parcels, cartons, bubble mails, envelopes, etc,
- The cycle time can meet the requirements of the customer.
- Adaptable to logistic equipment such as AGV/AMR.

Point Cloud

Outcomes

- Labor costs are greatly reduced.
- Our solution helps customers improve the efficiency.

Recognition Result

Typical Use Cases

A Large International Delivery Company
Vision-Guided Mixed Depalletizing

Challenges

The company usually deals with a large number of cases with random sizes every day. The case 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 distribution center to improve the delivery efficiency.

Highlights

- One picture can be used to grab a layer of cases, which greatly improves the operating beat.

- It can deal with various sizes of cases and pallet patterns.

- It can deal with various complex situations, like tightly-packed cases, randomly-piled sacks, parts with considerably reflective or cable ties.

- It can deal with various complex situations such as randomly-stacked, tightly-packed cases, randomly-piled sacks, reflective parts or cable ties. The recognition success rate is > 99.99%.

- The intelligent path planning algorithm can ensure stability and avoid collisions.

- Intelligent robots can quickly grab the cases.The height measuring equipment enables the robots to measure the height of the cases and place them accurately.

Point Cloud

Outcome

- The overall efficiency is significantly improved, and the operating cycle time and stability can meet the needs of customers.

- A single workstation can handle 900+ cases of goods per hour.

Recognition Result

Typical Use Cases

A Large Cosmetics E-commerce Company
Vision-Guided Order Picking

Challenges

The cosmetics e-commerce company has thousands of SKUs and numerous online orders to deal with every day. Cosmetics are various in types, so manual picking inevitably leads to low efficiency and a high error rate. To solve the problems above, our customers decided to use industrial robots and 3D vision to improve delivery efficiency.
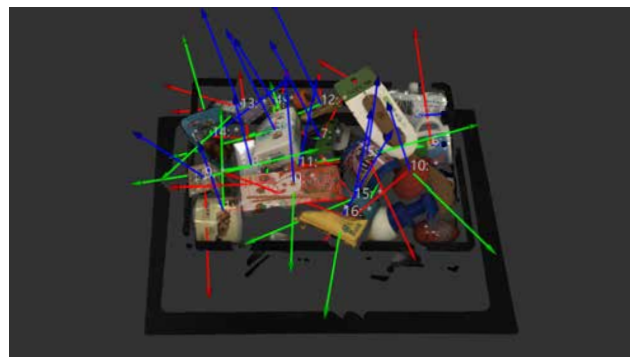

Highlights

- 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.

- The intelligent path planning algorithm allows robots to move stably and avoid collisions.

- It can be adapted to the adjustable end effector, so objects tightly attached to sides, or stuck in corners can also be easily picked up.

- It can be used together with logistic equipment such as AMR, automated storage system, etc.

Point Cloud

Outcomes

- The overall stability is dramatically improved with our automated order picking solution.

- High stability and high processing speed, which can reach 1200 pieces/hour, greatly improve the overall efficiency.

Recognition Result

Typical Use Cases

A Large Pharmaceutical Enterprise

Vision-Guided Carton Depalletizing

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

- There are more than 500 types of cartons in the pharmaceutical logistic warehouse.
- Support for cartons with textures, tapes, and cable ties.
- The system is able to count the number of cartons to be depalletized.
- With extended field of view and deep depth of field, our solution can handle different kinds of pallet patterns.

A Large Brewery Company

Vision-Guided Cardboard Depalletizing

Workflow : The robot grabs cardboards and put them on the conveyor.

- The system is able to handle more than 10 types of cardboards.
- Support for cardboards with textures, tapes, and cable ties.
- Empowered by high-accuracy Mech-Eye and intelligent vision algorithms, the robot can cut the ties and place cardboards on the production line accurately.
- With the extended field of view and deep depth of field, our solution can handle different kinds of pallet patterns.

A Large Building Materials Factory

Vision-Guided Carton Depalletizing

Workflow : The robot picks cartons from pallet and puts them on the conveyor.

- The robot can handle more than 1000 types of cartons.
- Cartons can be tightly packed or randomly piled.
- The robot can be seamlessly integrated with common logistic equipment including AMR, automated conveyor belt, etc.

A Large Steel Plant

Vision-Guided Sack Depalletizing

Workflow : The gantry robot picks sacks from different pallets and puts them on the conveyor.

- Support for sacks with wrinkles, deformation, and textures.
- The robot can handle any pallet pattern when the 3D camera is mounted on the flange.
- The vision system can work in concert with various industrial robots (including 4-axis, 6-axis, gantry robots, etc.)

Typical Use Cases

A Large Battery Factory

Vision-Guided Sack Depalletizing

Workflow : The robot picks 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, gantry, etc.

A Large Chemical Factory

Vision-Guided Sack Depalletizing

Workflow : The robot picks 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 sacks with deformation, wrinkles, patterns,text, etc.

- With high precision and deep depth of field, Mech-Eye can be adapted to pallet patterns in different heights, when the camera is mounted on the flange.

A Large Food Factory

Vision-Guided Cases Depalletizing

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

- Can recognize various cases of different sizes and poses.

- With high precision, our solution allows multiple cases to be picked at once.

- Support tightly-packed cases with patterns and tapes.

- With extended field of view, deep depth of field and high speed, Mech-Eye can meet the requirements when the camera is mounted on the flange.

A Large Airline
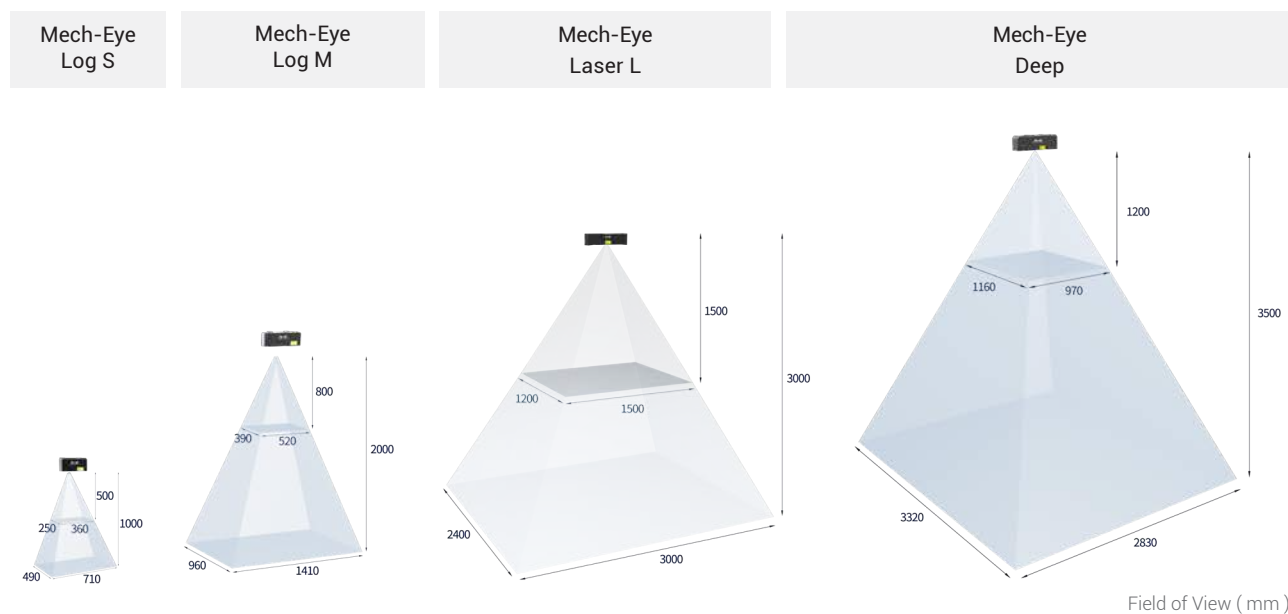
Vision-Guided Containers Depalletizing

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

- Support tightly-packed containers in different colors.

- With high precision, the working speed can meet the requirements of users.

- Able to handle different kinds of pallet patterns.

Mech-Eye Industrial 3D Camera
A Perfect Combination of Excellent Performance and Cost Effectiveness

Specification Sheet	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	0.5 - 0.9	0.7 - 1.1 s
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℃		-10 - 45℃	0 - 45℃
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

Field of View (mm)

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

Tightly-Packed Cartons with Patterns and Tapes

Tightly-Packed Sacks with Patterns

Various Common Goods

Randomly-Placed Real Express Parcels

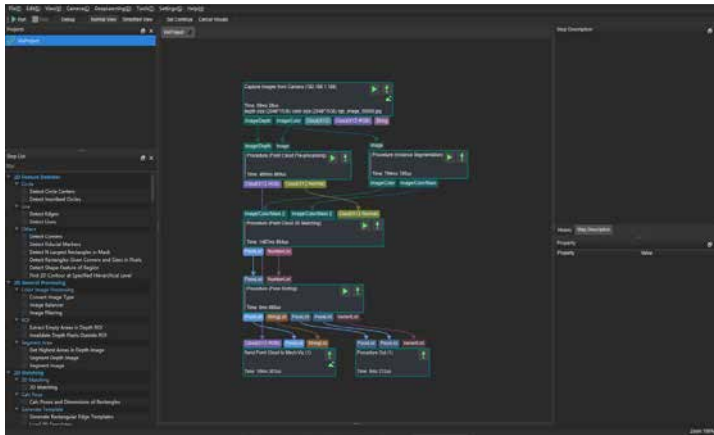High-quality Imaging of Many Objects(Metal, Wood, Plastic)

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.
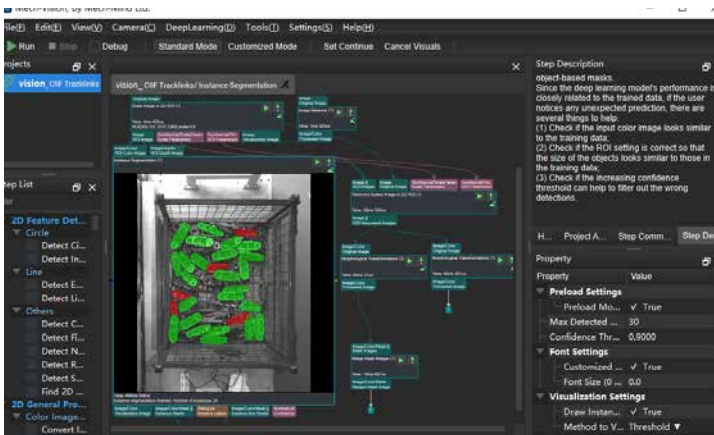

Code-free Graphical Interface, Easy to Use

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 autonomously.
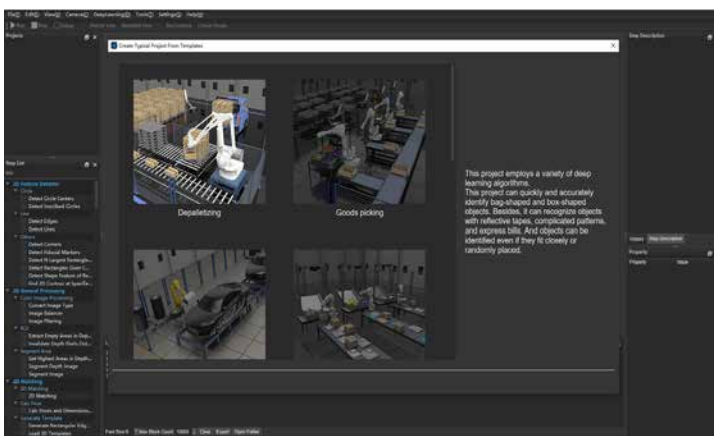

Built-in Advanced Algorithm Modules

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.

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

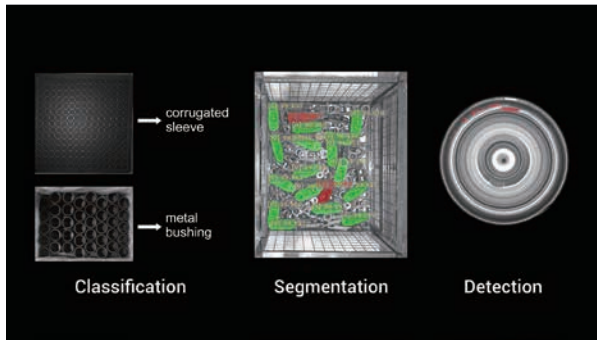### Various Built-in Typical Application Plug-ins

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.
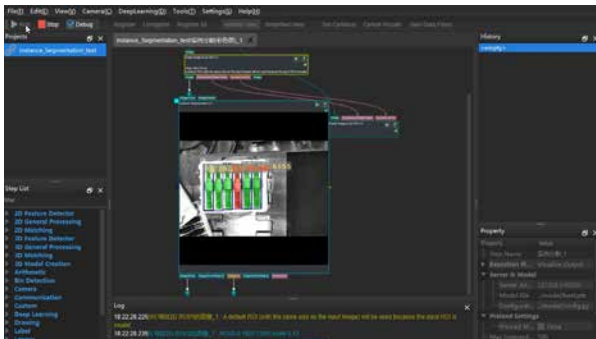
Mech-DL Kit
Offline Training Tool for Deep Learning

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.
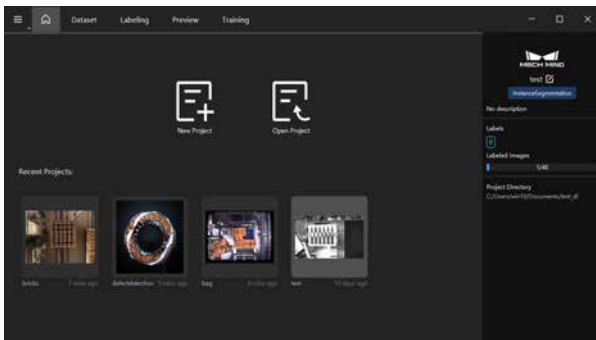

All-in-one Solution

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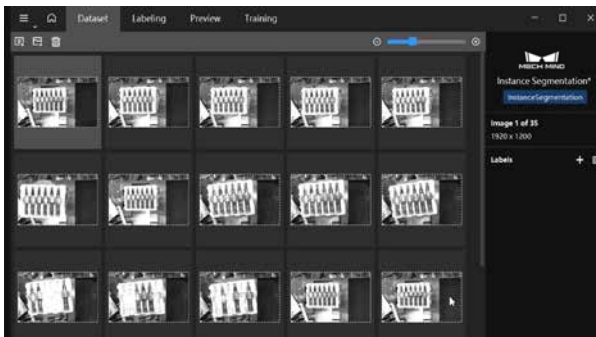

Consistently Reliable & Validated Results

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.
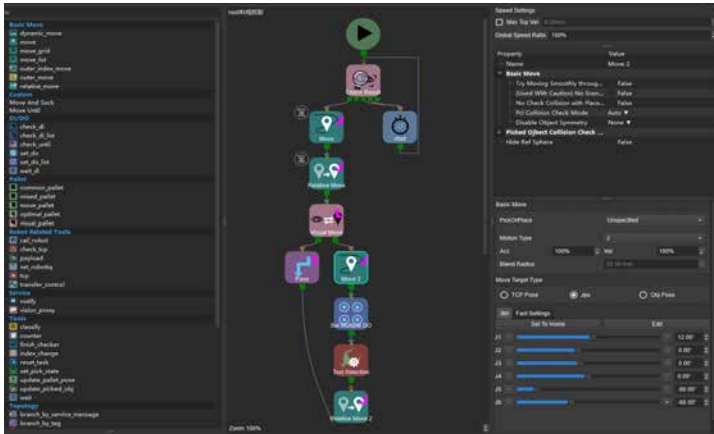

Smaller Image Sets Required

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

Mech-Viz
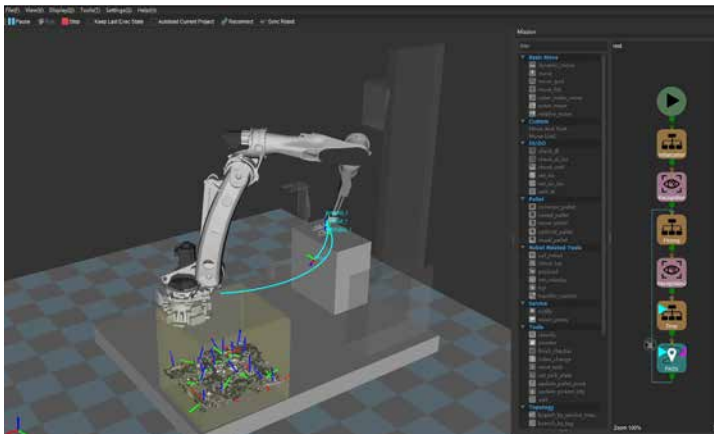## Intelligent Robot Programming Environment

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.

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 adaption 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 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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Website: www.mech-mind.com
E-mail: info@mech-mind.net