

Bulking to the next stage



»» Features

Robot calibration automation reduces startup effort (Proprietary AI technology: Maisart)

The image recognition method can be selected from modelless recognition and model matching recognition

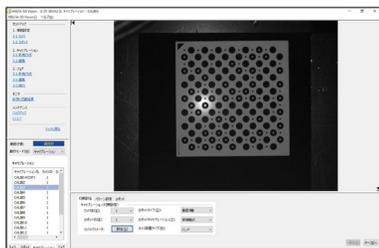
Realizing compact, dust-proof and drip-proof by cooperation with ENSENSO cameras

»» Concept

Just four steps! Easy and quick to setup!

STEP 1 Imaging position instruction

Perform initial setting and pattern setting



Default (Item)

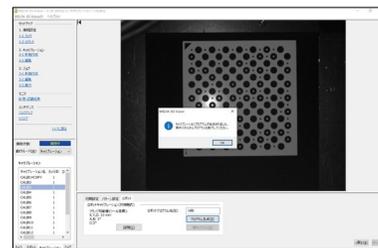
- Camera ID
- Robot ID
- Robot type
- Robot calibration
- Camera installation type
- Camera parameters

Pattern settings (Item)

- Number of patterns
- size [mm]

STEP 2 Generate calibration program

Select the "Generate program" button to generate program



ENSENSO Camera

STEP 3 Start calibration

Open the operation panel and select the "Start" button. (Calibration starts automatically)



操作パネル

状態: **運転中**

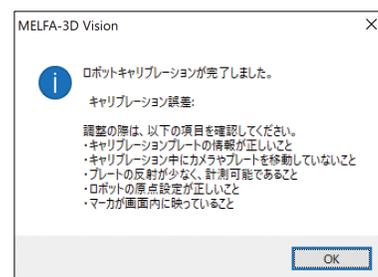
プログラム: CALIB 行番号: 24

オーバーライド(%)(O): 10

サーボ入(N) サervo切(E) リセット(R)

開始(S) 停止(P)

STEP 4 Calibration complete



MELFA-3D Vision

ロボットキャリブレーションが完了しました。

キャリブレーション誤差:

調整の際は、以下の項目を確認してください。

- キャリブレーションプレートの情報が入力されていること
- キャリブレーション中にカメラやプレートが移動していないこと
- プレートの反射が少なく、計測可能であること
- ロボットの原点設定が正しいこと
- マーカーが画面内に映っていること

OK

MELFA-3D Vision 3.0



» Features

Responding to diverse installation environments

Compact, dust-proof and drip-proof for a wide range of scenes

Challenges

In considering the introduction of 3D Vision to existing and new lines, The adoption was postponed due to the limitation of the device layout and the lack of environmental resistance

➔ Robotic applications can't actively use 3D Vision

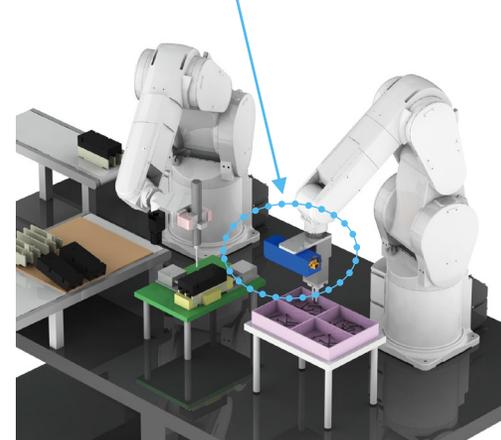
solution

- Choose from a wide range of cameras (next slide) with a high degree of freedom
- The compact and lightweight camera body is not only fixed to the trestle
Can also handle hand eyes, contributing to the realization of space-saving and advanced applications
- Can also be used in environments with a dust- and drip-proof camera

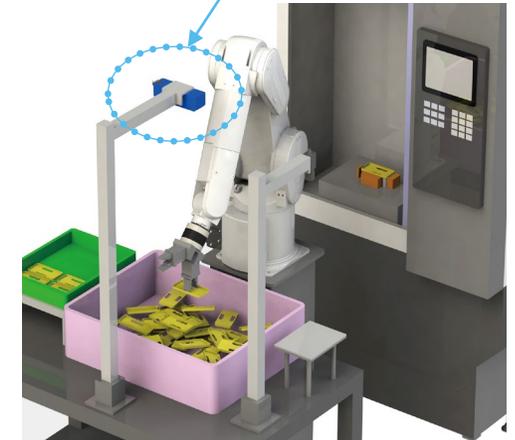
➔ Extensive lineup, compact, environmentally resistant camera integration

3D Vision lineup to lower installation hurdles, aiming for adoption in various use scenes

Handy-enabled/IP 65/67



Fixed Camera Compatible/IP 65/67



MELFA-3D Vision 3.0



» Features

Responding to diverse installation environments

Improve tact time by improving measurement time

Challenges

The work process of picking work (measurement → recognition → grasping/conveying)

It is not simple, so there are many issues to improve the tact time.

➔ To shorten the tact time in bulk picking work

solution

The combination with the stereo ENSENSO camera (which can calculate height information in one shot) reduces the ga measurement time compared to conventional our company cameras that use the triangulation method (which requires multiple projection in a striped pattern).

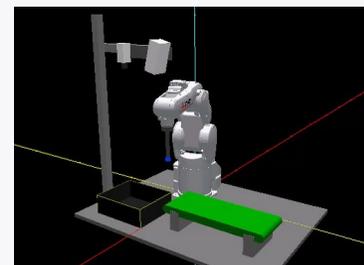
➔ Contributing to tact time improvement by improving measurement time (Approximately 30% improvement compared to the conventional our company in the assumed work of our company)

Improved takt time for bulk picking by shortening measurement time!

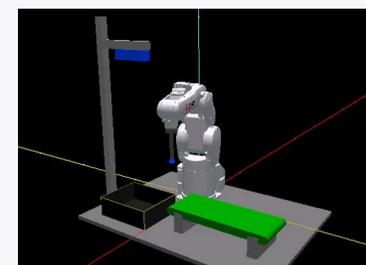
Differences in motion with fixed cameras

Condition

- measurement recognition time Ver.2.0:1.95[sec], Ver.3.0:1.5[sec]
- Takeout and transport distance: approx. 500 mm (Y direction)
- Removal/discharge Dly 0.4 sec, deceleration at approach and during transport
- Measurement recognition per cycle



Ver.2.0



Ver.3.0

The Ver. 3.0 measurement and recognition time has been shortened (approximately 30%).
Reduced waiting time for robot tray entry (improvement effect: 0.45 sec).
The operating time per cycle is:

- Ver. 2.0: 3.70 [sec]
- Ver. 3.0: 3.25 [sec] (12% improvement)

MELFA-3D Vision 3.0



» Features

Expansion of applicable work

Improved recognition technology for a wide variety of workpieces

Challenges

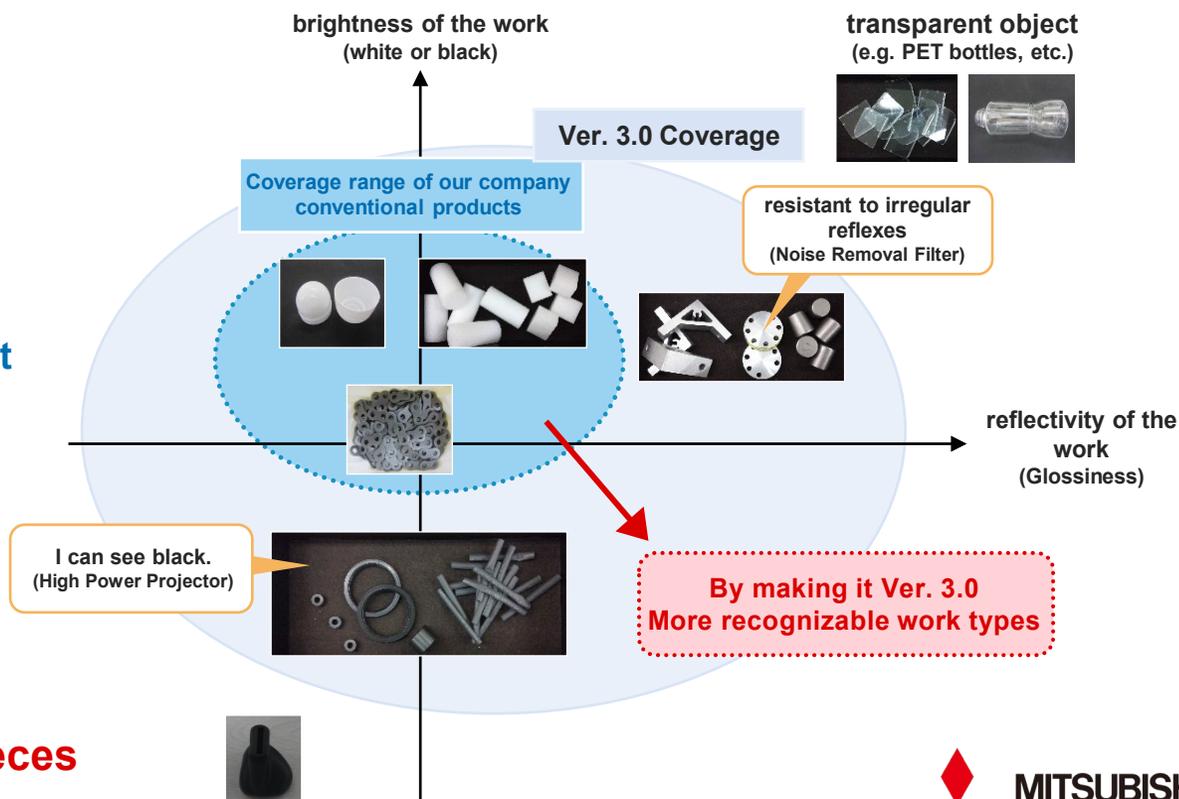
Depending on the camera performance and disturbance factors, some items cannot be recognized depending on the workpiece. There were times when 3D Vision applications were not feasible.

➔ **Lack of ability to deal with workpieces that are difficult to handle (black, matte, glossy etc.)**

solution

- Strong against disturbance light by adopting infrared light
- HDR support for scenes with large contrast (dedicated software)

➔ **A wide variety of workpieces can be recognized**
Expanding the scope of 3D Vision applications by expanding the number of applicable workpieces



MELFA-3D Vision 3.0



» Features

Work supply support (production efficiency improvement)

Efficient supply work is realized by the work residual capacity estimation function

Challenges

In the bulk loading process, the reduction of workpieces is not constant. It was necessary to check the remaining amount of work each time and perform the supply work

➔ Work supply could not be carried out efficiently

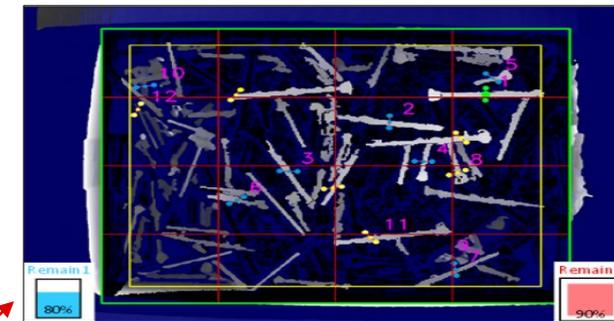
solution

In real time by calculating the remaining work rate
Timing of work supply can be judged!

➔ Efficient work supply through visualization of remaining work

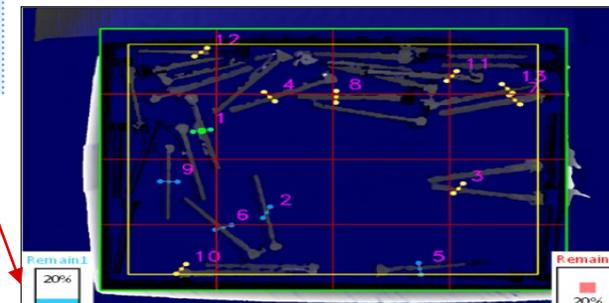
Contributing to Improvement of Yield in Bulk Picking Process

When you work a lot



The remaining amount is estimated from height information (Z component). Calculate the average height above the floor height, Show Percentage at Measurement Depth

When there is little work



The remaining amount is estimated from Information of the recognition range (XY component). above floor height within the range of recognition Show Pixel Percentage

MELFA-3D Vision 3.0



» Features

Automatic calibration function (reduced start-up time)

Automation of robot calibration simplifies startup work

Challenges

Manual calibration work (image position instruction, etc.), etc.
this may be confusing for first-time 3D Vision users

➔ Robotic calibration is time-consuming

solution

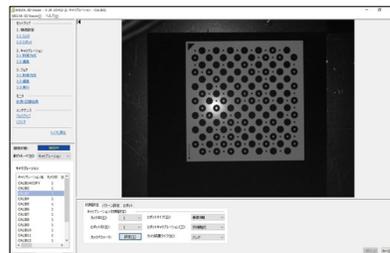
With MELFA -3 D Vision 3.0 software, Automates robotic calibration tasks
(Image position instruction → button execution only)

➔ Automatic Calibration Function Easy Start-up

Improved convenience for customers who are introducing 3D Vision for the first time

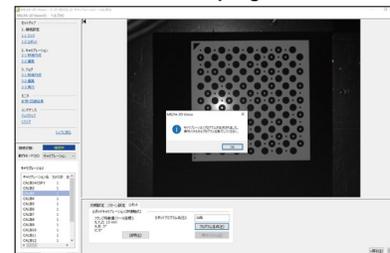
STEP1 Teach imaging position

Perform initial setting and pattern setting



STEP2 Generate calibration program

Press the program generation button to generate a program



STEP3 Start calibration

Open the operation panel and press the "Start" button.
Start calibration automatically



STEP4 Calibration complete



MELFA-3D Vision 3.0



» Features

SmartPlus/Automatic recognition parameter generation function (reduced start-up time)

Automatic generation of recognition parameters simplifies startup work

Challenges

I want to use modelless recognition function (*), but setting parameters is complicated

(*) Register the pawl/suction pad shape of the hand and insert the pawl.
Method for gripping workpiece by searching Adsorbable part of pad

➔ easily setting the modelless recognition function

solution

Optional SmartPlus (MELFA 3D Vision extension)
Highly difficult sensor parameter adjustment work is automated

➔ Allows anyone to easily adjust parameters on par with experts

The task of adjusting recognition parameters is automated by our unique AI technology

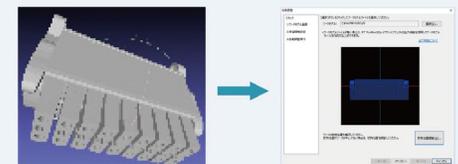
Flexible support for irregular workpieces by using modelless recognition technology

■ Configuration work image

STEP1

Import model of workpiece

Import a 3D model of the workpiece.

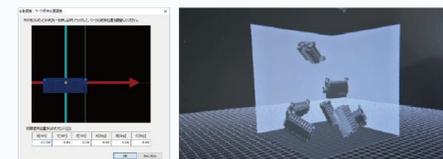


STEP2

Set learning conditions

Set the bin size and conditions required for learning.

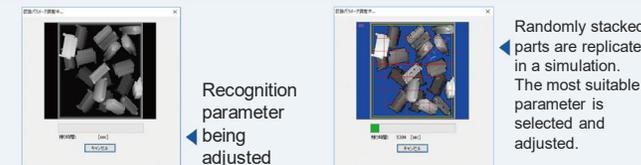
- (1) Adjust the grasp position of the model workpiece.
- (2) Configure the learning conditions parameter.



STEP3

Automatic adjustment

Adjustment of recognition parameter.



STEP4

Parameter optimization

Adjust sensor parameters



Note

Model-less recognition does not usually require a 3D model. However, a 3D model of the workpiece is required for this function.

MELFA -3D Vision 3.0 Product Structure



» Features

■ standard product configuration

MELFA-3D Vision 3.0
【Name: 3F -53 U-WINM】



- MELFA -3 D Vision Software
※Available via USB dongle (licensed)
- Owner's Manual, Quick Start Guide
Sample Programs, Software Use Agreement



■ Customer ordered goods (recommended by Mitsubishi Electric)

Camera head



general-purpose
PC

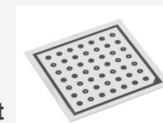


PoE LAN Cable
AD00268



Calibration plates
AL00065, AL00091

- ※Ceramic material with heat resistant expansion



■ Corresponding sensor Recommended Manufacturer: ENSENSO

Model number	Field of view (mm)	Work Distance (mm)
N35-804-16-IR	388 × 291 ~ 860 × 645	480 ~ 1000
N35-806-16-IR	287 × 215 ~ 435 × 326	350 ~ 550
N35-808-16-IR	231 × 173 ~ 290 × 217	280 ~ 360
N35-1204-16-IR	315 × 236 ~ 431 × 323	600 ~ 850
N35-1604-20-IR	248 × 186 ~ 268 × 201	700 ~ 800

SmartPlus
3DVS extension function
target

MELFA -3D Vision 3.0

Product Structure



» Basic Specifications

Items		Function Description
Compatible Robot ^{Note 1}		RV-F, RH-FH Series, RV-FR, RH-FRH Series RV-CR, RH-CRH Series, RV-AS Series
robot programming language		MELFA-BASIC VI or MELFA-BASIC V
robot controller	MELFA -3 D Vision Specific Commands	Notification of calibration and job execution instructions to the control unit Dedicated command to get recognition results
Connection Settings	Number of camera head settings	Up to 2
	Number of robot settings	Up to 4
Calibration	Number of calibration data	Up to 15
	contactless calibration	Applicable to fixed cameras and hand eyes Automatic calibration possible (some teaching work is required in case of other than 6 vertical axes)
	contact calibration	Applicable to fixed cameras Manual calibration with 5-point teaching
Measurement ^{Note 2}		An imaging command is given to a camera head, and a distance image from the imaged pattern image is calculated.
	measurement time	Approximately 0.8 seconds ^{Note 3}
	number of measurement points	1.3 million
	measurement sensitivity	Selectable HDR measurement Extending the pseudo dynamic range by measuring twice at low exposure + high exposure
	Measurement accuracy improvement function ^{Note 4}	ENSENSO Accuracy Enhancement Technology "FLEXVIEW" Selectable

Note 1) Not applicable to wiring interior specifications of vertical multi-joint RV-F series or RV-FR series.

Note 2) Shielding measures may be required in order to be affected by ambient light. If the work distance is long, the projector light will be weak. Easier to be affected by ambient light.

The workpiece of transparent or specular objects may not be measurable or difficult to measure. Measurements/recognition may be difficult for high gloss objects, black objects, dark objects, and workpieces with complex surface shapes.

Note 3) Enter the standard time under the best conditions. Standard time may be exceeded depending on conditions such as control unit performance, ambient environment, workpiece, processing parameters, number of registered jobs, etc.

Note 4) Specify the number of images to be used for Flex View, the addition average algorithm of ENSENSO cameras. The larger the value, the smaller the change of the luminance value, and the longer the measurement time.

MELFA -3D Vision 3.0

Product Structure



» Basic Specifications

Items		Function Description	
Job	Number of registered jobs	Up to 250	
	modelless recognition	Register the shape of the pawl/suction pad of the hand, and insert the pawl into the gap. Recognition method for gripping workpiece by recognizing suction position of suction pad	
		Output information of the recognition result	Posture output ⁰ : Work position in camera coordinates (XYZC) ^{Note 4} Attitude Output "1 ~ 6": Robot Coordinate Work Position (XYZABC) ^{Note 4}
		recognition time	Approximately 0.5 seconds ^{Note 3}
	Model matching recognition ^{Note 5}	Recognition method for grasping workpiece by registering shape by 3D-CAD model of workpiece and recognizing workpiece matching 3D-CAD model	
	Work registration size/piece	Up to 8.5 million bytes (8.1 MB)	
	Work 3D - CAD Data Format	STL, OBJ, and PLY formats	
	Number of work registrations	Up to 250	
	Number of work parameter registrations per work	Up to 10	
	Number of Worklists	Up to 250	
Recognized items per worklist	Up to 100		
Output information of the recognition result	Work Position in Robot Coordinates (XYZABC)		
recognition time	Approximately 1.0 seconds ^{Note 3}		

Note 3) Enter the standard time under the best conditions. Depending on the conditions such as the performance of the control unit used, the surrounding environment, the workpiece, the processing parameters, the number of job registrations, etc. Standard time may be exceeded.

Note 4) See separate manual for attitude output. In the case of picking with modelless recognition, it may be necessary to use a two-dimensional vision sensor together.

Note 5) Not compatible with horizontal multi-articulated RH-F series or RH-FR series.

MELFA -3D Vision 3.0 Basic Specifications



» Basic Specifications

Items		Function Description
Job	Automatic adjustment of recognition parameters AI ^{Note 6}	When adjusting for modelless recognition, our unique AI and simulation technologies automate the adjustment of recognition parameters that require specialized knowledge.
	Work registration size/piece	Up to 8.5 million bytes (8.1 MB)
	Work 3D - CAD Data Format	STL, OBJ, and PLY formats
	adjustment time	Approximately 10 to 60 minutes ^{Note 9}

Note 6) Automatic adjustment of recognition parameters AI is available for ENSENSO cameras (N 35 -804 -16 - IR, N 35 -806 -16 - IR, N 35 -808 -16 - IR)

Also, MELFA -3 D Vision enhancements are not available on the RV-AS series

Note 9) It depends on the control unit performance used, the work 3D-CAD data, and the learning preferences

■ USB Dongle Body

Items	Specifications
External dimensions mm x mm x mm	62.1 x 17.0 x 10.0
Weight	9.0g
activation feature	Execute the application activation process. ^{Note 1}
dust-proof and drip-proof performance	None ^{Note 2}
Guaranteed operating temperature/humidity	0 °C to + 50 °C/0 ~ 85% RH ^{Note 3}
Storage temperature/humidity	-20 °C to + 85 °C/0 ~ 85% RH ^{Note 3}

Note 1) This product periodically reads the license for the USB dongle and performs the application activation process

The USB dongle must remain inserted into the control unit when using the MELFA -3 D Vision 3.0

Note 2) Not applicable to oil mist environment

Note 3) The condition is that there are no external factors such as condensation or static electricity