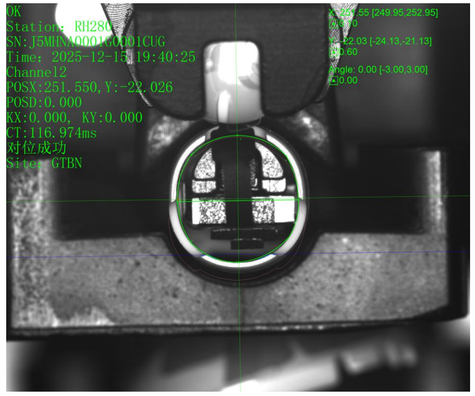
H280 SCUD Vision Flow

H280 | Glue path AOI Vision flow change list

Station ID	Station Description	Vendor	Process Type		MIL
H280		EW	Dispense		

H280 | Glue path AOI introduction report



命令	Point #	X(mm)	Y(mm)	Z(mm)	R	速度参数
起点	Point #1	0	0	0	0	5.00
圆弧		-0.5	1.1	0	-22.5	
直线	Point #2	-1.5	1.8	0	-45	7.50
圆弧		-2.7	2.1	0	-67.5	
直线	Point #3	-3.6	2.1	0	-90	6.50
圆弧		-4.3	1.8	0	-112.5	
直线	Point #4	-5.25	1.1	0	-135	10.00
圆弧		-5.9	0.2	0	-157.5	
终点	Point #5	-6	-0.7	0	-180	1.60
起点	Point #6	0	0	0	0	5.00
圆弧		-0.15	-1.5	0	22.5	
直线	Point #7	-0.9	-2.6	0	45	7.50
圆弧		-1.6	-3.2	0	67.5	
直线	Point #8	-2.5	-3.8	0	90	3.00
圆弧		-3.2	-3.6	0	112.5	
直线	Point #9	-4.35	-3.4	0	135	12.00
圆弧		-5.55	-2.4	0	157.5	
终点	Point #10	-6	-1.6	0	180	2.20

H280_Right gantry

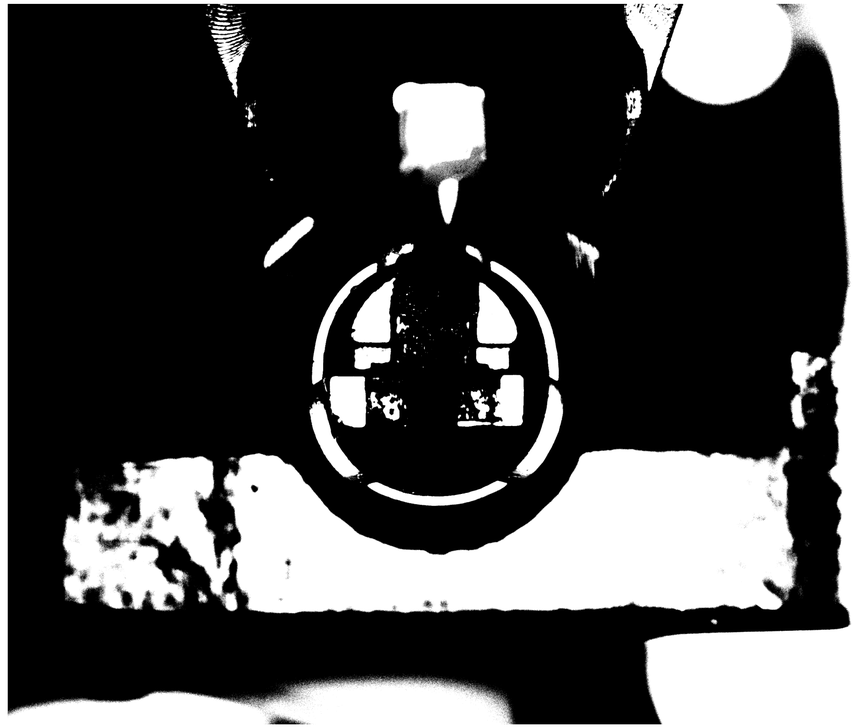
命令	Point #	X(mm)	Y(mm)	Z(mm)	R	速度参数
起点	Point #1	0	0	0	0	5.00
圆弧		-0.5	1.1	0	-22.5	
直线	Point #2	-1.5	1.8	0	-45	7.50
圆弧		-2.7	2.1	0	-67.5	
直线	Point #3	-3.6	2.1	0	-90	6.50
圆弧		-4.3	1.8	0	-112.5	
直线	Point #4	-5.25	1.1	0	-135	10.00
圆弧		-5.9	0.2	0	-157.5	
终点	Point #5	-6	-0.7	0	-180	1.60
起点	Point #6	0	0	0	0	5.00
圆弧		-0.15	-1.5	0	22.5	
直线	Point #7	-0.9	-2.6	0	45	7.50
圆弧		-1.6	-3.2	0	67.5	
直线	Point #8	-2.5	-3.8	0	90	3.00
圆弧		-3.2	-3.6	0	112.5	
直线	Point #9	-4.35	-3.4	0	135	12.00
圆弧		-5.55	-2.4	0	157.5	
终点	Point #10	-6	-1.6	0	180	2.20

H280_left gantry

Glue Dispense Vision Guidance

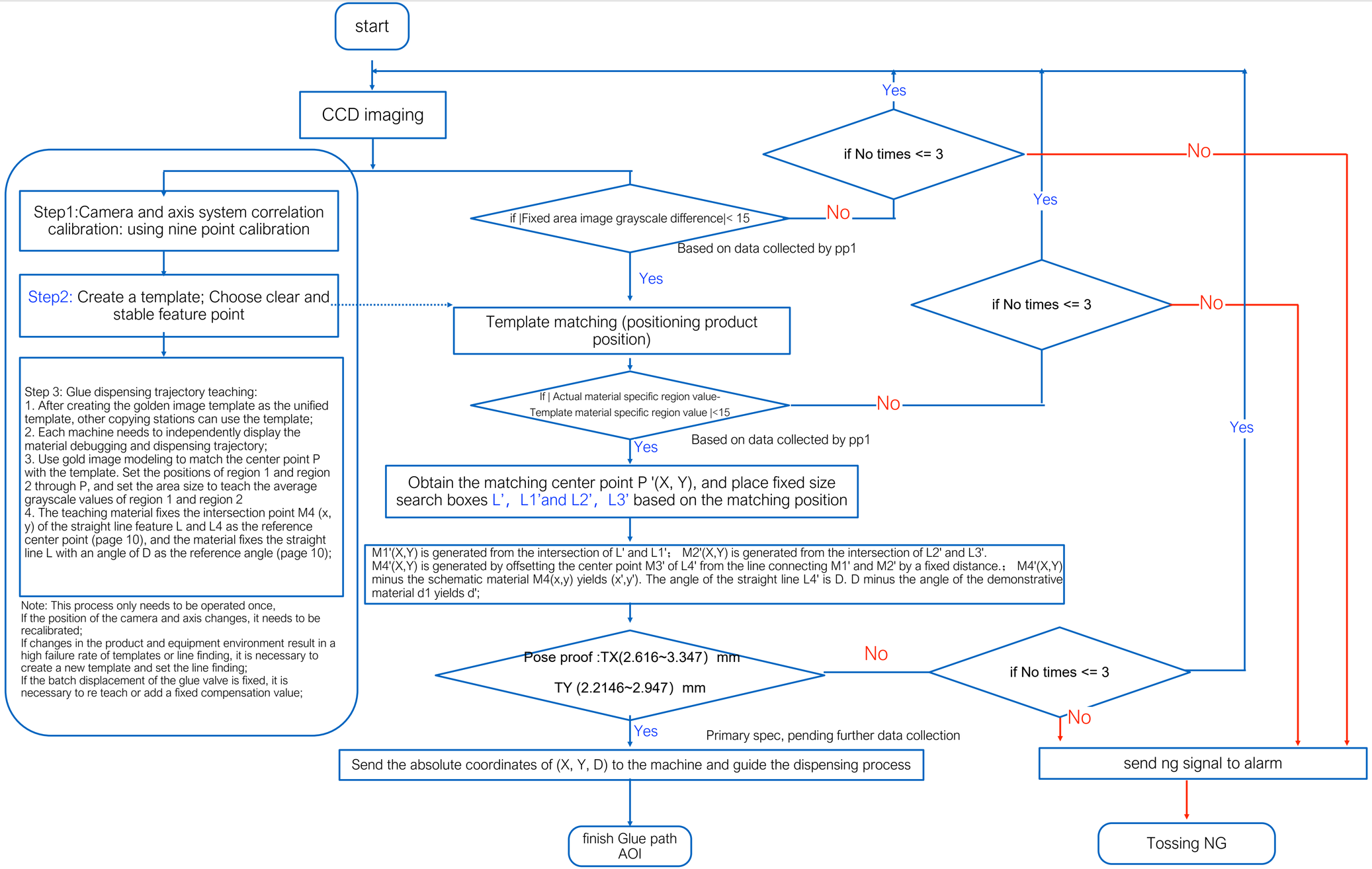
The algorithm and work flow to guide the machine to dispense the glue.

Glue path
Golden image



Pixel dimension	0.0086mm/pixel
Lens resolution	2448*2048
FOV	21*17.5mm
DOF	5mm
Lightning Brightness	255
Exposure time	3

Audio | H280 Vision Flow | Glue path 1 – Workflow



Pose 1 Vision Workflow

Step	Description	Page	Remark
1	Creating coarse finder templates Pose1	8	
2	Pattern Matching in Pose1	9	
3	Finding lines	10	
4	Foolproof	21	
6	Glue path AOI Product Glue Path Edge	25	
7	Glue path AOI Glue Area Region	26	

Select Golden image

↓

Select clear and stable features and draw ‘contour feature area’ according to set fixed parameters

↓

Set up the parameters for modeling (see training parameters attached)

↓

Masking out other unstable and unwanted features in the ‘contour feature area’

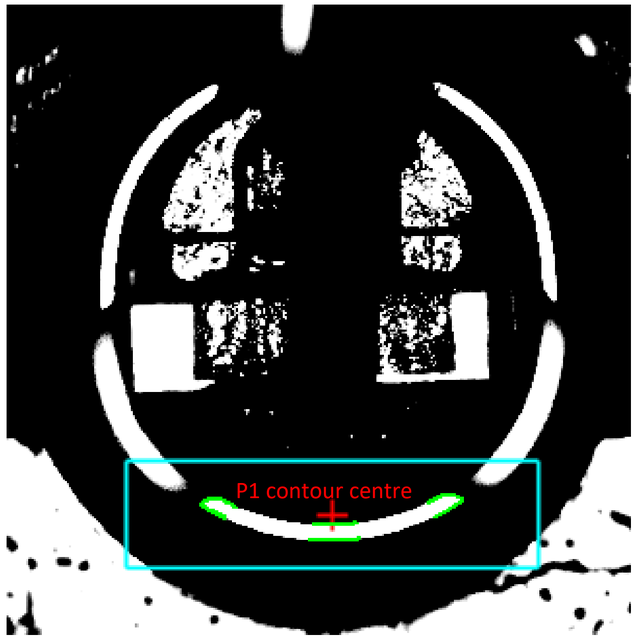
↓

Click on the template training to get the template

↓

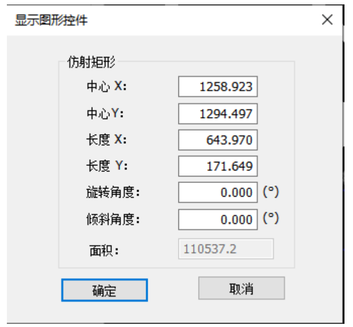
Offset the fixed coordinates of the template center P to obtain the center of region 1 and region 2
Record the average gray values G1 and G2 respectively

Modeling Process

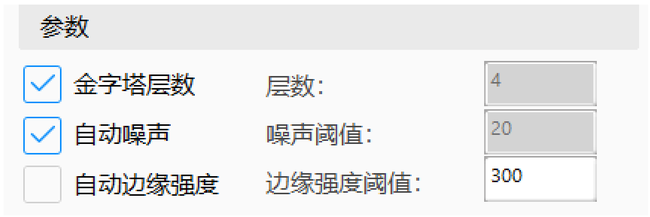


Template 1

Use the center of the template as the reference center



Contour feature area parameter

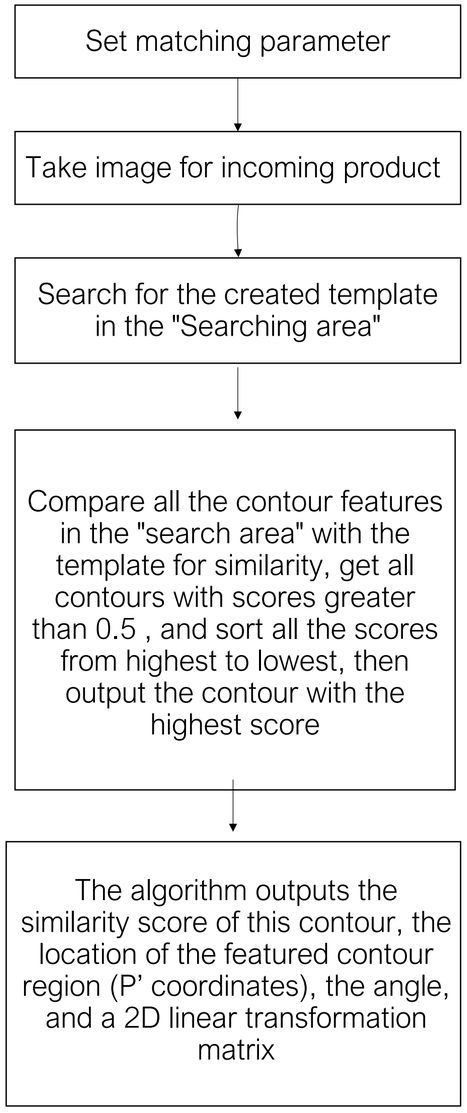


training parameters

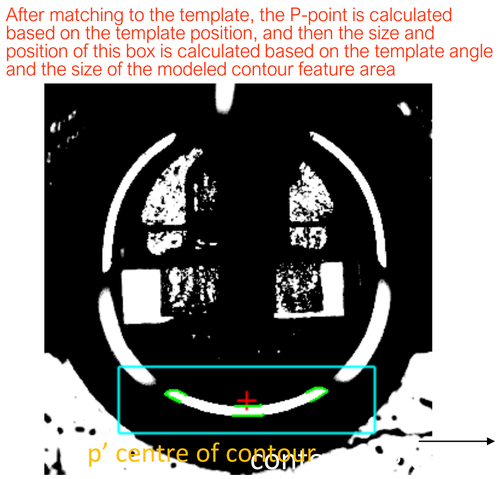
Modeling feature requirements:
1. Stable and clear outline edge, no dirty
2. Do not have multi-layer, complex contours
3. Search area, do not have a close shape of the edge of the contour

When modeling, make good use of the masking function to mask out the unwanted edge contour features. Leaving only stable and clear contour features

After the modeling is completed, need offline test with all the previous material images to confirm the compatibility of this template for all incoming materials.

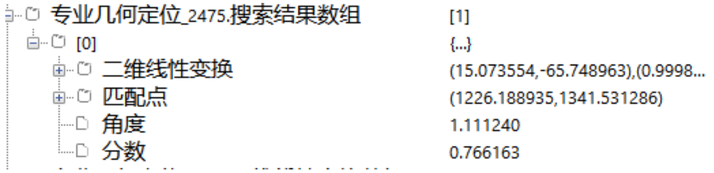


Matching process



Actual product

Matching parameter



Matching result

Point P' is the center point of the matched contour feature and is sent to the machine as a guide point

Incoming material requirements:
1. to ensure that the difference between the material and the modeled material can not be too large (visual inspection can not have obvious differences in the structure)
2. region1 and region2 detection area, grayscale value and template material difference can not exceed ± 10
3. dirty, foreign matter also can not have a lot, can not obscure the modeled features;

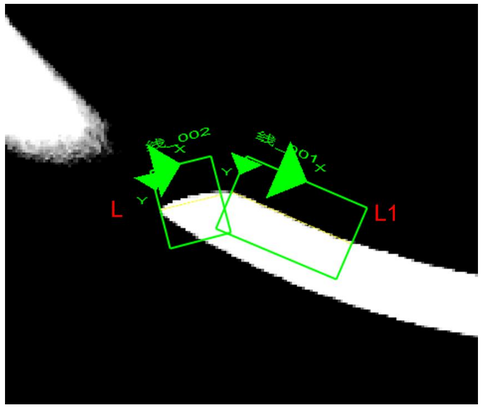
According to the template created, P-point offset (-320, -32) to get the center of the L line search box, offset (-263, -26) to get L1 line search box

↓

According to the center of the line search box set the parameters, the line search box is automatically generated.

↓

According to the caliper parameters, in the line search box, find the line L & L1



L searching template

caliper parameter

L1 searching template

caliper parameter

Line finding process

Search direction: left to right, dark to light

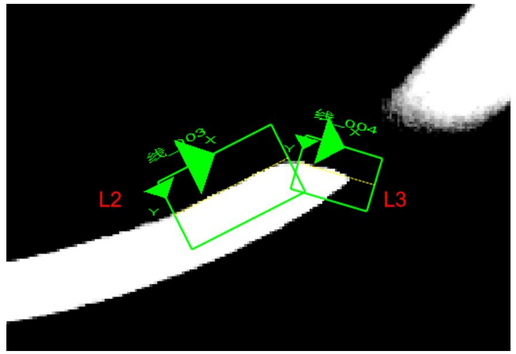
Feature selection:
Select a small section above the RVM that is relatively close to a straight line to represent the angle of the material, the length of the search box is 43pixel and the height is 34pixel

According to the template created in Page10, P-point offset (314, -35) to get the center of the L2 line search box， offset (260, -34) to get the center of the L3 line search box

According to the center of the line search box set the parameters, the line search box is automatically generated.

According to the caliper parameters, in the line search box, find the line L2 & L3

Line finding process



L2 searching template

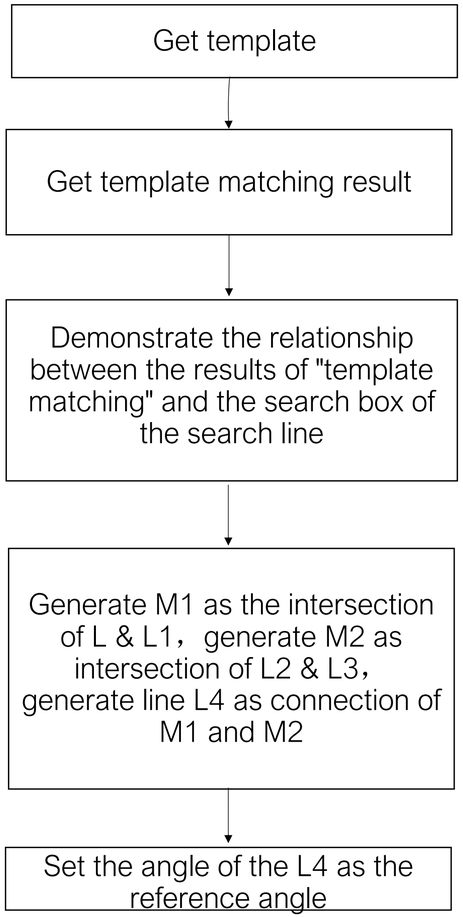
L2 caliper parameter

L3 searching template

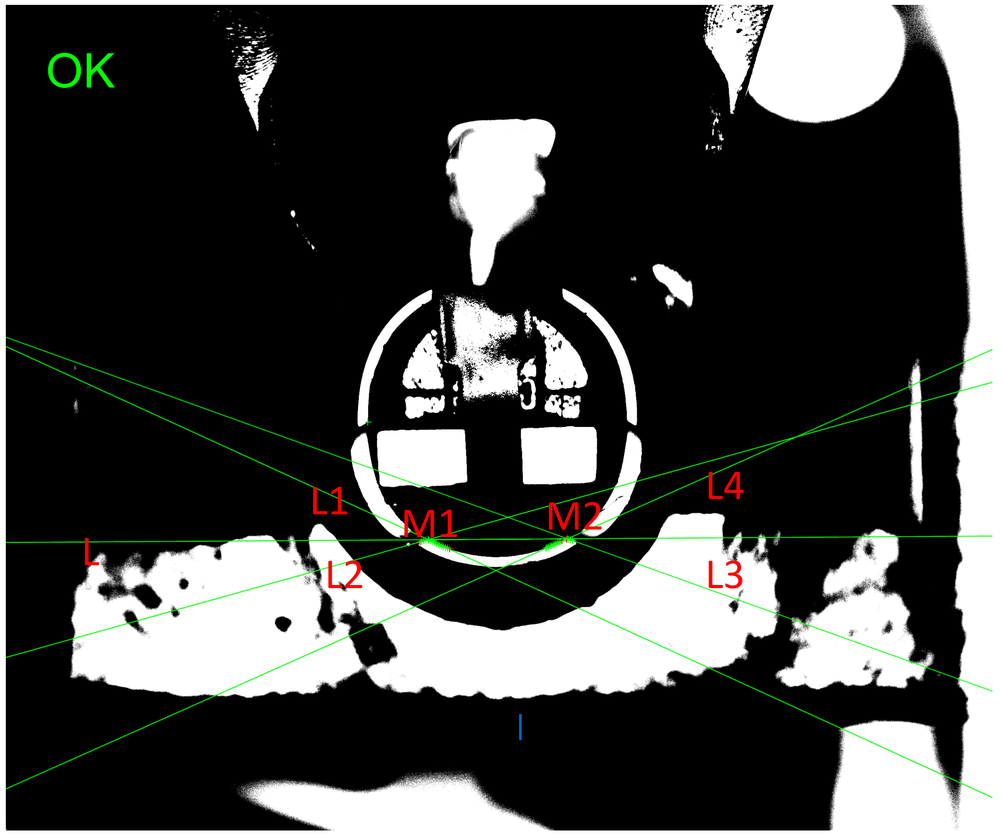
L3 caliper parameter

Search direction: left to right, dark to light

Feature selection:
Select a small section above the RVM that is relatively close to a straight line to represent the angle of the material, the length of the search box is 43pixel and the height is 34pixel



Angle demonstration process



Template angle

The angle of the line L4 generate from the connection of M1 and M2 is used as the reference angle of the template material.

Generate M3 as middle point of M1 and M2

↓

Do the vertical line of L4 through point M3 to generate L5

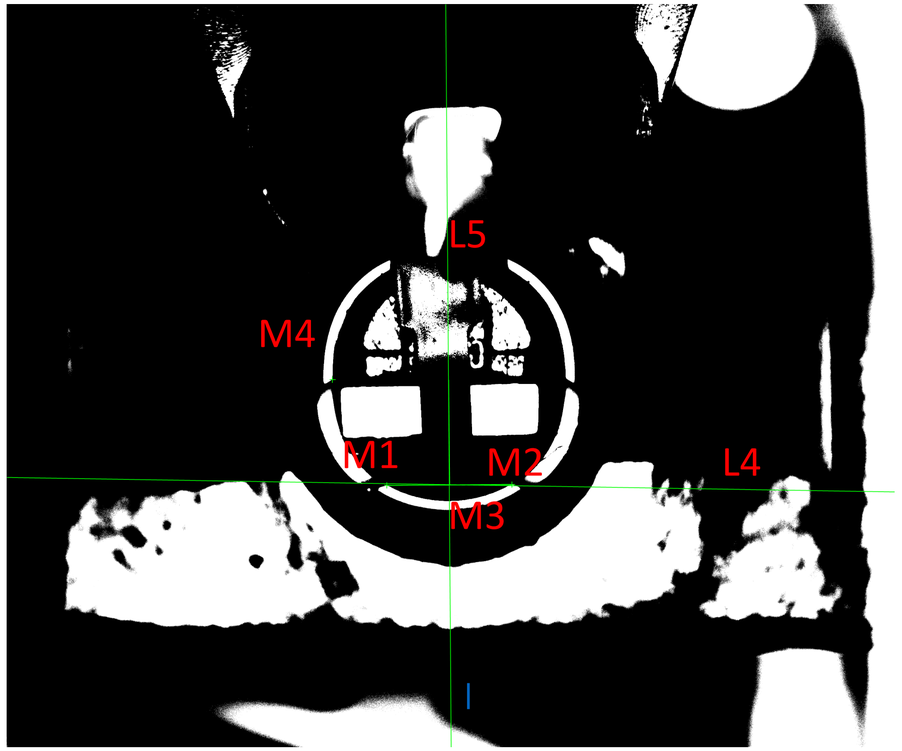
↓

Offset M3 by a distance of -2.75 in the direction of L4 and -2.55 in the direction of L5 to generate M4 (X, Y)

↓

Send M4(X,Y) as reference point to dispenser

Demonstrate reference point



Send M4（X,Y） as reference point to dispenser

Generate M1' points from L' and L1'

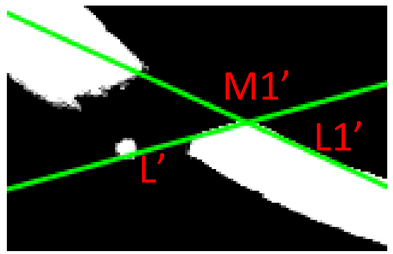
Generate M2' points from L2' and L3'

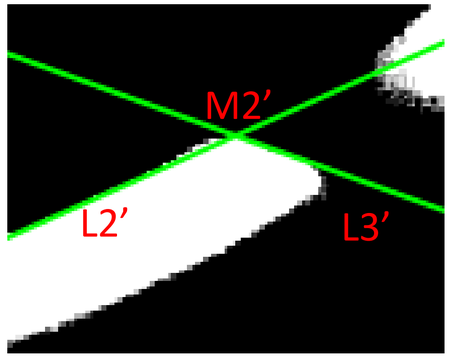
generate line L4’ as connection of M1’ and M2’

generate point M3’ as connection of M1’ and M2’

The vertical line of L4' through point M3' is L5'.

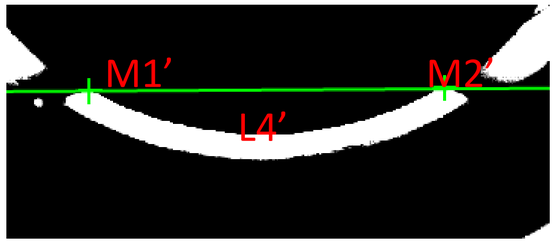
Reference point generation process



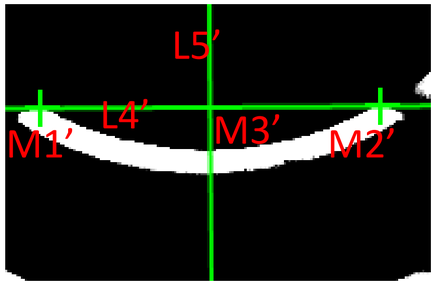


Generate M1’

Generate M2’



Generate L4’



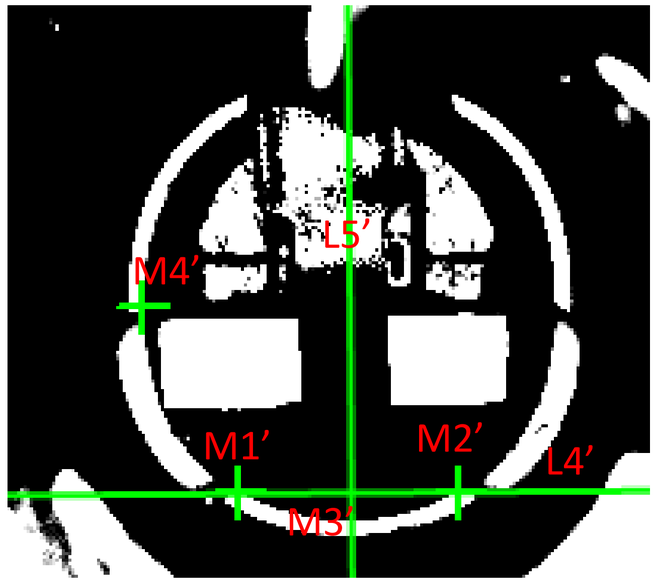
Generate M3’ and L5’

Audio | H280 Vision Flow | Glue path 1 – Create standard point

Offset M3 by a distance of -2.75mm in the direction of L4 and -2.55mm in the direction of L5 to generate M4 (X, Y)

↓

Send M4’（X，Y）and L4’angle D1’ to dispenser



ParameterList	
修正基准线	0
基准线角度归一化	是
x补偿方向	1
y补偿方向	1
x固定偏移量	-2.750000
y固定偏移量	-2.550000
x随机补偿量	0.000000
y随机补偿量	0.000000

M4’ parameter

Reference point generation process

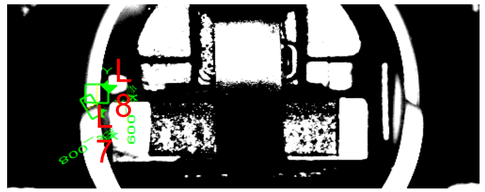
Send M4’as reference point and L4’ as reference angle to dispenser

Generate M5 points from L7 and L8

Move L4, upward so that it intersects point M5; the resulting line is L6

Get TX &TY, its the material assemble position

The spec of TX&TY, TX: (2.616~3.347) mm, TY: (2.2146~2.947) mm



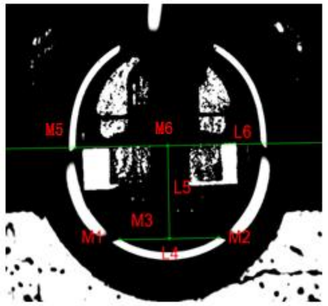
L7 caliper parameter

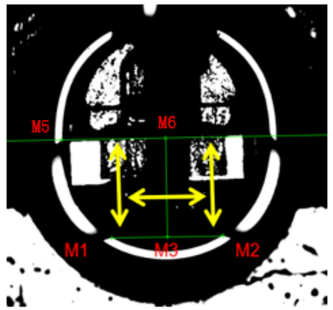
L7caliper parameter

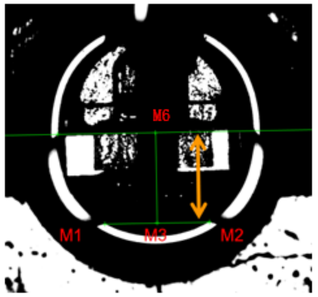
L8 caliper parameter

L8caliper parameter

Generate foolproof distance







TX: (2.616~3.347) mm

TY: (2.2146~2.947) mm

According to the template created, P-point offset (-320, -32) to get the center of the L line search box, offset (-263, -26) to get L1 line search box

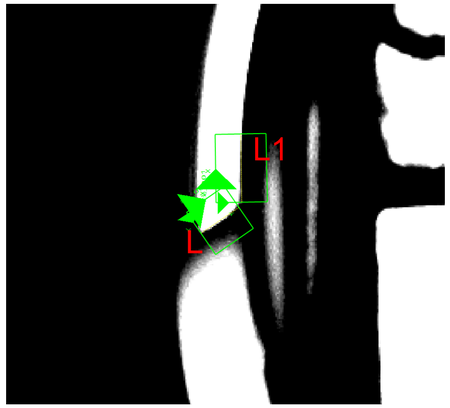
↓

According to the center of the line search box set the parameters, the line search box is automatically generated.

↓

According to the caliper parameters, in the line search box, find the line L & L1

Line finding process



L searching template

caliper parameter

L1 searching template

caliper parameter

Search direction: left to right, dark to light

Feature selection:
Select a small section above the RVM that is relatively close to a straight line to represent the angle of the material, the length of the search box is 43pixel and the height is 34pixel

According to the template created in Page10, P-point offset (314, -35) to get the center of the L2 line search box， offset (260, -34) to get the center of the L3 line search box

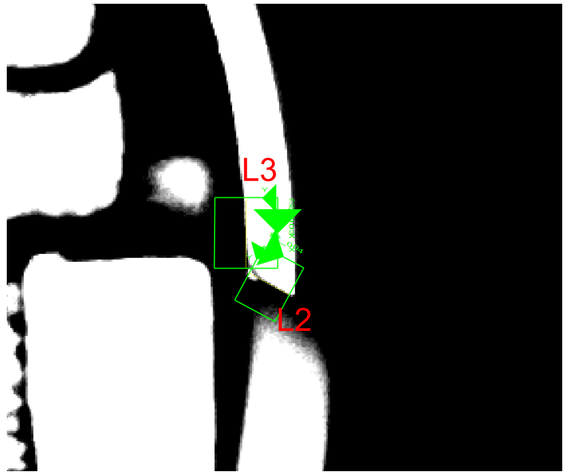
↓

According to the center of the line search box set the parameters, the line search box is automatically generated.

↓

According to the caliper parameters, in the line search box, find the line L2 & L3

Line finding process



L2 searching template

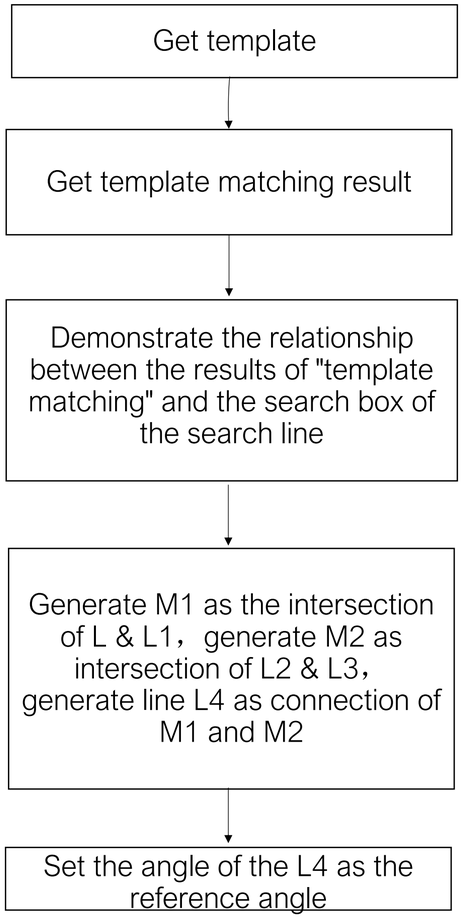
L2 caliper parameter

L3 searching template

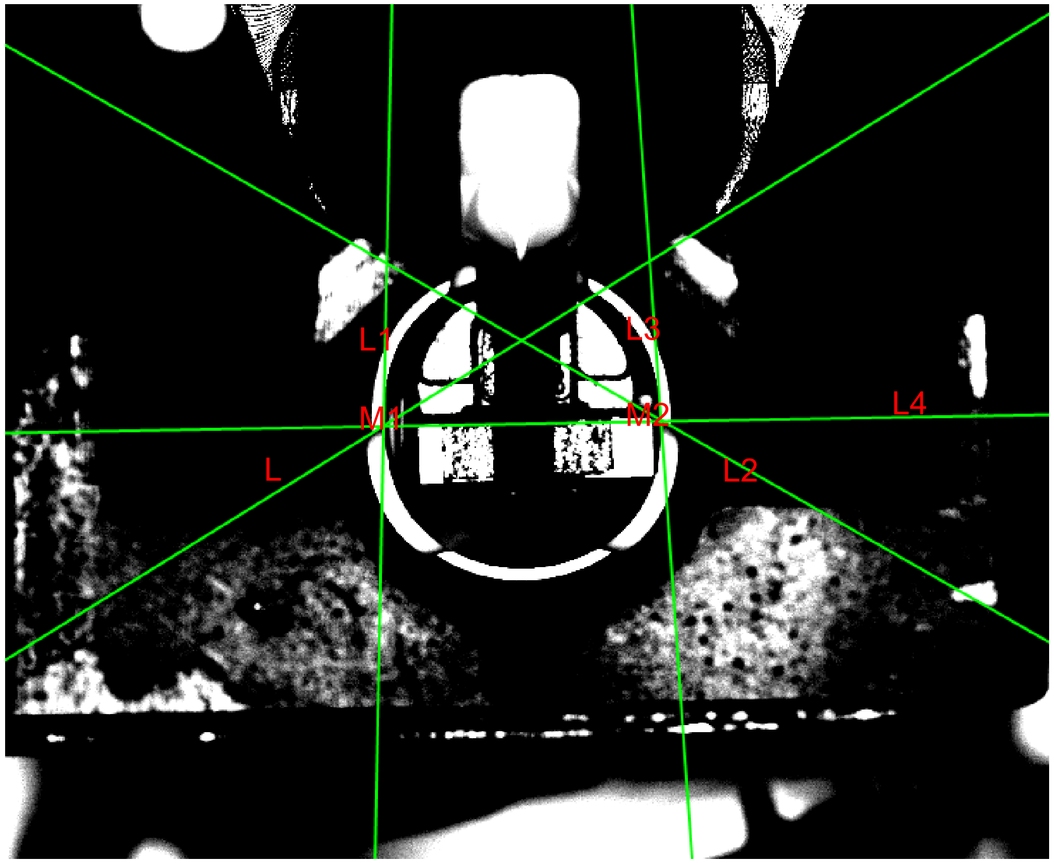
L3 caliper parameter

Search direction: left to right, dark to light

Feature selection:
Select a small section above the RVM that is relatively close to a straight line to represent the angle of the material, the length of the search box is 43pixel and the height is 34pixel



Angle demonstration process



Template angle

The angle of the line L4 generate from the connection of M1 and M2 is used as the reference angle of the template material.

Generate M3 as middle point of M1 and M2

↓

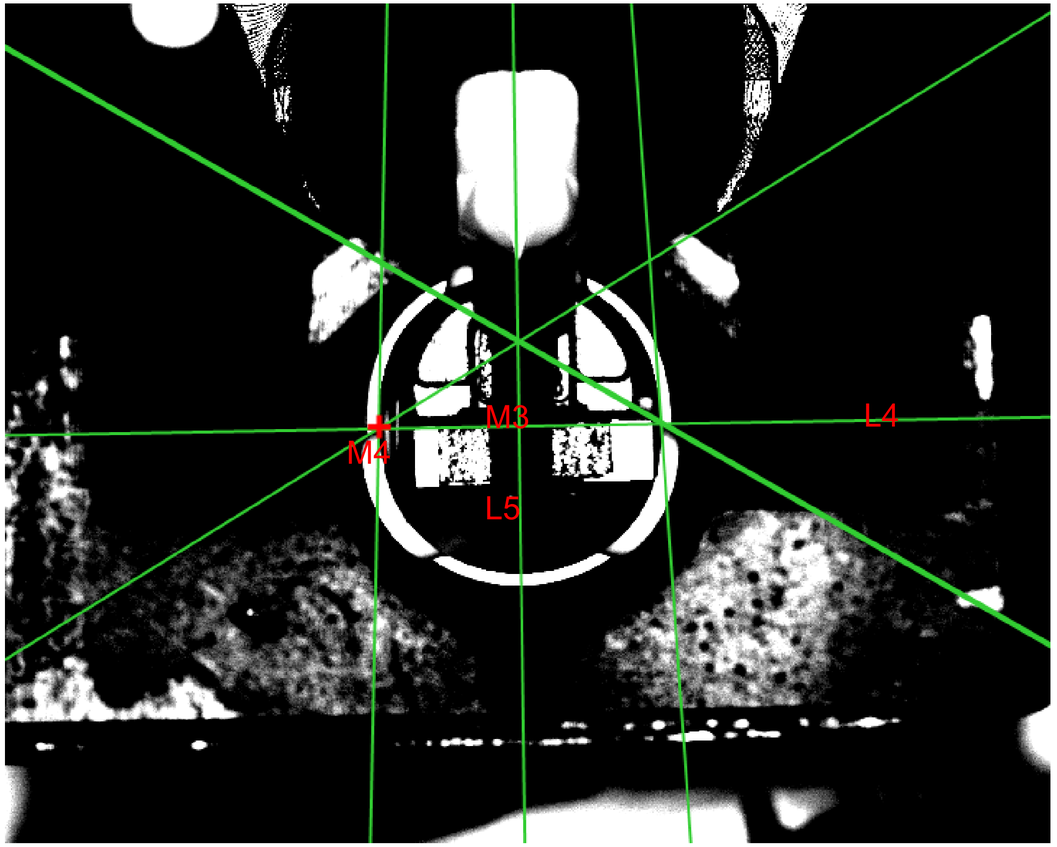
Do the vertical line of L4 through point M3 to generate L5

↓

Offset M3 by a distance of -2.765 in the direction of L4 and -0 in the direction of L5 to generate M4 (X, Y)

↓

Send M4(X,Y) as reference point to dispenser



Send M4（X,Y） as reference point to dispenser

Demonstrate reference point

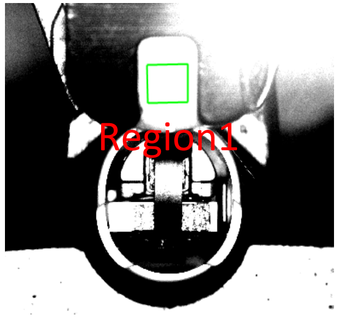
During guided positioning, use the grayscale detection tool to place an affine rectangular ROI box on the plug.

↓

The average gray level of the plug within the detection area.

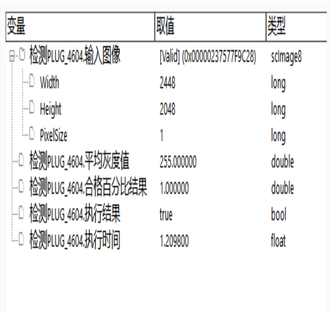
↓

Grayscale range: 0–255
If the average gray value is “< 90”, it is judged that the plug has detached and the batch is rejected (NG).



Region1 parameter

caliper parameter



变量	取值	类型
检测PLUG_4604.输入图像	(Valid) (0x00000237577F9C28)	scImage8
Width	2448	long
Height	2048	long
PixelSize	1	long
检测PLUG_4604.平均灰度值	255.000000	double
检测PLUG_4604.合格百分比结果	1.000000	double
检测PLUG_4604.执行结果	true	bool
检测PLUG_4604.执行时间	1.209800	float

Gray value fool-proof

分支条件:

```
检测PLUG_4604.平均灰度值<90&&#nErrorCode==0
```

Audio | H280 Vision Flow | Glue path 2– Gray value fool-proof

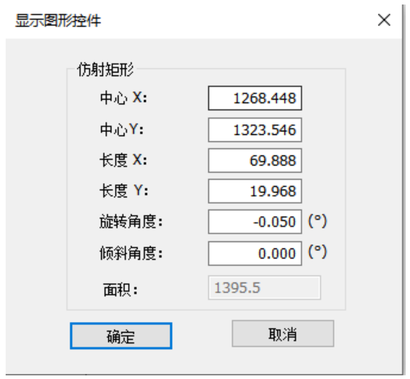
After the first adhesive layer is applied, the system flips the plug and the wiring harness. Using a grayscale detection tool, an ROI rectangle is placed at the corresponding location in the flipped image for inspection.

Measure how the average gray value at the flipped location changes.

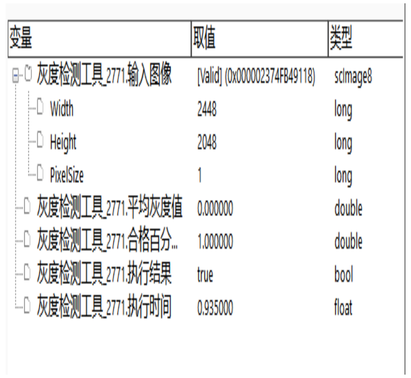
Grayscale detection range: 0–255
If the average gray value is < 225, it is judged “OK”.

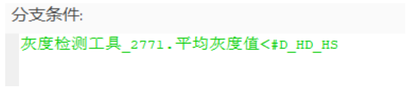
Gray value fool-proof

Region1 parameter



caliper parameter





变量名称	变量类型	变量取值
#D_HD_HS	double	225.0000000000000000

Glue Path AOI MSOP

The algorithm, inspection definition and spec of the glue path AOI.

H280 | Glue path AOI Product Glue Path Edge

No Glue

The areas of the glue > 0mm²

Glue Coverage-Shift

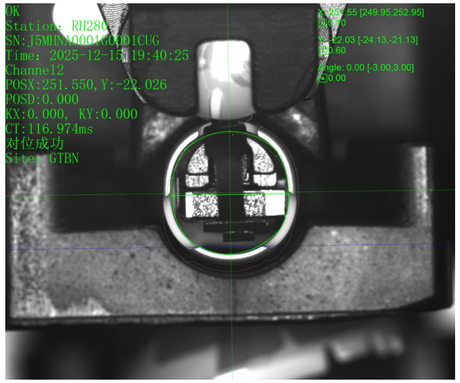
The R1 coverage line should be >=100 % covered by glue path

Glue Missing

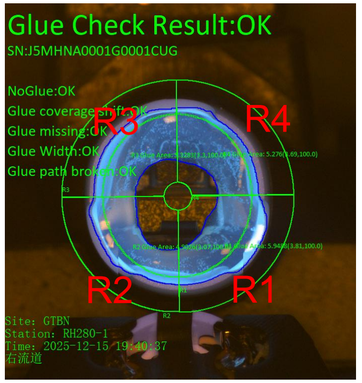
Glue Broken

The gap of glue breakage ≤ 0.1 mm

Pre-dispense image



Post-dispense image



Legend:

Glue Path Edge

Glue Coverage Line

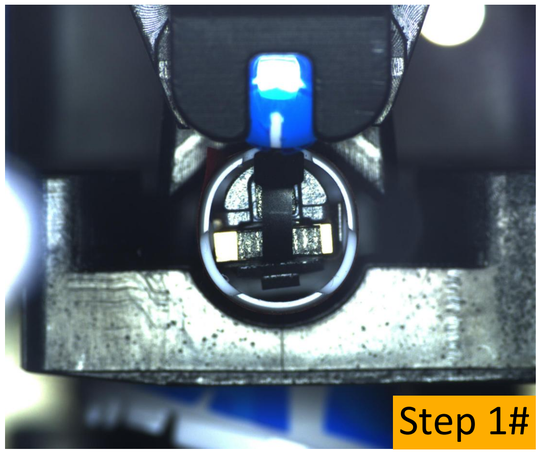
Glue Area Region

Pix accuracy:0.0086mm/pix

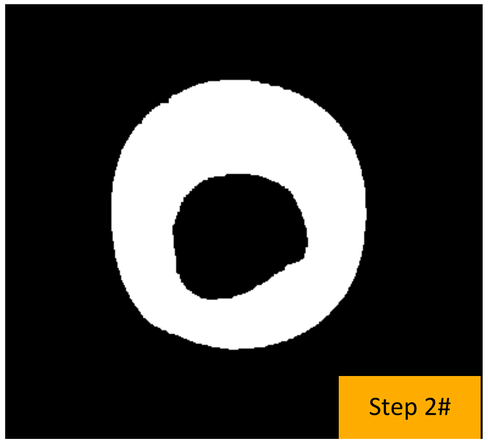
Keep out zone

Region	No Glue	Glue Coverage-Shift	Glue Missing-Area	Glue Broken
R1	Glue area > 0mm²	≥100%	Glue area > 3.81mm²	≤0.1mm
R2	Glue area > 0mm²	≥100%	Glue area > 3.07mm²	≤0.1mm
R3	Glue area > 0mm²	≥100%	Glue area > 3.3mm²	≤0.1mm
R4	Glue area > 0mm²	≥100%	Glue area > 3.69mm²	≤0.1mm

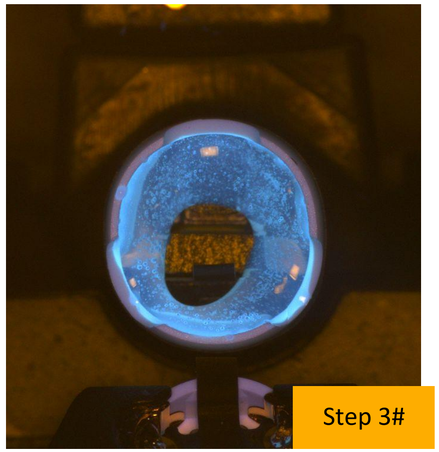
Audio | Glue path AOI Product Glue Path Edge



Source image (post-dispense)



extract glue color



extract result

missing
Step 2#

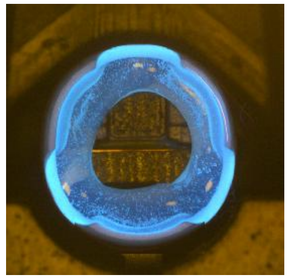
The purpose of this process is used to extract the Glue path

Step 1# Capture pose1 source image

Step 2# Extract the color of glue path

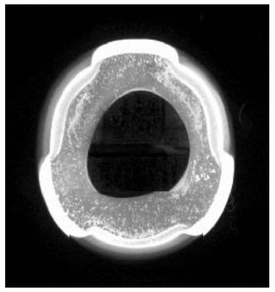
Step 3# Inspect the glue path

Audio | Glue path AOI Glue Area Region



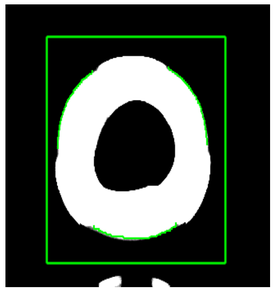
Step 1#

RGB to gray



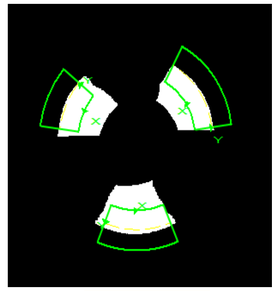
Step 2#

pattern match



Step 3#

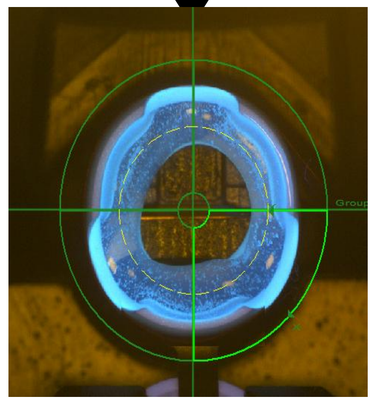
find line/circle



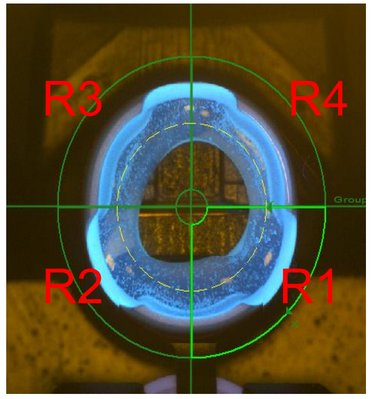
Step 4#

Create

coordinate system



Step 5#



Step 6#

Index	CenterX	CenterY	StartAngle	Angle	R	Width	Length
1	0.020	0.019	0.000	90.000	0.467	3.466	3.456
2	0.020	0.019	90.000	90.000	0.467	3.466	3.456
3	0.020	0.019	180.000	90.000	0.467	3.466	3.456
4	0.020	0.019	270.000	90.000	0.467	3.466	3.456

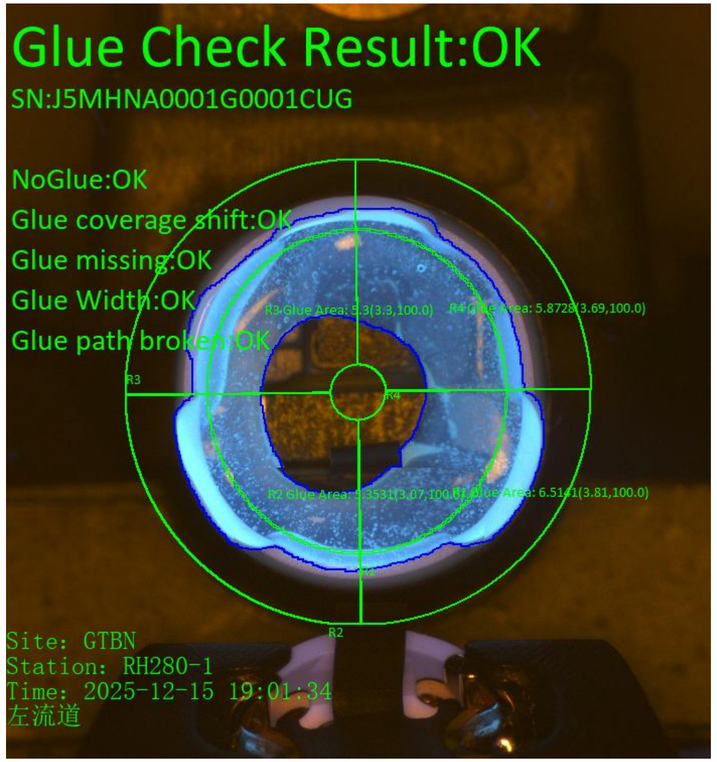
The purpose of this process is used to find the position for dispense and region for coverage inspection:

Step 1# Capture pos1 source image
Step 2# RGB image to gray image
Step 3# Pattern match to get the place of the product
Step 4# Grab the product characteristics of circle to obtain C1, point P is center point of curve.
Step 5# Establish a product coordinate system by using P0.
Step 6# Place the glue inspection region according to product coordinate system

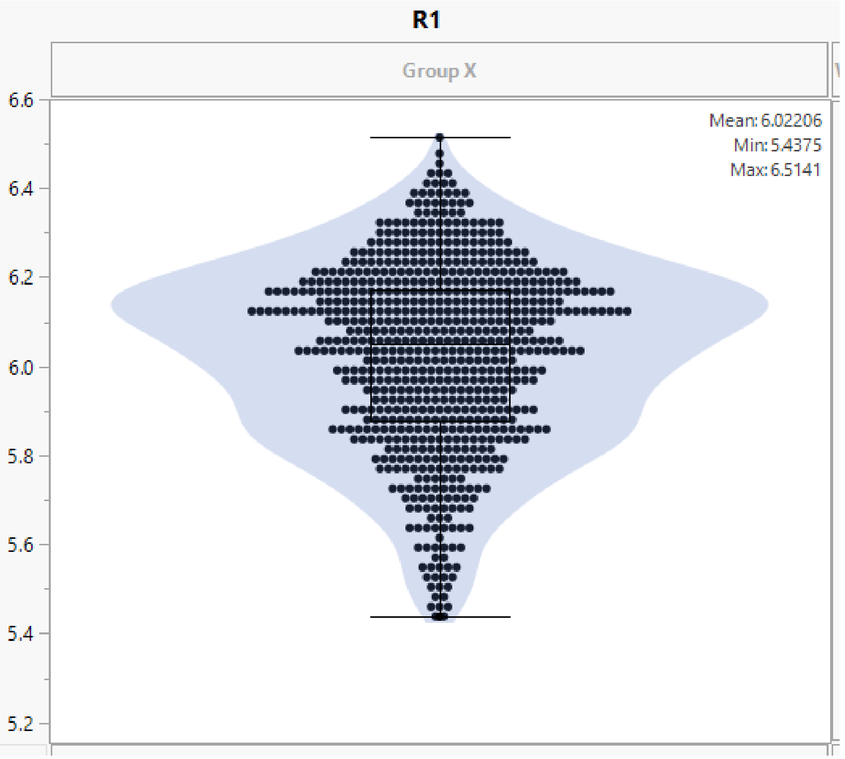
H280 | Glue path AOI Product glue Inspection logic

Pose1_Missing_R1 MIN: 5.4375

Pose1_Missing_R1 MAX: 6.5141



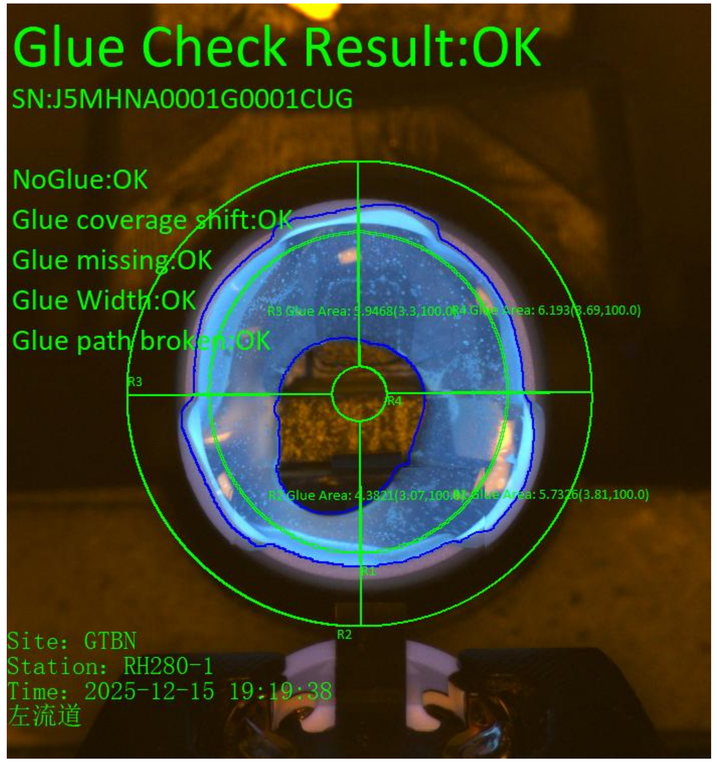
Pose1_Missing_R1 Data



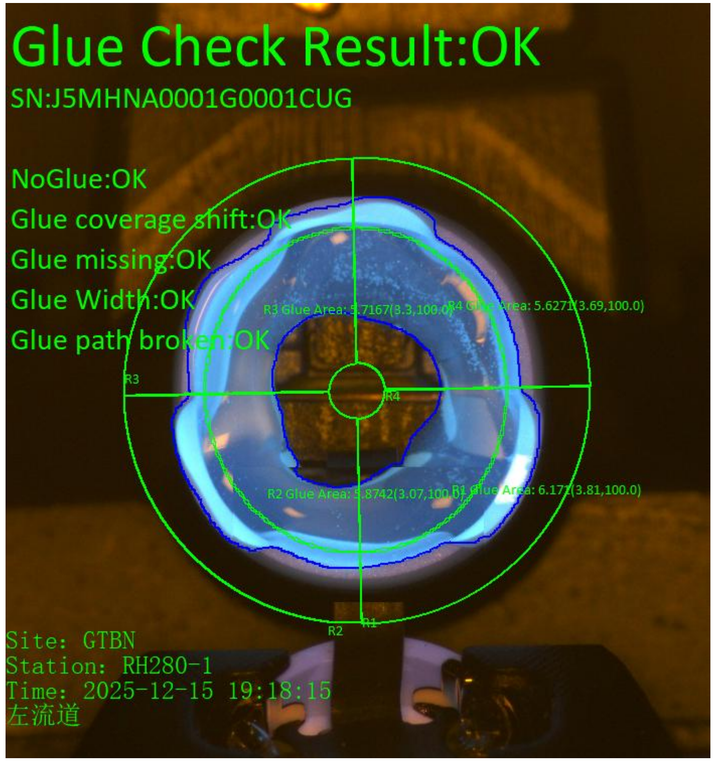
R1 Missing spec= Pose1_Missing_R1 MIN*0.7=5.4375*0.7=3.81

H280 | Glue path AOI Product glue Inspection logic

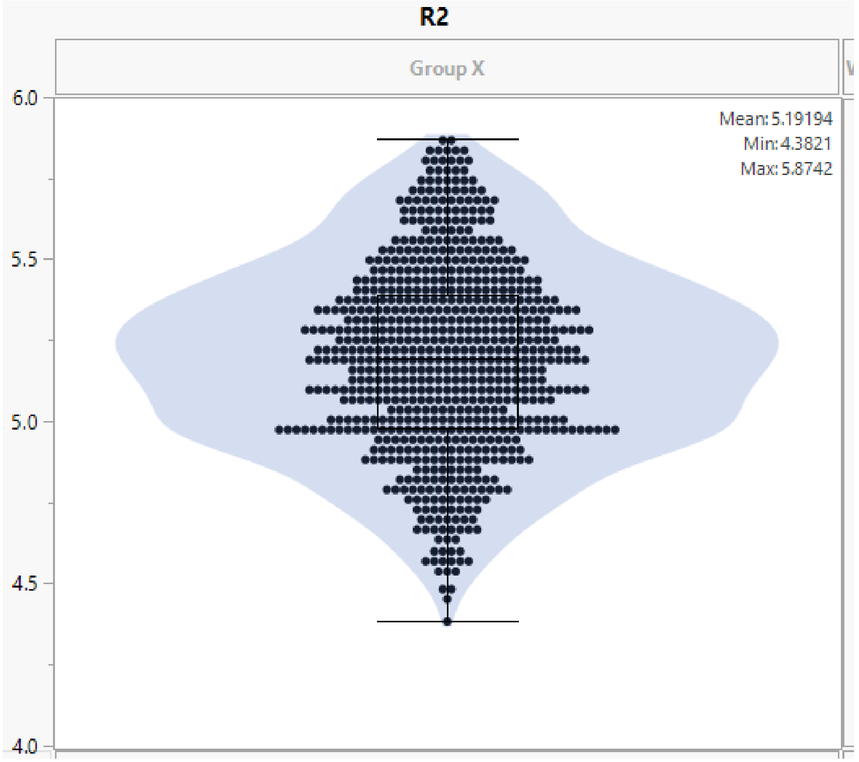
Pose1_Missing_R2 MIN: 4.3821



Pose1_Missing_R2 MAX: 5.8742



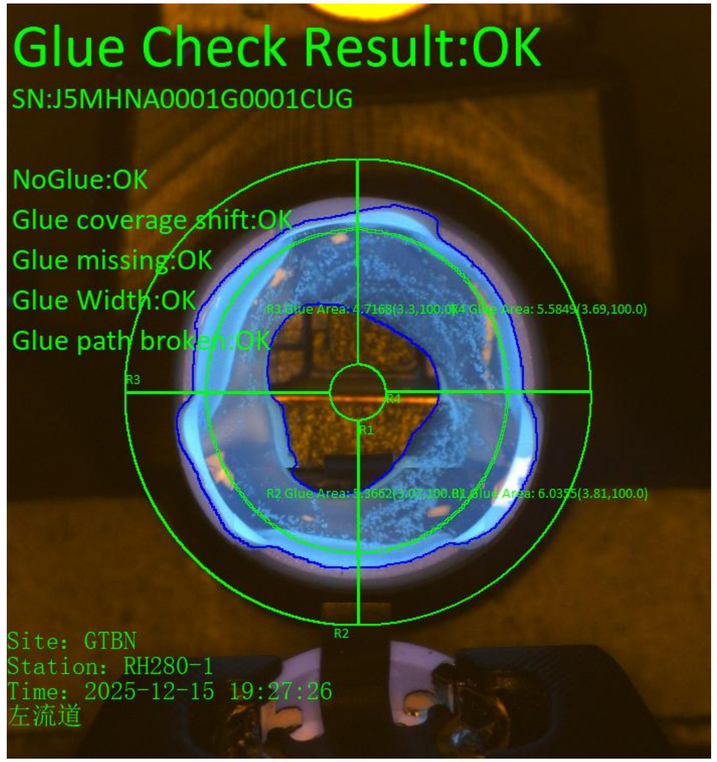
Pose1_Missing_R2 Data



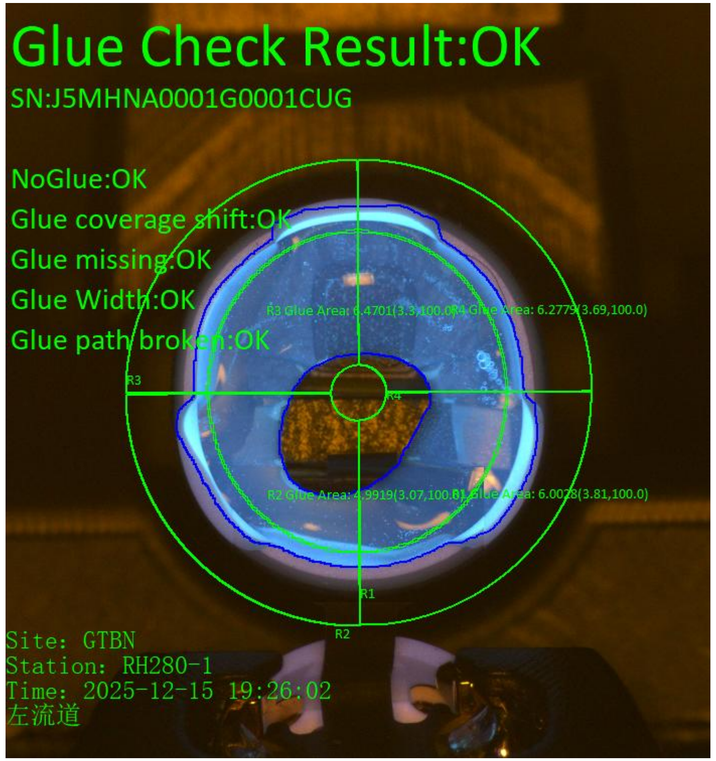
R1 Missing spec= Pose1_Missing_R1 MIN*0.7=4.3821*0.7=3.07

H280 | Glue path AOI Product glue Inspection logic

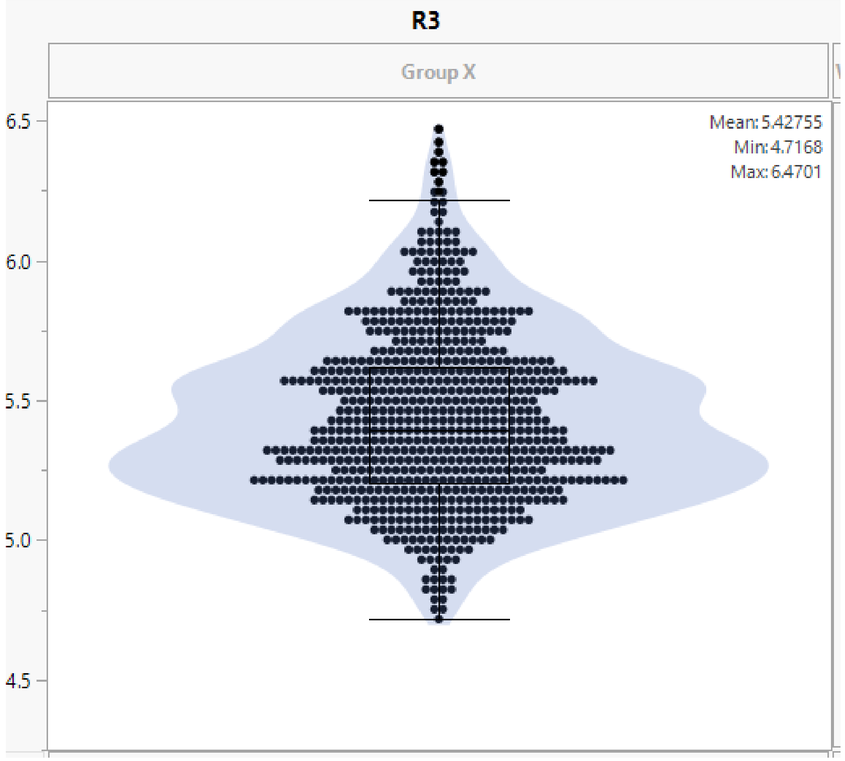
Pose1_Missing_R3 MIN: 4.7168



Pose1_Missing_R3 MAX: 6.4701



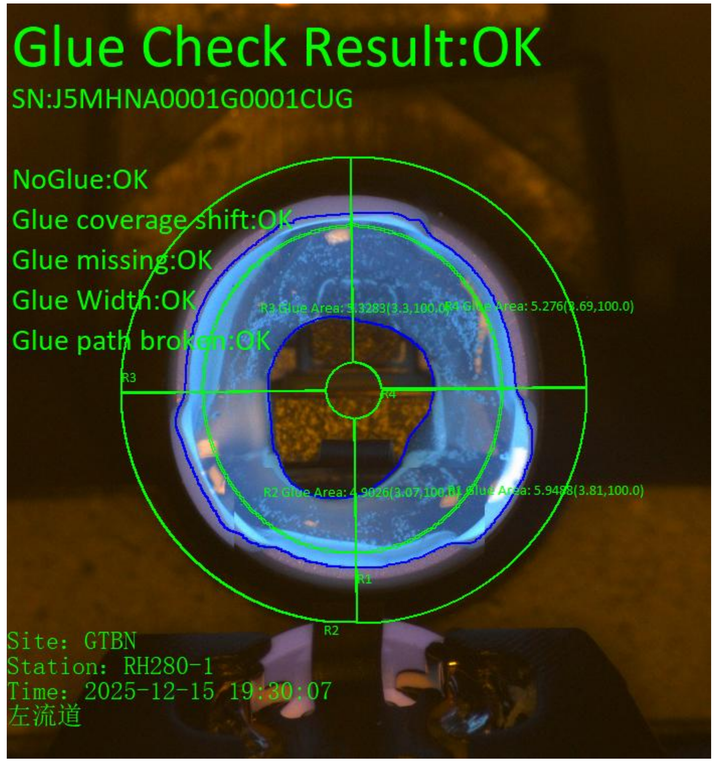
Pose1_Missing_R3 Data



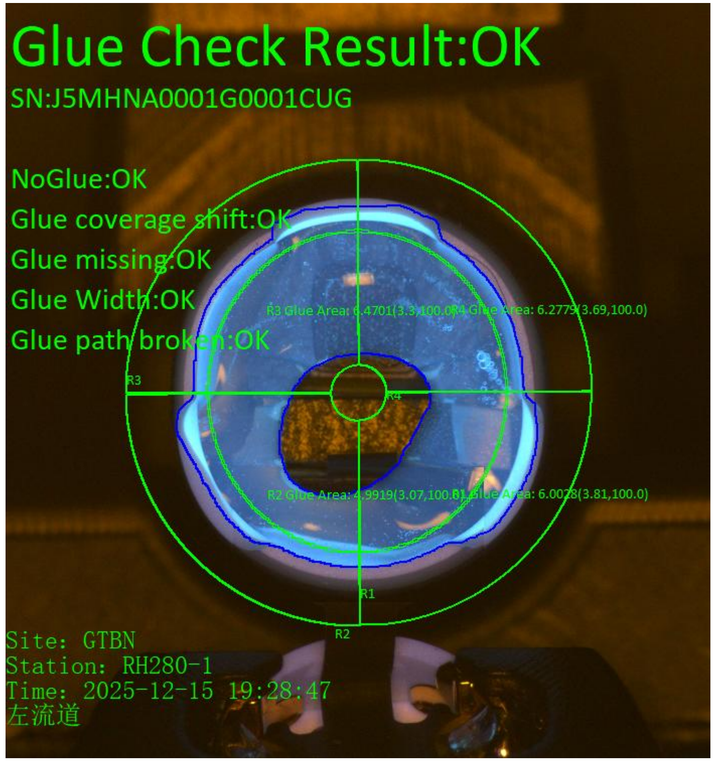
R1 Missing spec= Pose1_Missing_R1 MIN*0.7=4.7168*0.7=3.3

H280 | Glue path AOI Product glue Inspection logic

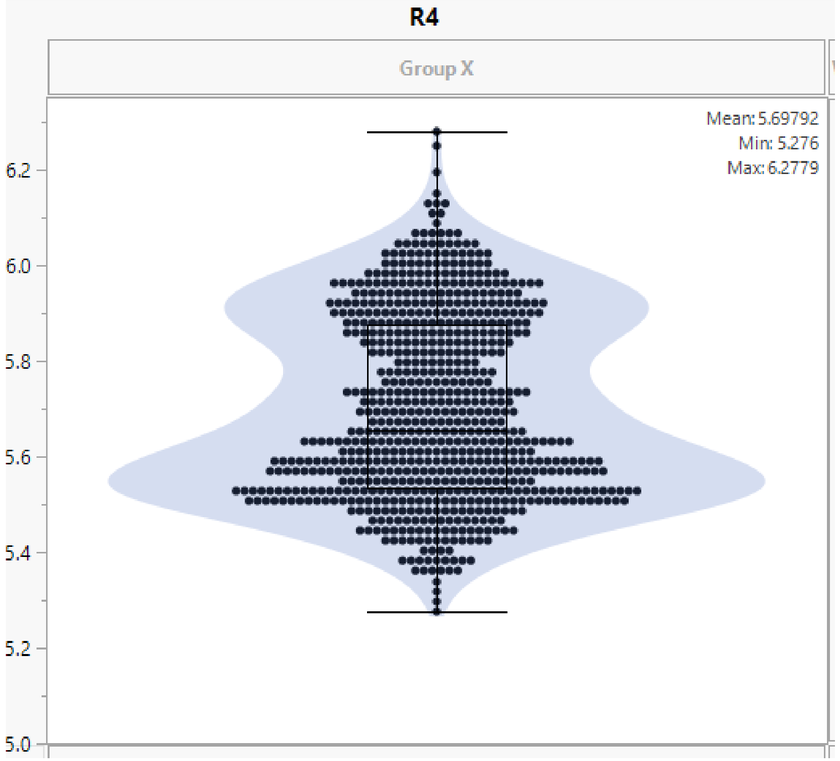
Pose1_Missing_R4 MIN: 5.276



Pose1_Missing_R4 MAX: 6.2779



Pose1_Missing_R4 Data



R1 Missing spec= Pose1_Missing_R1 MIN*0.7=5.276*0.7=3.69