



Special – NGS1_C_nn

■ Description

Goal of subgraph NGS1_C is the exact detection of the gap position and the gap width inside the 'Preposition ROI' from subgraph NGS1_b.

The detection path is:

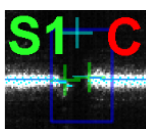
- Laser line tracking from left and from right side ('two lines').
- If there is a gap (a break), the position is found.
- If there is no break (line ends are crossing over each other), the position result from the second detection ('one line') of subgraph NGS1_B is chosen or the gap searched again in a separate "Dark gap ROI" (above the laser line) in the grey image.
- In a separate "Light gap ROI" (above the laser line) a "Bright gap" is searched. If a "Bright gap" is found, and before was a zero gap detected ('two lines' had no break), then the result from the bright gap detection will be used.

So we have 4 possible position results:

- a break from 'two lines'
- a zero gap from 'Dark gap'
- a zero gap from second detection of subgraph NGS1_B ('one line')
- a 'Bright gap' position

nn: declaration of the actual subgraph version (here: version 40).

■ Icon



NGS1_C_40

Comment for the new graph

■ Parameters

Filter Groups of NGS1_C_40

G00 INIT

G10 edge detection

G20 gap dark detection

G22 gap bright detection

G30 logic

G35 ROI gaplight

G00 INIT

Filters of G00 INIT

P01 ImageArithmetic

P02 BinarizeDynamic

P03 offset Binarization

P04 linefeature -1 or grey dark 1

P05 draw PositionCrosses 1 or 0

Attributes of P01 ImageArithmetic

Verbosity level

None

TimeWindow

1

frames

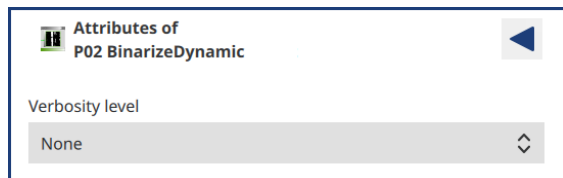
Operation

Mean

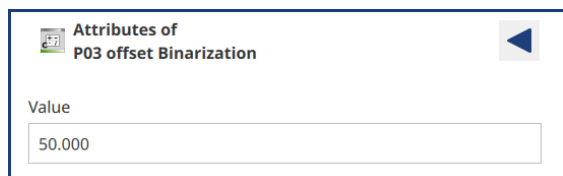
Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.




TimeWindow	<p>Number of single camera images that are "laid over each other" for the analysis.</p> <p>Not suited for curved weldings!</p>
Operation	<p>Filter function for the image overlaying:</p> <p>SUM Sum over "TimeWindow" images</p> <p>Mean Mean filter over "TimeWindow" images</p> <p>Median Median filter over "TimeWindow" images</p> <p>The grey image calculations will be done in the original image ROI (not in the overlayed)!</p>




Parameter	Comment
Verbosity level	<p>Selection of verbosity level. Larger verbosity levels offer more overlay information.</p> <p>Display of the binarized image area in the "Preposition ROI".</p>



Parameter	Comment
Value	<p>Used for detection of greylevel values for the gap. The higher the value, the darker the gap must be compared with the blank intensity.</p> <p>[Greylevel]</p>


Attributes of
P04 linefeature -1 or grey dark 1

Parameter	Comment
Number	-1 Use resultat from 'one line'
	1 Use resultat from 'Dark gap'









Attributes of
P05 draw PositionCrosses 1 or 0

Parameter	Comment
Number	0 No marking
	1 Marks the found gap position with a cross

G10 edge detection

Fine search of the gap position from the 'two line' detection.

Filters of
G10 edge detection

 P01 fine LineTracking left
 P02 fine LineTracking right
 P03 offsetLeft px
 P04 offsetRight px
 P05 percentage pos cross
 pos cross left
 pos cross right



**Attributes of
P01 fine LineTracking left**

Verbosity level
Low

Tracking Threshold
100

Double Tracking bool
0

upper or lower
1

mean x pixel
1

search area y upper pixel
3

search area y lower pixel
3

mean area y pixel
5

Maximum Gap Width
0

Maximum Number of Gaps
0

Maximum height jump
3

Starting Point Width Pixel
5

Starting Point Height Pixel
5

**Attributes of
P02 fine LineTracking right**

Verbosity level
Low

Tracking Threshold
100

Double Tracking bool
0

upper or lower
1

mean x pixel
1

search area y upper pixel
3

search area y lower pixel
3

mean area y pixel
5

Maximum Gap Width
0

Maximum Number of Gaps
0



Maximum height jump
3

Starting Point Width Pixel
5

Starting Point Height Pixel
5

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Tracking threshold	Minimum grey scale value for an image pixel that it's defined to belong to the laser line. [Greylevel]
DoubleTracking	0 The laser line is tracked from left to right side. 1 The laser line is tracked first from left to right side, and then once again from right to left side.
upper or lower	
mean x	Number of pixels in X direction, used for averaging the brightness in order to define the next point of the laser line. [Pixel]

search area y	This parameter defines the maximum limits for the search area in Y direction, used for searching the next tracking point. [Pixel]
mean area y	Number of pixels in Y direction, over which the "Average brightness in X direction" is averaged, in order to define the next laser line point. [Pixel]
Maximum Gap Width	Maximum allowed width of a laser line interruption: If the number of side by side laying pixels, having a lower grey scale value than the search threshold, exceeds this parameter figure, the line interrupts counter figure is raised by 1. [Pixel]
Maximum Number of Gaps	Maximum number of laser line interrupts: If the number of line interrupts per laser line becomes higher than this parameter, the line search is stopped and a line interrupt warning is released.
Maximum height jump	Maximum interrupt in Y direction: If the height jump of the laser line exceeds this parameter, the line search is stopped. [Pixel]
search area y	This parameter defines the maximum limits for the search area in Y direction, used for searching the next tracking point. [Pixel]
Starting Point Width	Width of the search area from the left resp. right image border to find the vertical start position of the laser line. [Pixel]
Starting Point Height	Height of the search area on the left resp. right image border to find the vertical start position of the laser line. [Pixel]


Attributes of P03 offsetLeft px


Value

0.000


Attributes of P04 offsetRight px


Value

0.000

Parameter	Comment
Value	Constant offset to shift the left resp. right found gap rim. [Pixel]



**Attributes of
P05 percentage pos cross**

Verbosity level
 None

Weighting Percent
 50

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information. Marks with a cross the found gap position.
Weighting	Position (in %) between Minimum and Maximum.

**Attributes of
pos cross left**

Verbosity level
 None

**Attributes of
pos cross right**

Verbosity level
 None

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information. Marks with a cross the found left resp. right gap rim position.



G20 gap dark detection

Fine search of the gap position with the 'Dark gap' detection.

**Filters of
G20 gap dark detection**

P01 low pass grey level

P02 extremum dark gap




Attributes of P01 low pass grey level


Verbosity level
 None

Filter length N Pixel
 1

Kind of low pass
 Mean

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Filter length	During the 'Tracking' on the laser line, the grey scale values of the found intensity values are averaged over "Filter length" pixel. The higher the value the flatter is the intensity curve for the analysis. [Pixel]
Kind of low pass	Mean Mean filter over "Filter length" pixel Median Median filter over "Filter length" pixel


Attributes of P02 extremum dark gap


Verbosity level
 None

Extremum type
 Minimum

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Extremum type	Minimum The lowest intensity is the gap position Maximum The highest intensity is the gap position



G22 gap bright detection

Fine search of the gap position with the 'Bright gap' detection.

Filters of
G22 gap bright detection

P01 low pass grey
 P01 low pass grey gradient
 P02 position percent
 P03 Extremum gradient right
 TCPDistance
 extremum gradient left

Attributes of
P01 low pass grey

Verboesity level

None

Filter length

3

N Pixel

Kind of low pass

Mean

Parameter	Comment
Verboesity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Filter length	During the 'Tracking' on the laser line, the grey scale values of the found intensity values are averaged over "Filter length" pixel. The higher the value the flatter is the intensity curve for the analysis. [Pixel]
Kind of low pass	Mean Mean filter over "Filter length" pixel Median Median filter over "Filter length" pixel

Attributes of
P01 low pass grey gradient

Verboesity level

None

Filter length

3

N Pixel

Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay informa-tion.
Filter length	During the 'Tracking' on the laser line, the grey scale value changes of the found intensity values are averaged over "Filter length" pixel. The higher the value the flatter is the intensity changes curve for the analysis. [Pixel]

Attributes of
P02 position percent

Weighting

50

Percent

Parameter	Comment
Weighting	Position (in %) between Minimum and Maximum.

Attributes of
P03 Extremum gradinet right

Verboesity level

None

Extremum type

Maximum



Search direction

From right

Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay informa-tion.





Extremum type	Minimum	Searches the smallest intensity change of the laser line
	Maximum	Searches the biggest intensity change of the laser line
Search direction	From left	Check the intensity changes from the left to the right side
	From right	Check the intensity changes from the right to the left side


Attributes of TCPDistance


Verbosity level
 None

Type of laser line
 Line laser 1

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information. Marks the actual TCP position with a green cross.
Type of laser line	Line laser 1 Do not use Line laser 2 For SOUVIS6000 applications Line laser 3 Do not use GrayscaleImage Do not use DistanceFromScannerCenter Do not use


Attributes of extremum gradient left


Verbosity level
 None

Extremum type
 Minimum

Search direction
 From left

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Extremum type	Minimum Searches the smallest intensity change Maximum Searches the biggest intensity change
Search direction	From left Check the intensity changes from the left to the right side From right Check the intensity changes from the right to the left side

G30 logic

Filters of
G30 logic

 maxYoffsetOverlapp in px

 maxZdiffforZeroGap in px

Attributes of
maxYoffsetOverlapp in px

Value

5.000

Parameter	Comment
Value	Gives a measure how much the two found edge positions horizontally may overlap to be detected still as a gap and not as a zero gap (crossing over). [Pixel]

Attributes of
maxZdiffforZeroGap in px

Number

5.000

Parameter	Comment
Number	Gives a measure how big the vertical distance of the two found edge positions at least must be to be detected still as a gap and not as a zero gap (crossing over). [Pixel]



G35 ROI gaplight

Filters of
G35 ROI gaplight



P01 light threshold bright gap



Attributes of
P01 light threshold bright gap



Number

Parameter	Comment
Number	The mean intensity in the "Light gap ROI" must reach at least the value 'Number' that a bright gap is detected. [Greylevel]





■ Measured values for plotter

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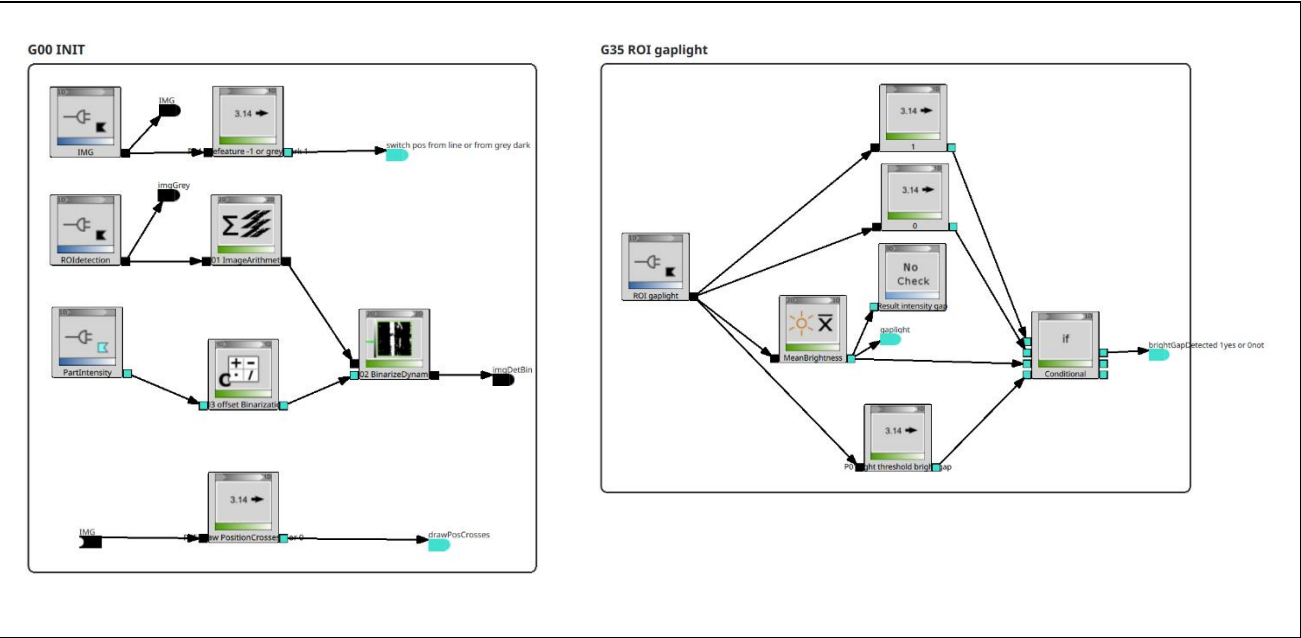
■ Subgraphs interface

IN bridges

OUT bridges

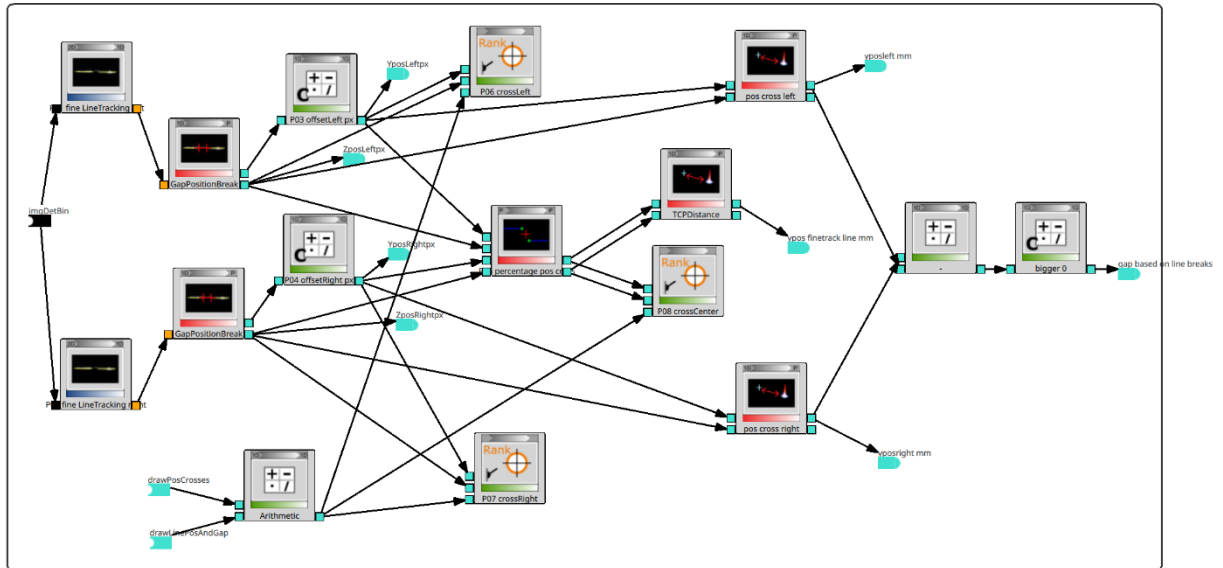
 image	IMG ROI detection ROI greydark ROI gaplight	 value	ypos raw mm gap raw mm
 line	doubleline		
 value	PartIntensity		

■ Graph block diagram

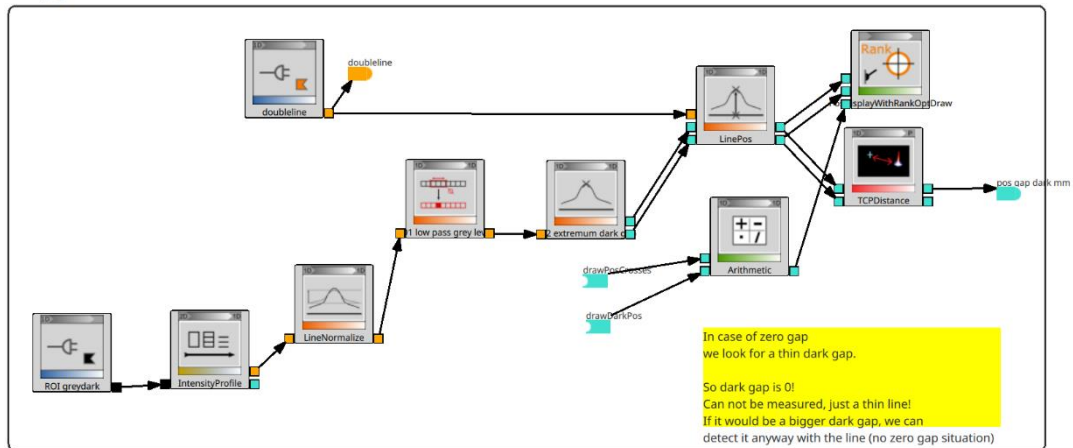




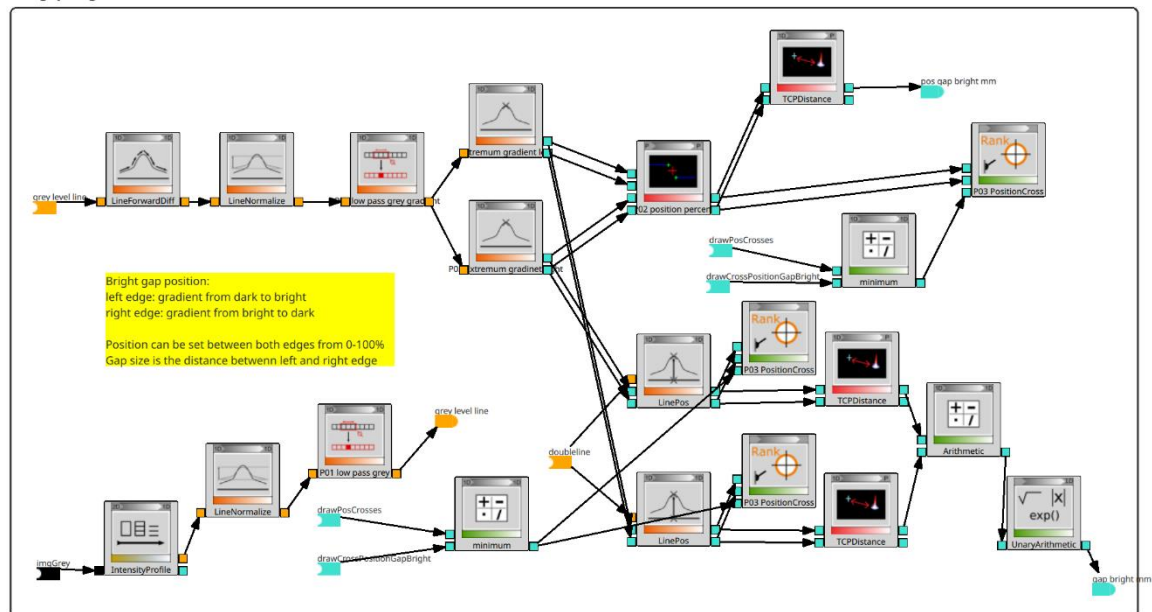
G10 edge detection



G20 gap dark detection



G22 gap bright detection



G30 logic

checks if zero gap situation is present
(it is when Ypos left is > Ypos right)
Also a bit overlap is possible in case of step height

Was bright gap (process light in gap) detected AND also zero gap (Ypos left > ypos right)?
Only in case both is true we want to use later
bright gap measurement.

Yes: returns 1
No: returns 0

Final position result:

In case we have zero gap AND bright gap detected
we pass the position result from bright gap calculation

Else:

If no bright gap and no zero gap we pass the position result based of line detection
If no bright gap but zero gap we pass the dark gap position result OR the position result from second search
(choose via switch in INIT group)

returns the position from second search OR the position from dark gap detection.
Depends on the switch in INIT group.

Final Gap size result:

In case we have zero gap AND bright gap detected
we pass the result from bright gap calculation

Else:

If no bright gap and no zero gap we pass the normal line based real gap size
If no bright gap but zero gap we pass: gap = 0

