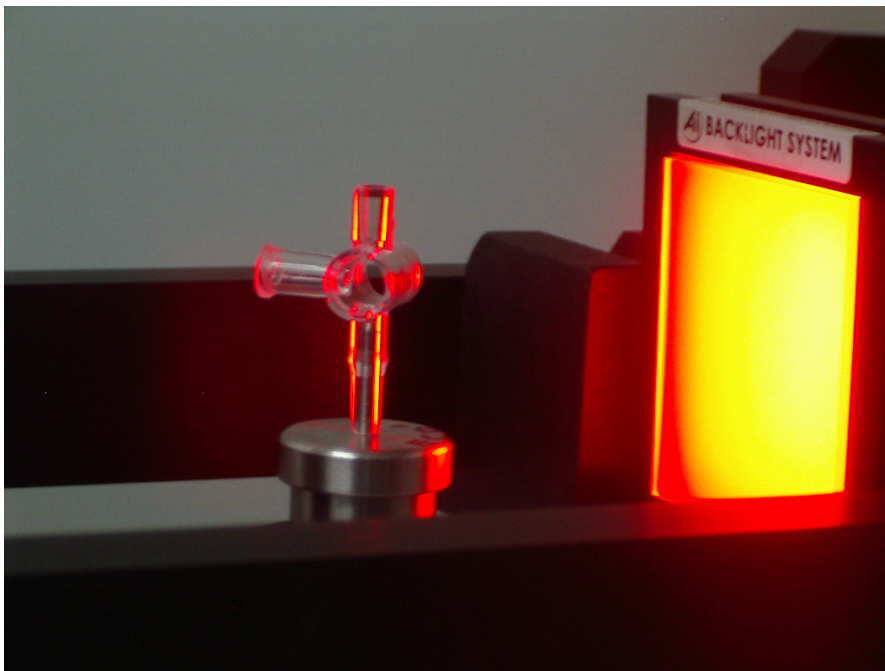


# bVision

## User Manual



# Table of contents

<b>GENERAL DESCRIPTION</b>	<b>4</b>
<b>VISION-LC GRAPHICS USER INTERFACE (GUI)</b>	<b>5</b>
Programming and control Panel:	5
X :	5
Y :	5
Rv:	6
Intensity:	6
X Pix Size:	6
Y Pix Size:	6
<b>MACHINE CONFIGURATION SCREEN:</b>	<b>7</b>
Optional Cameras and Frame Grabbers:	8
Optional Video Formats:	8
Motors	8
Operation:	9
Illumination:	9
SPC:	9
Results units:	9
<b>MAIN PANEL</b>	<b>10</b>
Magnification	11
Live Video	11
Execute Recipe	11
Show Results	11
Adjust Pixel Size	12
Set Camera and Light Parameters	14
Create New Recipe	15
Open an Existing Recipe	16
Product List	17
Focus Bar	18

<b>Save Image</b>	<b>18</b>
<b>Open Image</b>	<b>19</b>
<b>Stage and I/O Control</b>	<b>19</b>
<b>Open Calculator</b>	<b>20</b>
<b>Color Control</b>	<b>20</b>
<b>Executable Program</b>	<b>20</b>
<b>Instruction Bank</b>	<b>21</b>
<b>INSTRUCTION BANK DESCRIPTION</b>	<b>22</b>
<b>GRABBING:</b>	<b>22</b>
<b>ALIGNMENT:</b>	<b>23</b>
<b>DETECTION:</b>	<b>25</b>
<b>SURFACE DEFECT</b>	<b>30</b>
<b>DATUM</b>	<b>31</b>
<b>GEOMETRY:</b>	<b>31</b>
<b>PROGRAMMING:</b>	<b>31</b>
<b>PRE PROCESSING:</b>	<b>38</b>
<b>MOTION:</b>	<b>40</b>

## **General Description**

Thank you, for using VISION – LC , In this document we will try to help you using the software easily.

The VISION-LC system is a friendly Machine Vision platform used for generation of Inspection and Metrology applications.

Moreover, micro stepping motors control is fully integrated in the system to enable complete Machine Vision functions implementation.

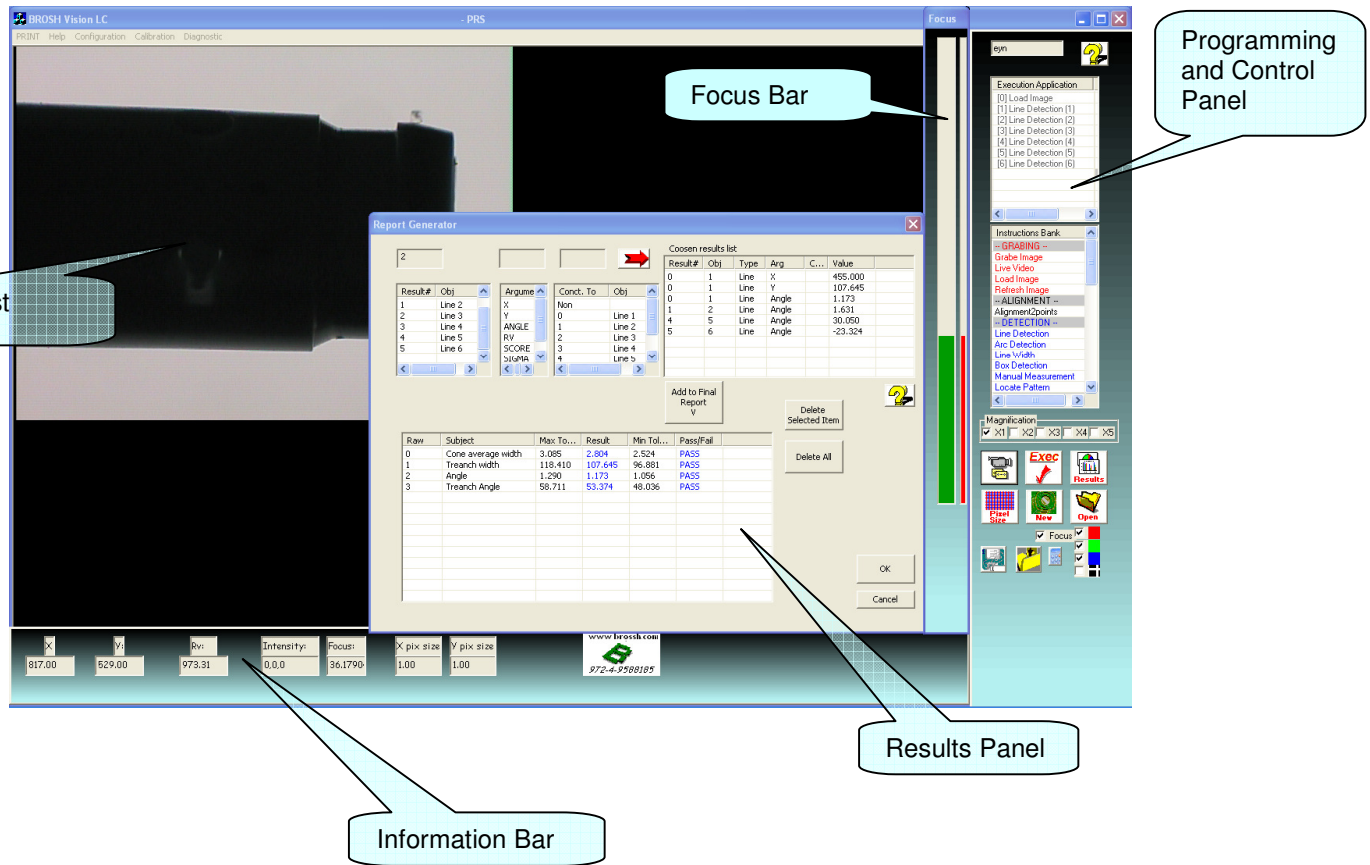
Creating your own Inspection Application requires minimal Machine Vision Theory knowledge and no programming knowledge at all.

The VISION-LC Instruction Set helps you to build multi-function Inspection Program in a very quick, efficient and easy manner.

# VISION-LC Graphics User Interface (GUI)

The friendly GUI allows you to build Inspection Program by several mouse clicks.

The VISION-LC GUI is organized as a single screen main panel with several sub-panels:



## Programming and control Panel:

The Dialog Box is used to generate new recipes and run stored ones.

## Unit Under test

Displays the current "unit under test" image and graphic information of the measurement progress.

## Information Bar:

Helps to perform manual (mouse) measurements as follows:

**X :**

Shows the current **X** position of the Mouse relative the Top Left corner of the screen.

**Y :**

Shows the current **Y** position of the Mouse relative the Top Left corner of the screen.

***Rv:***

Shows the current vector length between the mouse position and the Top Left corner of the screen.

***Intensity:***

Displays the Red, Green and Blue intensity values (0-most dark to 255-most bright).

***X Pix Size:***

Indicate the current X direction pixel size.

***Y Pix Size:***

Indicate the current Y direction pixel size.

## Machine Configuration Screen:

This screen appears once after start-up of the VISION-LC application. It allows you to set some parameters to define the system configuration.

**Machine Configuration (F1 for Help)**

Frame Grabber

Came...	Camera Name	Grabbing Type	Video Format
0	Right	IDS USB	
1	Left	IDS USB	
2	Matrox Porphis	Matrox Morphis	PAL
3	Pixelink	Fire Wire Pixelink	

Delete Cameras

Motor

Exist

Comport#

Operation

Supervizer

Illuminator

Exist

Comport#

SPC

Automatic Save

Results Units

Microns

Milimeters

Absolut

I/O

Advantech

Paralel Port

Tcp/Ip

Tcp/Ip Enable

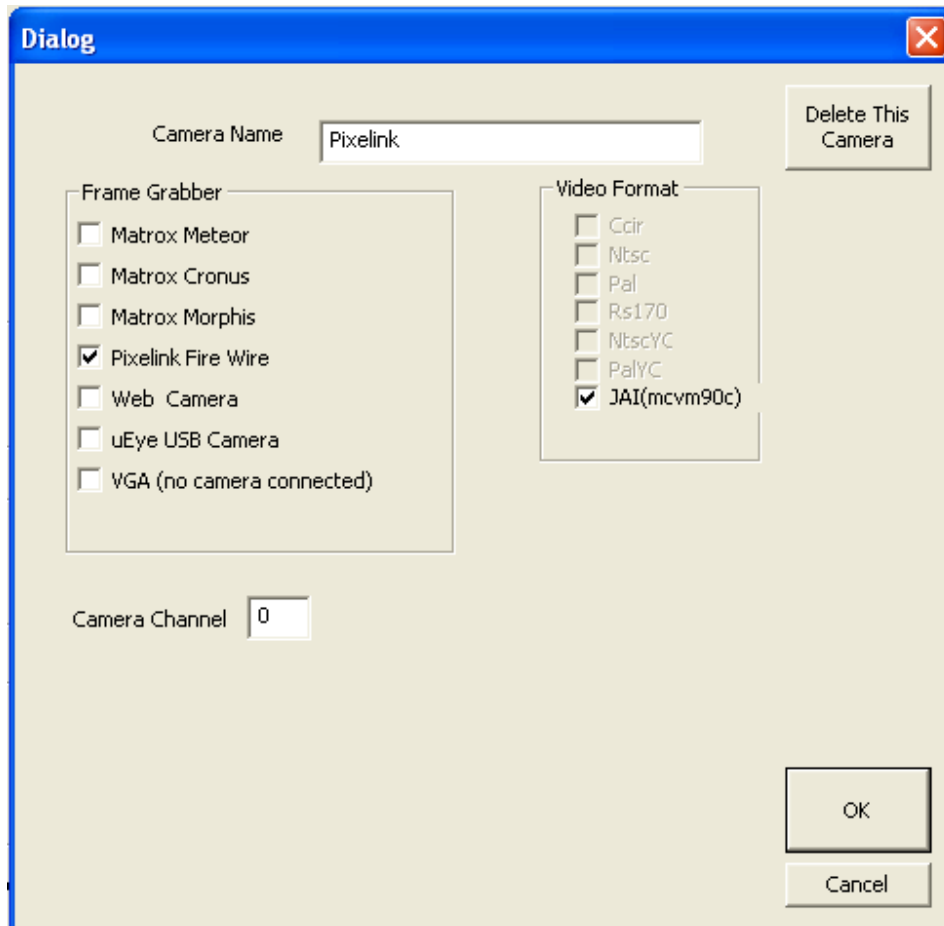
Ip:

Port

Software Version:

### **Optional Cameras and Frame Grabbers:**

Clicking on the Frame Grabbers list to get the following cameras and frame grabber selection.



You can choose multiple cameras and frame grabbers in the same application.

### **Optional Video Formats:**

Ntsc  
NtscY  
Pal  
RS170  
PalYc  
Ccir

### **Motors**

Check this box if motors are integrated in the system. This interface support the new IMS mDrive stepping motors connected to the RS232 PC port.

In this section you have to assign the Com-Port to which the motors are connected.

***Operation:***

Select the system operation mode – Operator or Supervisor (Password protected) to avoid accidental saved recipes modifications.

***Illumination:***

The bVision supports the "SCHOTT DCR 3 PLUS" Illuminator.  
This illuminator is controlled by RS232 (the port should be assigned).

***SPC:***

Check this box if automatic results saving is required (manual saving is possible after every program run).

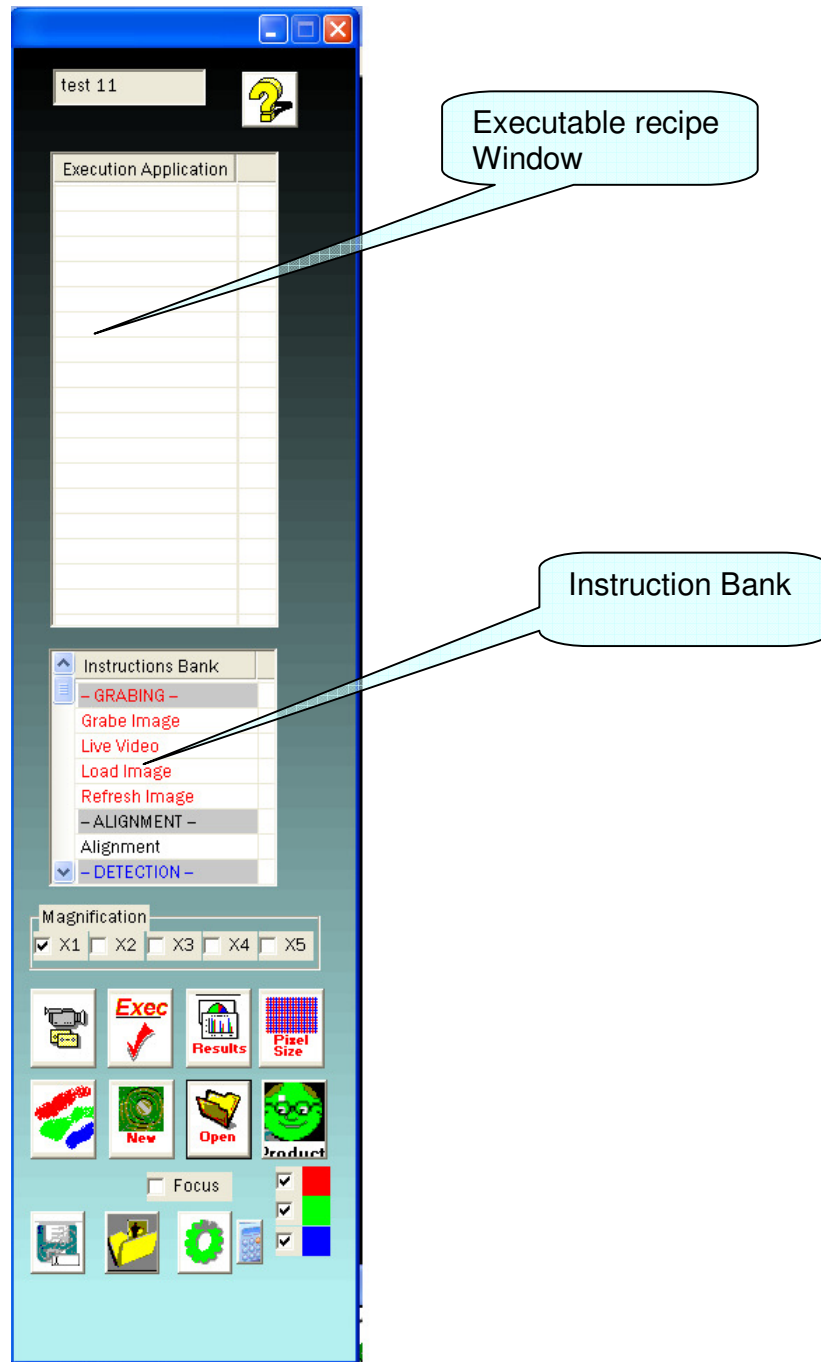
***Results units:***

Select the desired (microns or millimeters) result unit.  
Distances between two elements may be displayed as relative or absolute numbers (in relative mode the sign may be + or -).

***Tcp/Ip:***

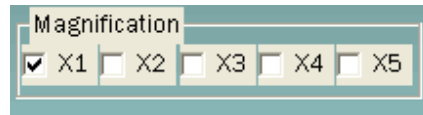
Use this option to communicate with external computers , robots and Controllers.  
The application will open communication as a Server.

# Main Panel



The main screen enables you to generate your recipe by selecting an instruction from the "instruction bank", which will then be copied into the "Executable recipe window". The "instruction bank" is divided into few instruction sub-groups according to their subjects.

## ***Magnification***



Selection of the magnification factor will set a different pre-defined pixel size.

## ***Live Video***



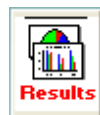
On/Off live video

## ***Execute Recipe***



Execute the selected recipe, the Instructions in the Executable recipe Window will be executed automatically.

## ***Show Results***



A "Results Window" will be opened.  
The same "Results Window" will be displayed when the "Show Results" command will be selected from the instruction bank.

## Adjust Pixel Size



The pixel size can be set for each magnification.

The following dialog will pop up:

The image shows a software dialog box titled "Machine Parameters". It contains several sections for configuring machine settings:

- Pixel Size:** Two input fields for X and Y, both containing the value "1". Below them are buttons for "Copy X to Y" and "Copy Y to X".
- Magnification:** A list of radio buttons for X1, X2, X3, X4, and X5. X1 is selected.
- Global Light:** Four input fields for Exposure 1, 2, 3, and 4, all containing "0". Below them are input fields for "Bright" and "Dark", both containing "0".
- Homogenuse:** Four buttons labeled "Map 1", "Map 2", "Map 3", and "Map 4".
- Temporary Clear Pixel size:** A checkbox that is currently unchecked.
- Buttons:** "Manual Learn X", "Manual Learn Y", "OK", and "Cancel".

The Pixel Size may be set either manually by typing it or automatically by the "Manual Learn" procedure. In this procedure you'll be required to put a pre-measured object under the camera lens, point on two different points of the object image and type in the known distance between them. The system will automatically calculate the pixel size for you.

### **Temporary clear pixel size**

That option's purpose is that when you define a pixel size, and you want to temporary use another pixel size without erasing the current one, you press on the box near the command, so it will be signed with a V. now define the new size, and when you press again on that box, that size will be erased and you will back using the old one.

### ***Magnifications***

As you can see, there are 5 magnifications. When you use more than 1 camera in the same time while executing a project, sometimes it's required to define a pixel size to one camera which is different than the other camera's pixel size. We provide you the option of using more than 1 magnification as a way to solve that problem. When you define a pixel size, it will be saved as the magnification you chose (for example- magnification 1) . Then you choose another pixel size on magnification #2, and you define that magnification on the settings of the second camera you use. (look for the instructions of the "Grabe image" command).

### ***Global light (exposures)***

A common problem in using lamps is that after a while it starts to lose it's power and being less affective.

Most of the applications we use in the **bVision** program based on precise light's amount, and you design your program based on the information you have. When that data changes, it will interrupt your program's reliability and maybe even make it totally useless, and even if you switch lamps, it will not help because even if you use the same lamp, it probably won't have the precise same power.

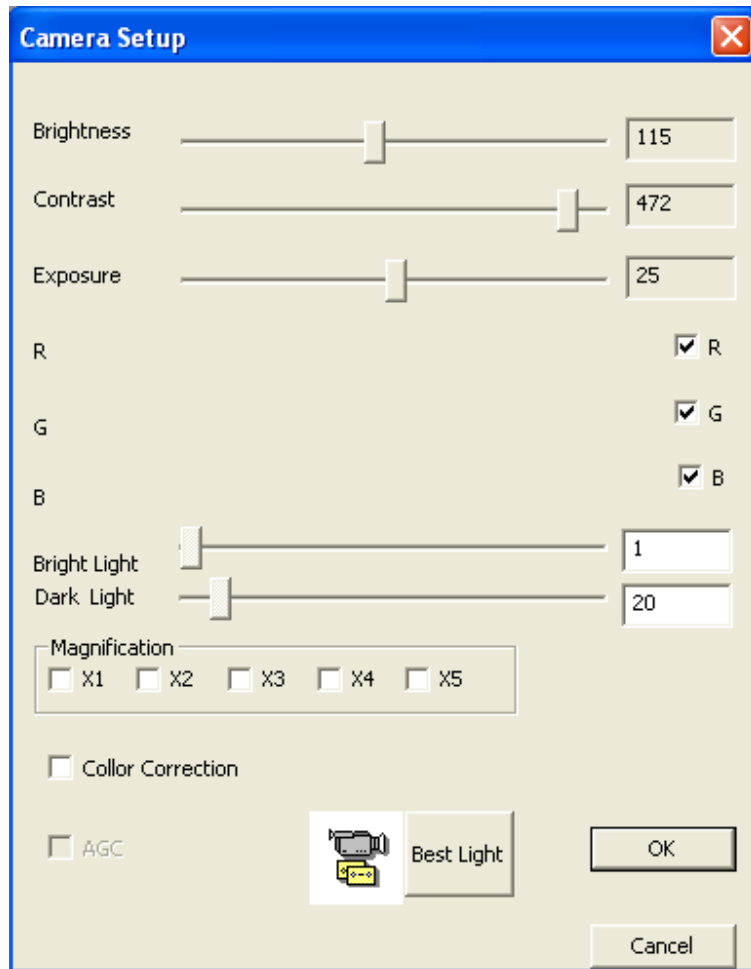
What can we do about that?

When you install a new lamp, we recommend you to put a blank page under the lamp, in the same distance you use for your programs, and check the green level (look for "Histogram"). Let's say for example that we measured under our old lamp a green level of 120. Now, after we switched lamp, we measure 100. We can change the exposure on every program, but it takes a lot of time. Instead you can use the "global light" command. You want to fit the light to the lamp you used when you designed it, and the difference is 20. Write 20 in the box near exposure 1, 2, 3 or 4, and you solved that problem. Of course You can define 4 different exposure's levels.

**Note!** Everything we wrote about exposure can be done by:

- Mechanically lenses shutter.
- External illumination (dark illumination and bright illumination).

## Set Camera and Light Parameters



### **Camera parameters:**

You can set the Brightness, Contrast and Exposure time. The Red, Green or Blue channels might be selected as well. A color correction can be used for IDS cameras.

### **Light parameters**

Bright and Dark lights level can be adjusted.

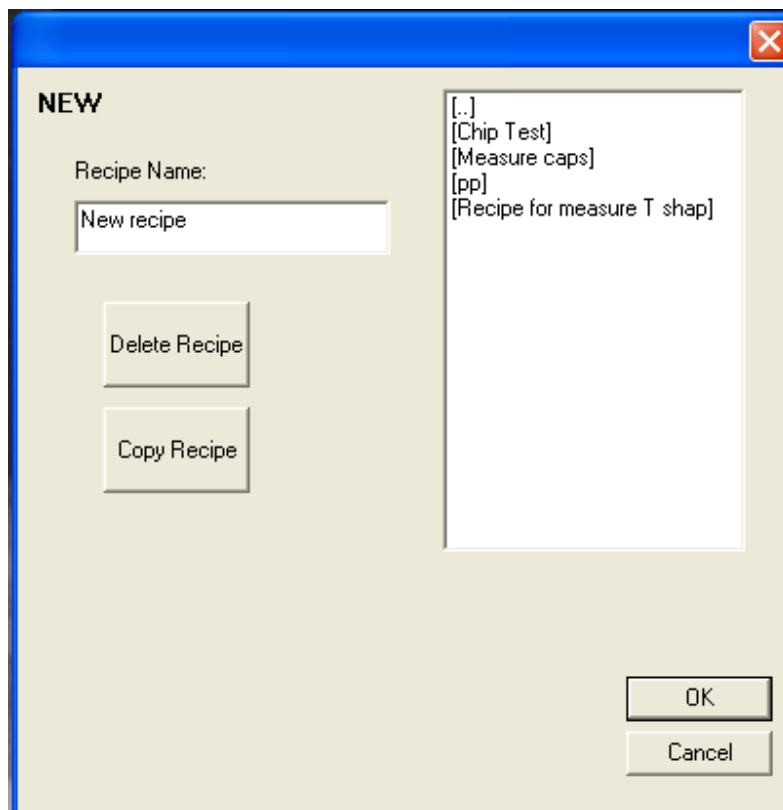
### **Best Light**

This can be used for IDS camera to automatically set the optimum combination of brightness, contrast and exposure time.

## **R G B**

Switches on and off the base colors- red, green and blue.

### **Create New Recipe**

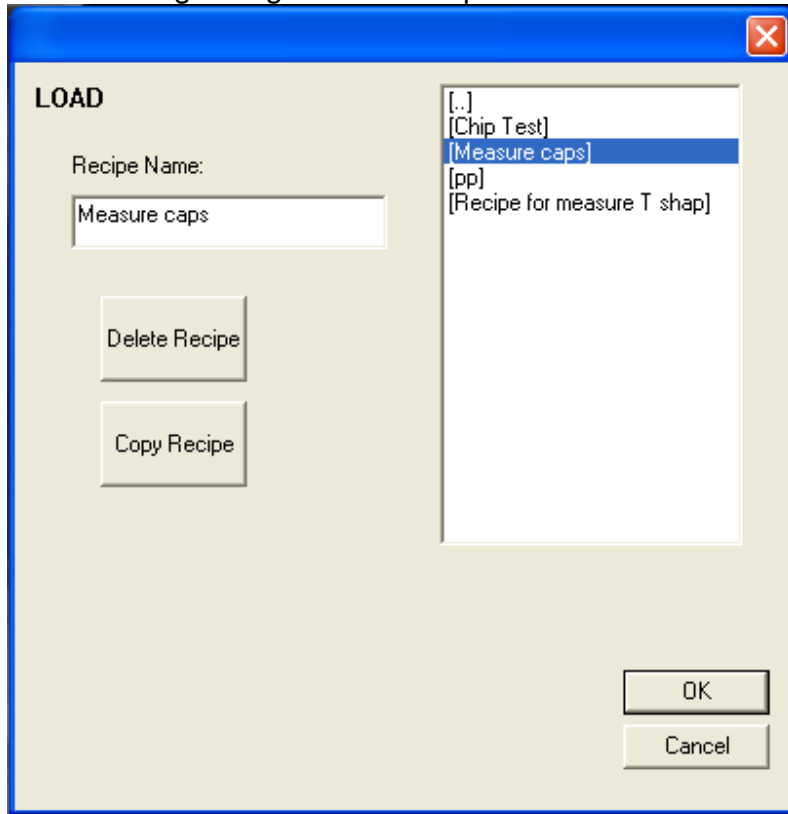


In this dialog you can generate a new recipe (inspection program), copy and delete existing ones.

## Open an Existing Recipe



The following dialog box will be opened:



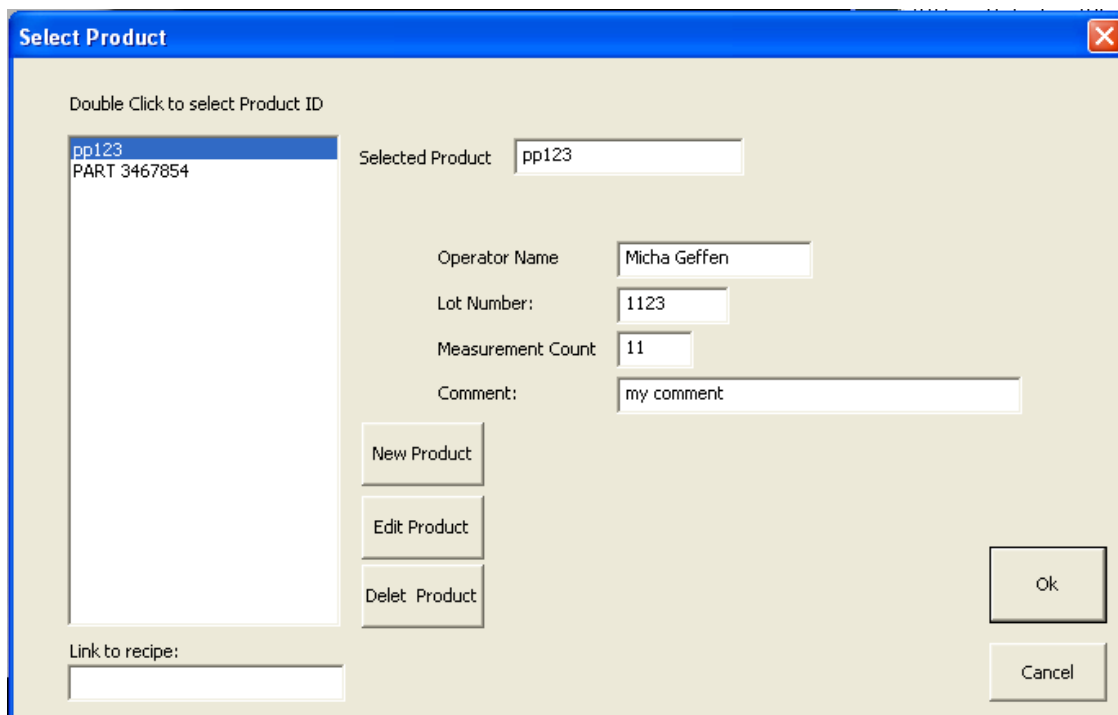
In this dialog you can open, copy and delete existing recipes.

## Product List



The inspection recipe can be initiated from PRODUCT NAME SHELL. Several PRODUCTS may be assigned to the same RECIPE.

In this dialog you can define a new PRODUCT and link it to a certain existing recipe. You can also insert the operator name, lot number and an arbitrary comment. The measurement count will be incremented automatically after every run of the same product (can be set to any initial number).



Double Click to select Product ID

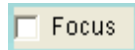
pp123 PART 3467854	Selected Product: pp123
	Operator Name: Micha Geffen
	Lot Number: 1123
	Measurement Count: 11
	Comment: my comment

New Product  
Edit Product  
Delet Product

Link to recipe:

Ok  
Cancel

## ***Focus Bar***



The focus bar will be opened:



The green bar represents the actual focus level, while the red one shows the best focus you can expect in this frame.

## ***Save Image***



Save the current image to the disk.

## Open Image



Open image from the disk and display it on the main screen.

## Stage and I/O Control



The screenshot shows a 'Dialog' window with the following sections:

- Choos Motor:** A list of checkboxes for selecting a motor: X (checked), Y, Z, T, M2, M3, M4, M5.
- Read Motor:** A text box showing 'Position 2863.6546' and an 'Update' button.
- I/O:** A table with four columns labeled I1, I2, I3, and I4, each containing a text box with the value '0'.
- What To Do:** A list of checkboxes for selecting an action: Init, Move To, Move Relative (checked), Read Position, Wait for end of motion (checked).
- How Much to move:** A text box showing '0' and two arrow buttons (< and >).
- Buttons:** 'Stop', 'Motor Calibration', 'Stage Control', 'OK', and 'Cancel'.

The following functions can be selected:

### **Choose motor:**

You can select one of the 8 pre-defined motors for the operation to run.

### ***What to do***

Select “Move to” in order to move the motor to an absolute location as per the “How Much to move” value.

Select the “Move Relative” to move the motor delta distance from the current location (delta is defined as per the “How Much to move” value).

Check the “Wait for end of motion” box when a new image has to be grabbed after the motor motion (this box is checked by default).

### ***Motor Calibration:***

This operation will cause the motors to move to their zero positions.

### ***Stage Control:***

In this mode live video will be displayed and you can use the mouse to move the object under the lens using the motors. This is done by clicking the mouse at the desired location on the screen, which will then cause the stage to move so the clicked point will be shifted to the center of the screen.

### ***Read Motor:***

This field shows the I/O states and the current selected motor position.

### ***Open Calculator***



The default Microsoft calculator will pop up for your convenience.

### ***Color Control***



You can filter out each of the 3 RGB colors; this may sometimes help to get better images of the part under test.

### ***Executable Program***

The executable program will be shown on this screen section. The instructions will be listed in the order of their execution.

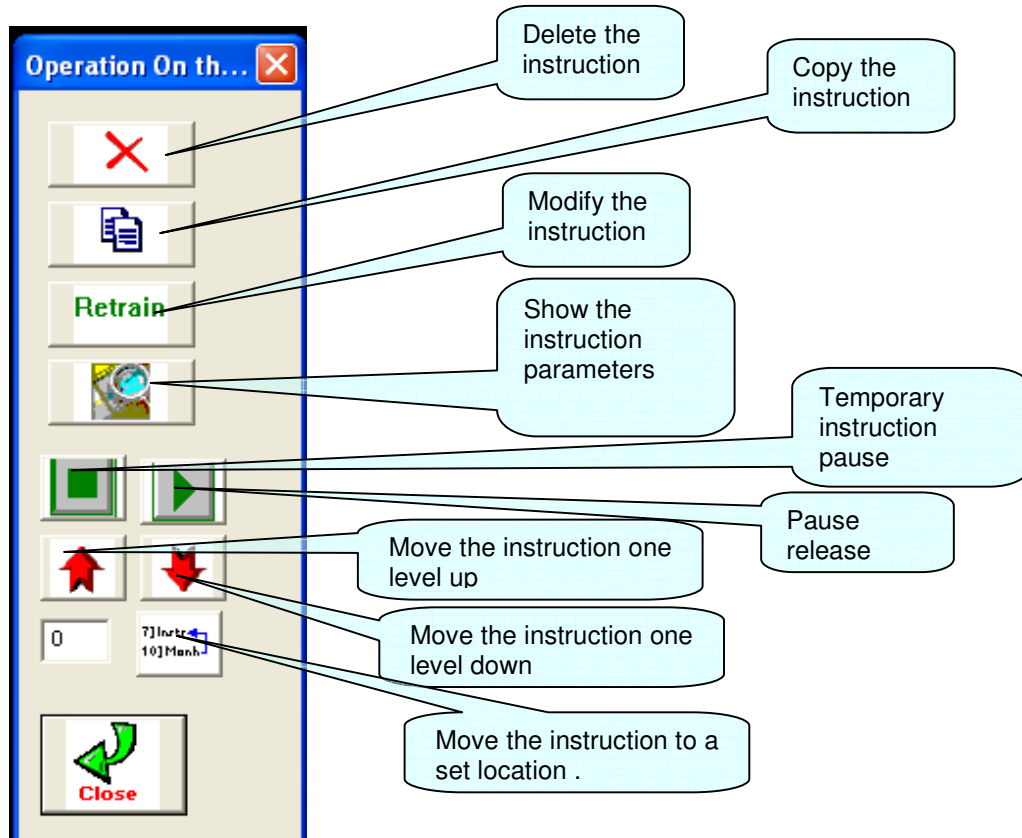
Double Click on single instruction will cause the instruction to be executed; this option is very useful for debug.

## Instruction Bank

This screen section contains the full instruction set; double click on an instruction will copy it to the executable screen section.

## Instruction Editing Window

Clicking the right button of the mouse on an instruction in the EXECUTABLE PROGRAM window will open the editing dialog:



This section provides a set of instruction editing controls:

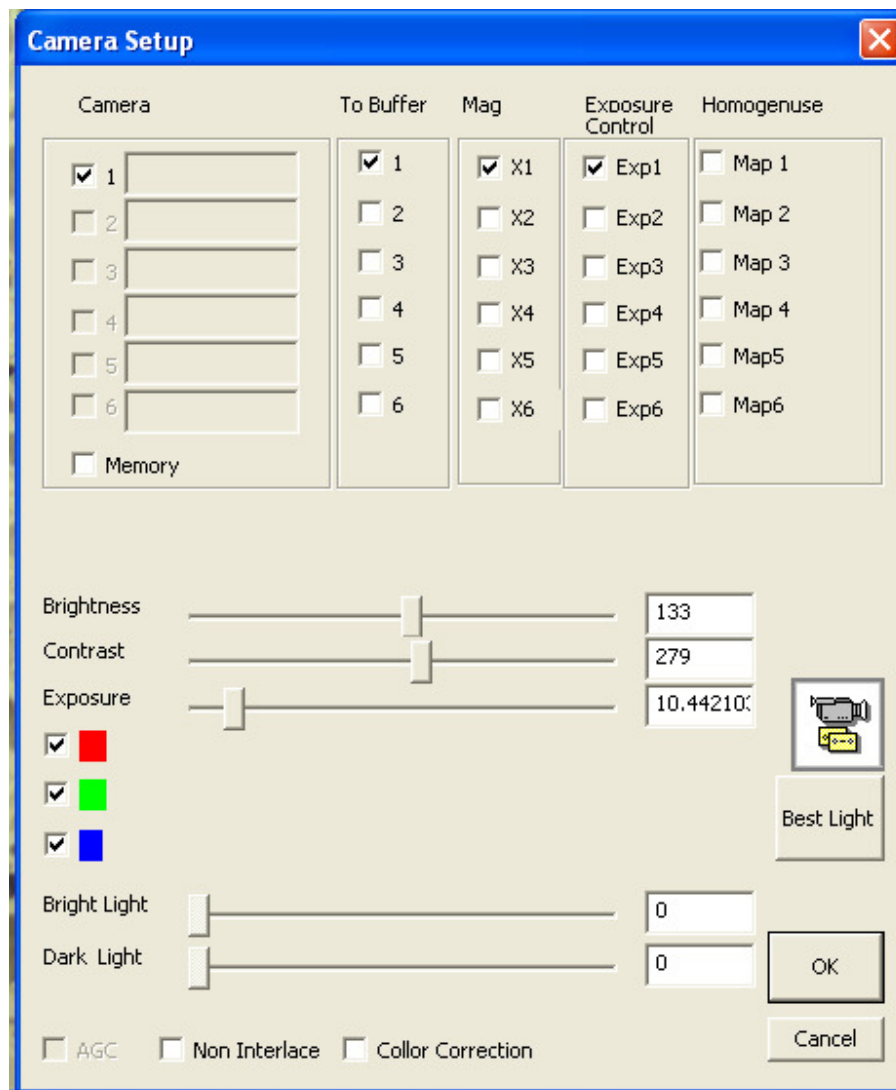
- Delete (X)- Clicking this icon will cause the selected instruction to be deleted from the executable recipe.
- Move Up (▲) – this will cause the selected instruction to move one line up in the recipe order.
- Move Down (▼) – this will cause the selected instruction to move one line down in the recipe order.
- Pause / Resume (■/ ►) – this will put the selected instruction on inactive state (pause) or release it back to be active.

## Instruction Bank Description

### GRABBING:

#### *Grabe Image*

Selection of this instruction will open a dialog box that will enable the optimum setting of the Camera & Light parameters. Those parameters will be restored every time the recipe will be executed.



#### Camera

You can choose the number of the camera you want to grabe the picture with (according to your definition of which number related to which camera).

If you want to load an image from your computer's memory, than instead of clicking a camera number, click on the "memory" option, and each time the "grabe image" command will be executed in that specific recipe, you will be able to choose an image restored on your computer.

### **Buffer**

You have 6 buffers. Every buffer contains an image. You can choose a buffer to restore the image in. there are some commands in the program that has a "buffer" option, that allow you to choose which image your command relate to.

### **Magnifications**

Look for "adjust pixel size"

### **Exposure control**

Look for "adjust pixel size"

### **Homogenous**

That option helps when the lightning is non uniformed. In that case you can take an image of a white pepper and save it to one of the maps (each camera has it's map- map 1 related to camera 1 and so it goes). Than the program fixes the lightning's non uniformity.

### **Best light**

Look for " Set Camera and Light Parameters"

## ***Load Image from File***

This instruction will call an image from the hard disk according to your selection.

## ***Live Video***

This will switch on/off the Live-video state.

## ***Refresh Image***

This will bring the grabbed image back to the active state. This is useful after "destructive" instruction like Binarization or Edge Extraction.

## **ALIGNMENT:**

The alignment procedure is one of the most advanced VISION-LC features that allow the system to inspect the parts in different locations and angles. In other words, the part under test does not have to be fixed at a highly accurate location, i.e. a highly accurate handling system.

The following steps will be taken prior to every measurement:

First Pattern recognition - for spatial (x, y) locate.

Line detection – for angle detection.

Image rotate – for orthogonal measurement.

Second Pattern Recognition to provide the accurate location after zeroing the angle.

In case there is no change in the angle positioning a single alignment mode can be used. In this mode just single pattern recognition will be performed to locate the part. This mode provides faster cycle time.

The following screen will pop up during the first training of the Alignment instruction:

**Pattern Recognition Parameters**

Pass Criteria [0.0 - 1.0]

**Recognition Speed**

Fast  
 Normal  
 Slow

**Recognition Method**

2 D Correlation  
 Projections  
 With Edge Extraction

Alignment with Angle

**Wait For success recognition**

Wait  
On Camera#   
Delay Between Recognitions:  [Milli Secons]

Search with Motors  
Choos Motor   
Move Increment   
Search Distance

OK  
Cancel

### ***Pass Criteria***

This number represents the Matching level of the pre-trained template and the one of the part under test. 1.0 means that the matching level should be 100%; which will naturally cause lots of failures. 0.0 means that every close template might be confirmed and that will cause lots of false recognitions.

The default number is 0.55 and should be usually proper. In case of large process variation this number can be decreased, in case of false alignments it should be increased.

### ***Recognition Speed***

The default setting is NORMAL. FAST will shorten the alignment process but at the same time will reduce its accuracy. SLOW will be much more accurate but will extend the process time.

## ***Recognition Method***

- 2D Correlation
  - For most of the cases this default method is recommended.
- Projection
  - For high process variation this method help to “average the variations” resulting better recognition stability.
- Edge extraction
  - In case the process variation is mainly color variation, the algorithm can ignore the colors and recognize only the object edges.

## ***Alignment with angle***

If this option is selected, the system will align the object image for **X** and Y shifts, as well as for rotation ones.

## ***Wait for success recognition***

This option enables continues iterations of recognition attempts before announcing Alignment Failure. A useful example for this option is when objects are being transported on a conveyer and have to be recognized on the run. This option performs an object search and will start the analysis of the image after successful recognition.

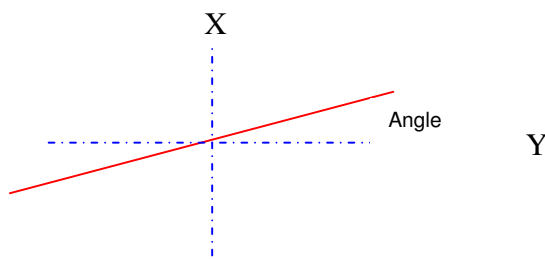
## ***Search with motors***

This option is similar to the previous one except the object (or the camera) is being moved by the motor which by itself is controlled by the system. The object will be scanned along the “search distance” range until the alignment (recognition) will be successful.

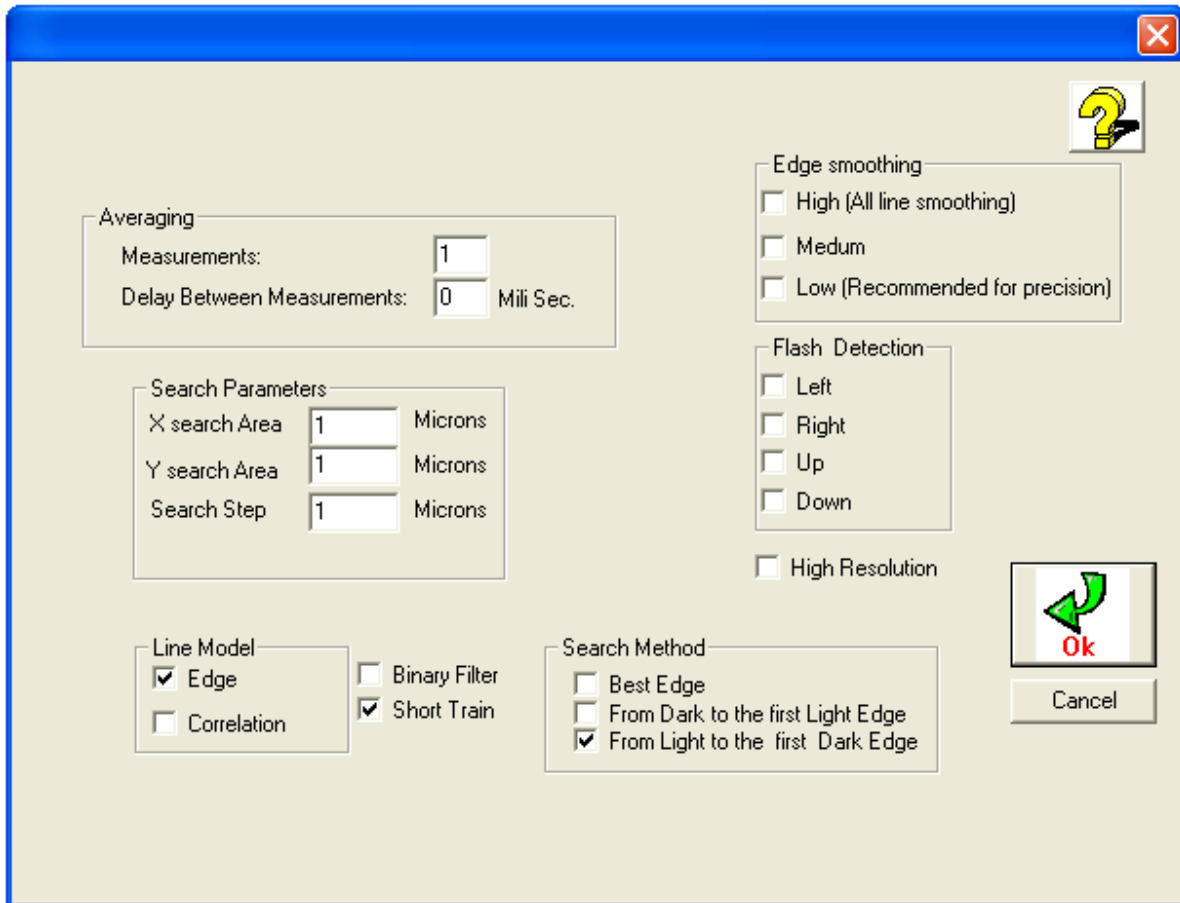
## ***DETECTION:***

The DETECTION group contains several geometrical detection features which will be described hereafter.

## ***Line Detection***



When this instruction is selected the following dialog box will pop up:



### **Averaging**

In cases where the repetition result (measurement stability) is not sufficient, it is possible to perform the measurements several times and average the results. It is also possible to set a delay between consecutive measurements. Please note that using this feature will extend the program running duration.

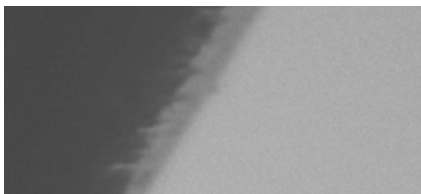
### **Line Model**

Edge – The machine search for changes across the line,

Correlation – The machine search for the best matching between the line model and the pre thought line model which was stored in the memory.

### **Search Method**

Sometime the part under measure have a noise in the edge as the following example:



In this case the “best edge” can be found on the inner line , so we can ask the machine to search the line from the right and to stop when the first edge will be accrue.

Best Edge- The machine search for best edge within the search area.

From Dark to the first Light Edge- The machine search the first edge starting from the Dark area.

From Light to the first Dark Edge- The machine search the first edge starting from the Dark area.

This section works for Edge only.

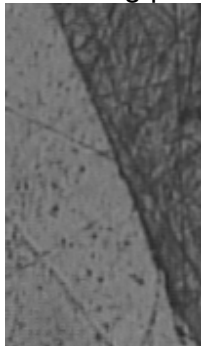
### **Short train**

The operator will not asked to define the cross section of the line under measurement , the machine will do that automatically for you.

### **Edge smoothing**

In cases where the background of the Object-Under-Test is grainy, the outline of the Line-to-be-Detected may not be clear enough. This feature will perform a pixel-averaging along the line and will filter out the grainy background.

The following picture is the example when this feature may be helpful.



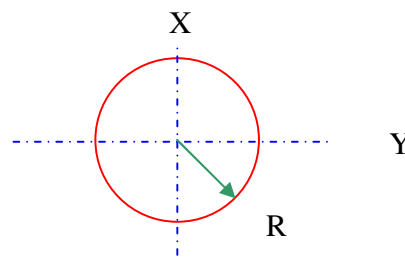
### **Flash Detection**

This feature enables the detection of flashes along the detected line. A flash is like a spark along the line. The search for flashes can be applied to certain orientations relative to the detected line.

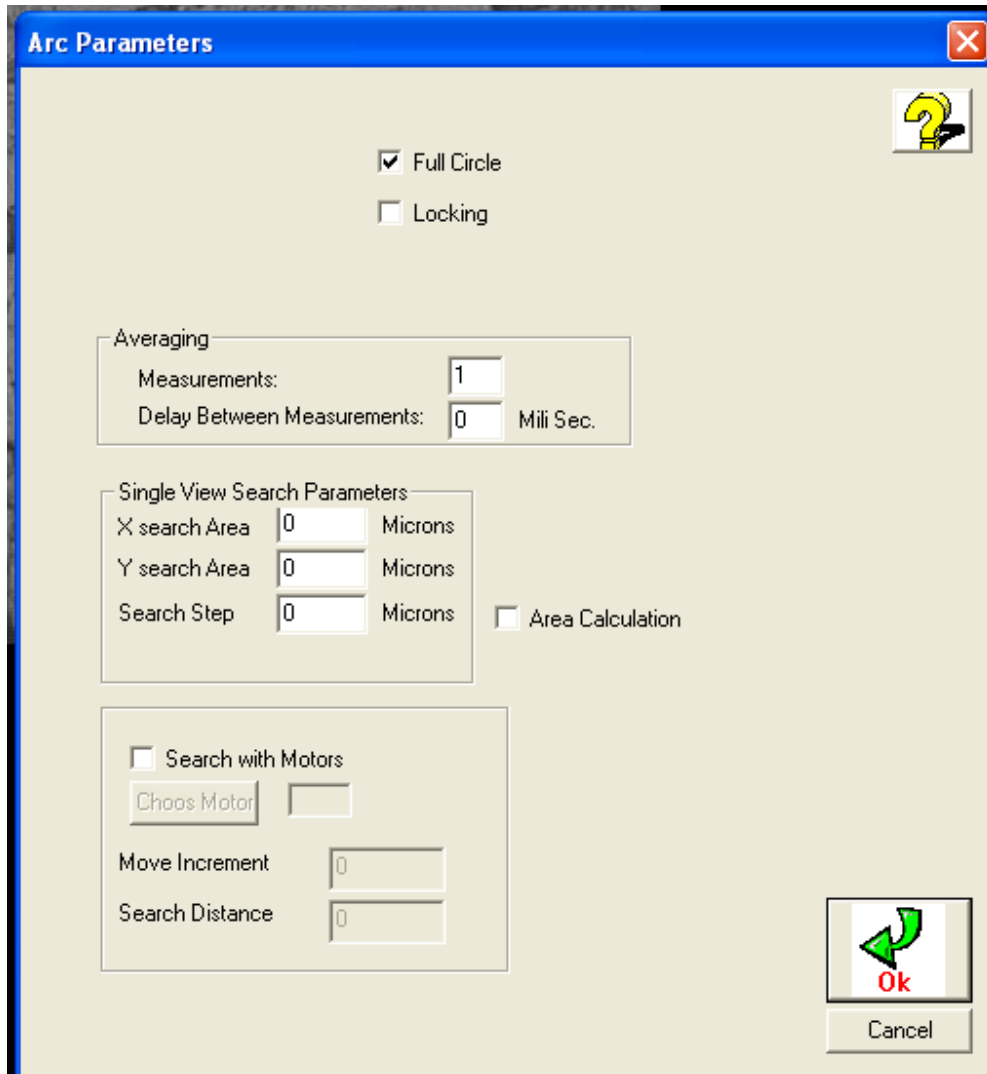
### **Binary Filter**

This is a special feature that can be used when an object silhouette is to be inspected. The binary filter enables the sharp differentiation between a line-pixel and a background-pixel. Please advice our support center for explanations.

### **Arc Detection**



When this instruction is selected the following dialog box will pop up:



### **Full Circle**

When searching for a circle you need to indicate whether full or partial (arc) circle is to be identified. If set then a full circle will be analyzed, otherwise a pre-defined arc will be analyzed (you'll have to point the Arc Start, Middle and End points).

### **Averaging**

Same like averaging in the line detection instruction. See above.

### **Single view search Parameters**

In cases where it is difficult to identify the circle search area it is useful to set the search area parameters manually. This feature may be helpful when the circle is very small and could not be easily marked by the mouse.

### **Search with motors**

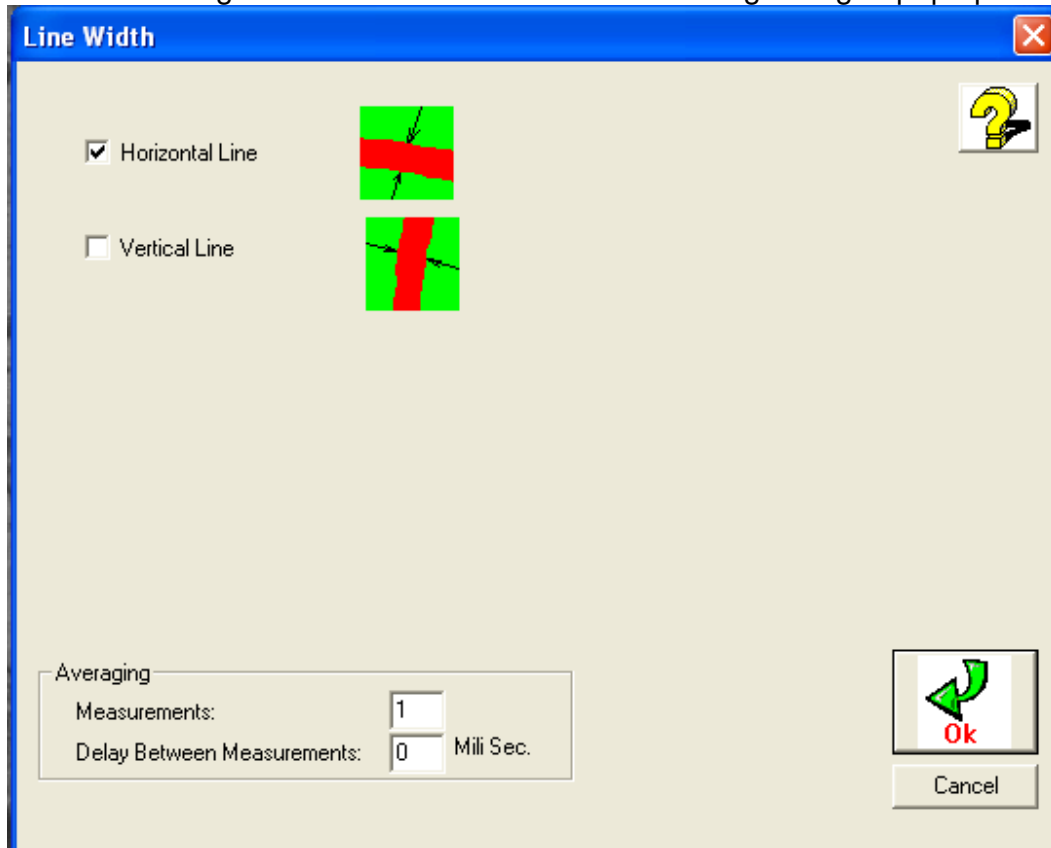
This feature is useful when the circle to be detected is not necessarily within the current image frame under the camera. The system will scan the object (using the selected motor and scanning parameters) and find the best fit to the predefined circle.

## **Box Detection**

This instruction will search for quadrangle geometrics, similar to circle detection.

## **Line Width**

This instruction is useful when the thickness (width) of a line have to be measured. Selecting the instruction will cause the following dialog to pop up:



## **Manual Measurement**

This is a special instruction that enables to perform manual measurements on the image frame. It is useful in cases where the distinctness of the geometry is not sufficient for the automatic algorithm and human eyes could make the judgment. During the execution of the program there will be a pause and the operator will be asked to point the requested measurement locations. The pointed spots will be recorded and displayed in the final results later on.

## **Locate Pattern**

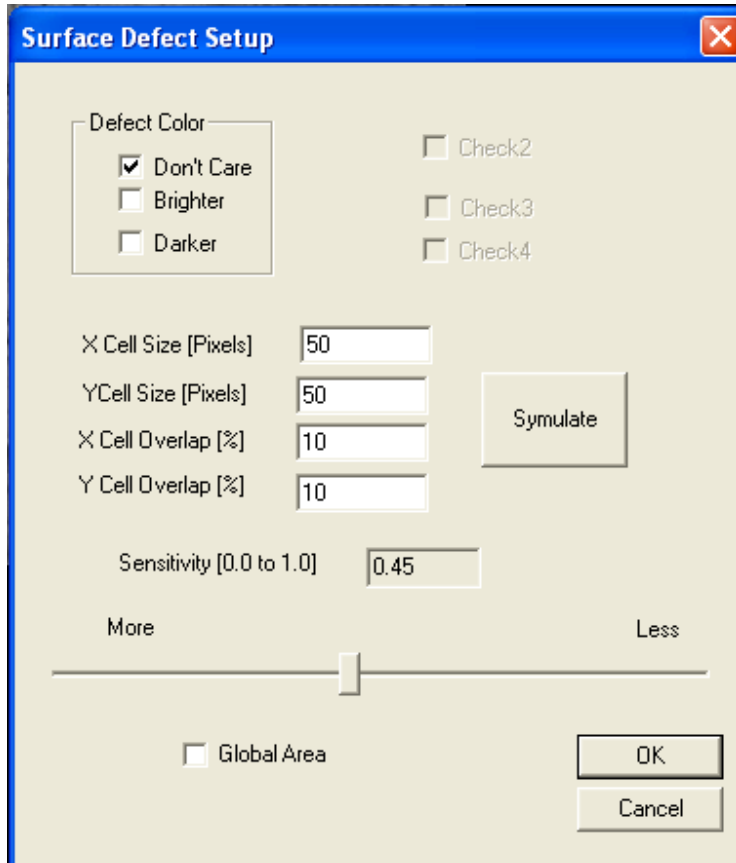
This instruction performs a search for a predefined pattern. It is useful for automatic parts counting where either the camera is scanning the area containing the parts or they travel under the camera on a conveyer. Selecting this pattern will cause a pop up of a dialog window that is similar to the Alignment dialog screen.

# **SURFACE DEFECT**

## **Surface Defects**

This instruction performs surface homogeneity inspection. It can be applied for non-patterned surfaces and will look for exceptions in the uniform surface.

The following dialog will be displayed after the instruction will be selected:



### **Defect Color:**

Select the defect shade relative to the inspected area (brighter, darker or both).

### **Cell Size:**

The surface image frame will be divided into cells and the search for defects will be performed on cells level. This parameter will set the cells sizes and overlaps.

### **Sensitivity:**

This parameter defines the severity threshold of the defect to be detected.

### **Global Area:**

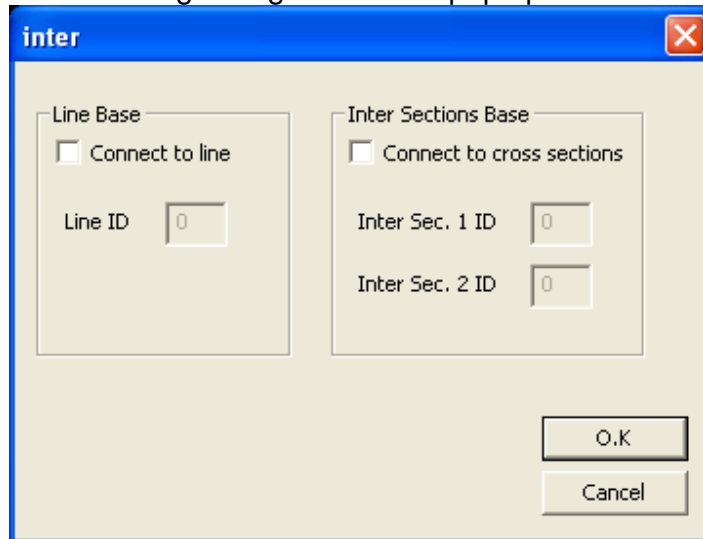
If set than the cell will be compared to the entire region of interest. In cases where stains that are larger than the cell size have to be detected, it will be useful to select this option. For small defects with high contrast relative to their background, the preferable option is not select the Global Area feature.

## **DATUM**

### **Line Datum**

This instruction will allow you to draw a virtual line relative to any other pre-detected line or between any two line intersections points.

The following dialog screen will pop up after the selection of Line Datum instruction.



### **InterSection**

This instruction will calculate and mark a cross at the intersection point between two (non-parallel) lines. This may be a theoretical intersection since its coordinates might be out of the screen.

## **GEOMETRY:**

### **Translate Image**

Move the acquired image by X/Y pixels to **X** and **Y** directions.

### **Rotate Image**

Rotate the acquired image by the set degrees.

## **PROGRAMMING:**

This set of Instructions helps to control the program flow.

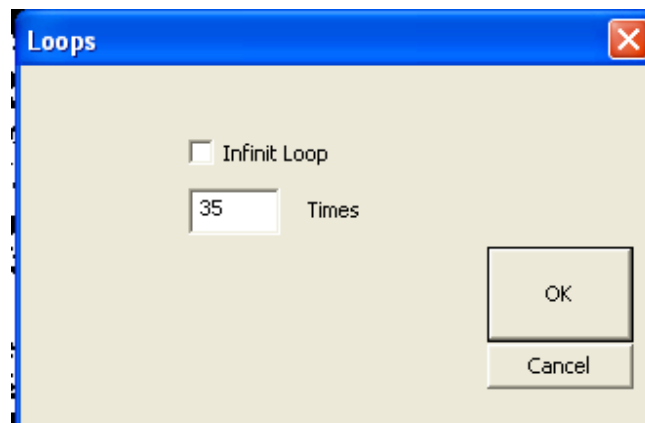
### **Delay**

Insert a delay between two consecutive instructions the set Milliseconds. This could be useful when you need to make sure that a certain process has to be completed before the execution of the following instruction.



### ***Start Loop***

This instruction enables a repetition of a group of instructions for the set number of times. The repeated group starts from the following instruction and ends at the **End Loop** preceded instruction. The following screen will pop up when this instruction is selected:

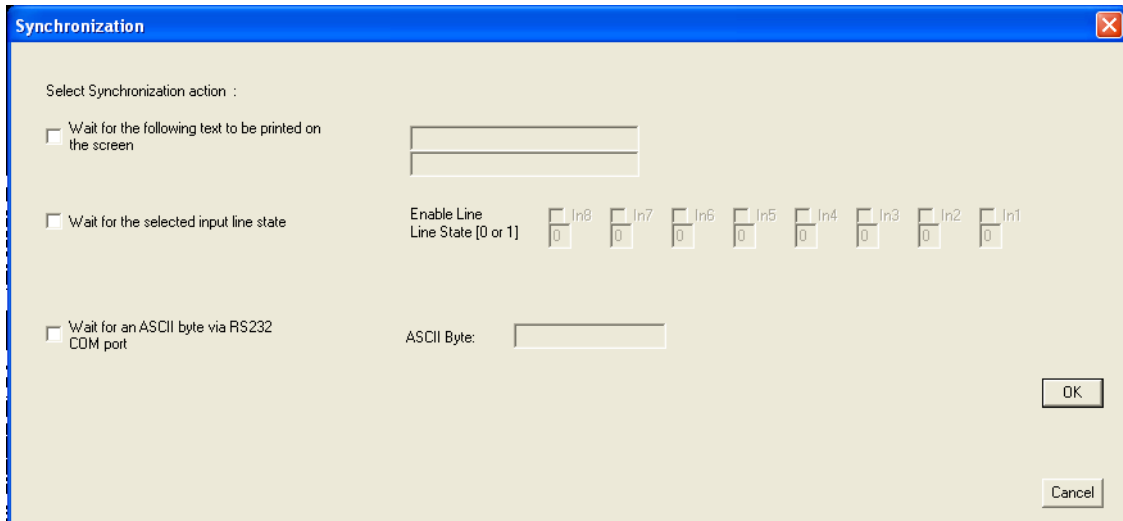


### ***End Loop***

This is the closing loop instruction. See above.

### ***Synchronization***

The Synchronization instructions enable the execution of the program to be synchronized with variety of external events. The following dialog screen will be shown when this instruction is selected:



There are three types of available synchronization modes:

***Wait for operator***

The selection of this mode will cause the program flow to pause every time it reaches this instruction. During the pause time the selected text message will be printed on the screen and the operator will be asked to confirm the message and click the continue button.

***Wait for input state***

The selection of this mode will cause the program flow to pause every time it reaches this instruction. The program will then wait for the selected external signal before continuing with the program flow.

***Wait for RS232***

The selection of this mode will cause the program flow to pause every time it reaches this instruction. The program will then wait for the selected communication ASCII character to be received before continuing with the program flow.

## Show results

This instruction will cause the inspection results to be displayed on the screen at the end of the program run. When you first setup the program you'll be able to define the type of results you're interested in by using the following dialog screen:

R...	Subject	Utl	Result	Ltl	Pass/Fail	Time
[ ]:						Mar 18 2008 09:06:28
1	גוון	1.193	1.277	0.976	**FAIL**	
2	בהירות	152.857	83.883	125.065	**FAIL**	
3	saturation	0.160	0.142	0.131		

Result#	Obj	Argument	C...	Obj	R...	Obj	Type	Arg	C...	Value
0	Histogram 1				0	1	His...	Hue		1.275
1	Histogram 1				1	1	His...	Hue		1.279
2	Histogram 1				2	1	His...	Hue		1.277
3	Histogram 1				3	1	His...	Hue		1.277
0					0	1	His...	Inten...		83.272
1					1	1	His...	Inten...		83.568
2					2	1	His...	Inten...		84.118
3					3	1	His...	Inten...		84.575
0					0	1	His...	Satur...		0.143
1					1	1	His...	Satur...		0.142

In the above dialog screen you can generate the inspection report including all the required objects results, inter-objects geometrics and arithmetic's as well as tolerances and pass/fail criteria.

- The upper left screen displays the raw results; the ones that are direct derivatives of the measurements taken from the program instructions list.
- Double click on particular result object will select the measured object.
- Once you selected an object result, the neighboring Argument List will be enabled for you to select the desired argument (action) to be applied on the selected object result. See below the description of the available arguments.
- When the selected arguments requires another result object (distance or angle between to lines, vector between two points etc.) you'll be asked to select the second object from the "Connect To" list. This list is actually a copy of the raw results list.

- After selecting the object and argument, click on the “chosen results” arrow to add it to the list.
- Repeat the above actions to add as many results as you wish.

### **Arguments Options**

#### **X**

Select this argument when you need to measure the distance in the **X** axis between two elements from the raw results list.

#### **Y**

Same like the above but for **Y** axis.

#### **Angle**

Select this argument when you need to measure the angle between two elements (lines) from the raw results list.

#### **RV**

Select this argument when you need to measure the distance between two elements from the raw results list. This is useful for measuring center to center distance between two circles, center of masses etc.

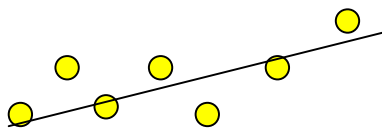
#### **Flash**

Select this argument when you need to count and mark the flashes along a selected line from the raw results list.

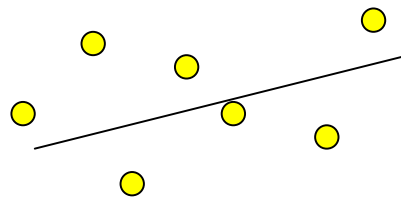
### **Score and Sigma results**

Score number represents the object “detection quality”. Since the system will detect the “best fit” for the desired geometry (line or circle), it will mark the detection success according to the match level between the actual detection and the best fit results. Value of 1.0 represents the best match while 0.0 represents the worst match.

Sigma number represents the variation level of the pixels along the “best fit” geometry. See example below:



**Line object with low sigma**



**The same Line object with higher sigma**

## Final Results

Once you are done with filling the “chosen results” list, you may select the final results, set the pass/fail tolerances and define the arithmetic and logical inter-relations between them. Each “Final Results” item may comprise of a single or multiple “chosen results” selection. Once you made your selection and clicked the “move down” arrow, the following dialog box will pop up:

Dialog

Players: 0,

Subject

Group Operation

- Averag
- Average For Largest 0 Items
- Max
- Min
- Sigma

Two Players Operation

- +
- 
- x
- 1/2
- 2/1

Set Tolerance 0.1

Result

-81.28' x 1 + 0 = -81.28754

Upper Tolerance: -73.15879:

Lower Tolerance: -89.41630:

Critical Failure

OK

Cancel

In this dialog box you'll be asked to fill and select the following:

- Type in the result name in the subject field. This name will be used in the final results table and print.
- Perform arithmetic operations on the group of results.
- Set the pass/fail tolerances of the results.
- Set the severity level (critical failure) for every result failure. Critical failures will cause a halt of the program and an intervention of the operator.

### Group operation

- When using the option *loops* in the program, that option aloud you to combine all the scores you got in the loop into one score.
- Mark the scores you want to combine and than you can choose the average score, sigma, max score or min score.

## Show and print the results

Clicking on the “printer” icon in the “show results” screen will open the following dialog box:







**Print Report**

Part #  Comment   
Lot  Operator   
Date

www.brossh.com  
972-4-9588185

Raw	Subject	Result	Pass/Fail	Max	Min	Utl	Ltl
[11]:							
1	D1	-81.288				-73.159	-89.416
2	Arc Diameter	222.388				244.627	200.149
[12]:							
1	D1	-81.288				-73.159	-89.416
2	Arc Diameter	222.388				244.627	200.149
[13]:							
1	D1	-92.368	**FAIL**			-73.159	-89.416
2	Arc Diameter	96.081	**FAIL**			244.627	200.149

Show Dates

Here you can do the following:

- Clear a selected line
- Clear the whole result list
- Print the displayed results



## Save the results

Clicking on the “save” icon in the “show results” screen will store the current results into the disk as text file. It will be stored in C:\IPP\SPC\productname.txt. the file could be opened by Excel for SPC purposes.



## Save Image

This instruction will save the current image into the hard disk. When you call the instruction for the first time it will ask you to define the saved file name and location. The system will automatically assign an incremental index to the file name every time you'll repeat the run of the program.

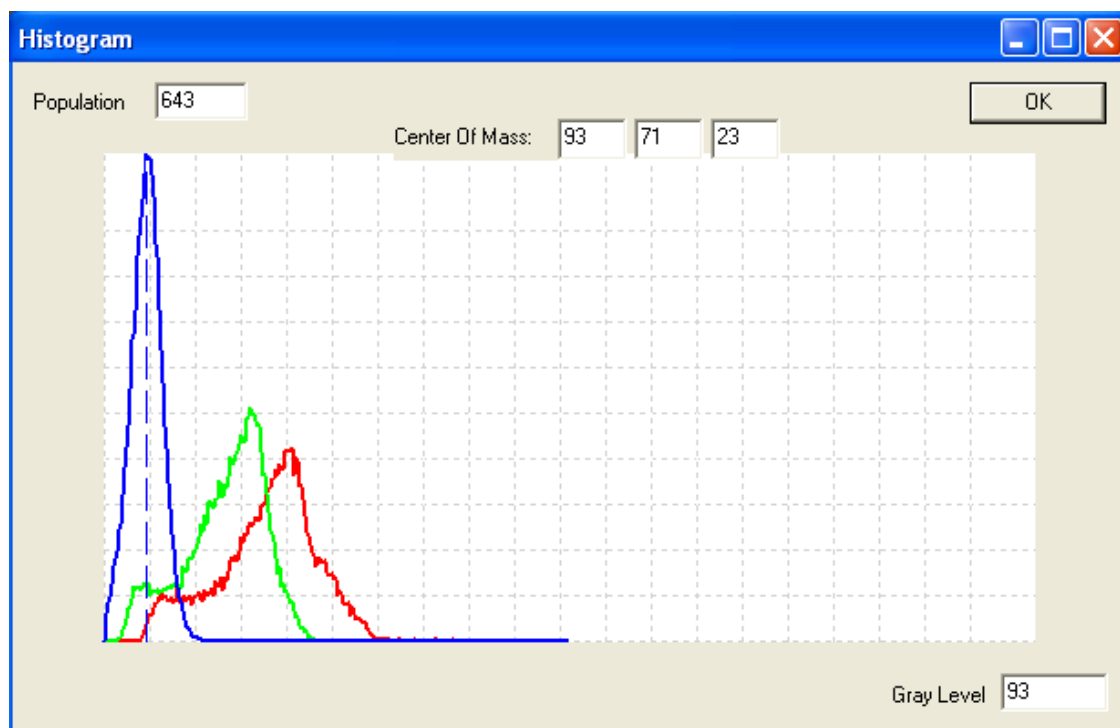
## PRE PROCESSING:

### Smooth

This instruction will smooth the acquired image by using a spatial average filter.

### Histogram

This instruction will generate a gray level histogram of the selected area pixels. The following graph will be shown:



## Histogram Equalization

Not implement yet

## Edge Extraction

This instruction will transform the acquired image into an image with contour display only. This feature may be helpful in cases where the original image is too “noisy” and it would be easier to apply the DETECTION instructions on the modified image.

## Blobs

The BLOBS instruction will detect all kind of blob shapes in the acquired image. You'll be able to set the detection level in terms of brightness, contrast and sizes of the blobs. The following dialog window will be displayed when the BLOBS instruction will be selected:

C	Area	Av I...	Ma...	Min...	Xc	Yc	Peri
192	1...	81....	89....	68....	369...	99....	0.00C
358	...	81....	89....	70....	286...	114...	0.00C
396	1...	83....	89....	74....	312...	115...	0.00C
417	...	82....	89....	68....	372...	114...	0.00C
630	...	84....	89....	72....	347...	133...	0.00C
632	2...	83....	89....	71....	401...	135...	0.00C
889	1...	85....	89....	73....	528...	150...	0.00C
1...	...	79....	89....	56....	775...	153...	0.00C
1...	1...	81....	89....	72....	292...	154...	0.00C
1...	...	83....	89....	76....	437...	156...	0.00C
1...	...	83....	89....	70....	484...	157...	0.00C
1...	1...	83....	89....	71....	420...	158...	0.00C
1...	...	86....	89....	82....	377...	167...	0.00C
1	...	84	89	79	368	166	0.00C

### Threshold

Set the threshold level to adjust the contrast level for the blobs to be detected. This is also considered as the “binarization” level.

### Perform Blob

Switch the blob calculation on and off.

### View binary Image

Switch the binarization display on and off.

### Blob Parameter

- \* Select the type (dark or bright) of blobs you are interested in.

- \* To avoid faulty detections, you can eliminate the blobs next to the edges of the image. Uncheck the edge side (right-left-up-down) to activate the elimination.

### ***Blob List Table***

The table displays the list of the detected blobs and their following parameters:

Area

Average Intensity

Max Intensity

Min Intensity

X center of mass

Y center of mass

Double click on a specific blob in the table to see its location on the image.

### ***Projection***

This instruction will average a selected part of the image by summing the rows or columns (according to the **X** or **Y** selection) of the selected part. This feature may be useful to enhance lines in cases where the line to be detected is not clear enough compared to its surrounding. Select the **Y** projection to enhance horizontal lines and **X** projection to enhance vertical lines.

### ***MOTION:***

#### ***Move***

This instruction will enable you to control any motor in the system as part of the inspection program. You'll be asked to define the motor and its movement parameters. This is useful when you need to scan the inspected unit.

#### ***Valve State***

Not defined yet.