LANOPTIK
Technologies

iWorks Series Software

# User's Manual

www.lanoptik.com

# Content

# System Requirement

- PC with a Pentium-Class Processor; Pentium IV3.0GHz or Higher Recommended Microsoft Windows XP, Windows VISTA, Windows 7 32bit or 64bit Operating System 512MB of RAM or More Recommended
- 100G Hard-disk Space
- CD-ROM drive
- 16G Video Memory or More Recommended
- Microsoft Mouse or Compatible Pointing Device
- USB-Port for Hardware Key
- 100G Hard-disk Space

# Software Installation

1. Place the program setup CD into the appropriate CD drive.

2. Run iWork.exe in the program Setup CD and follow the instructions.

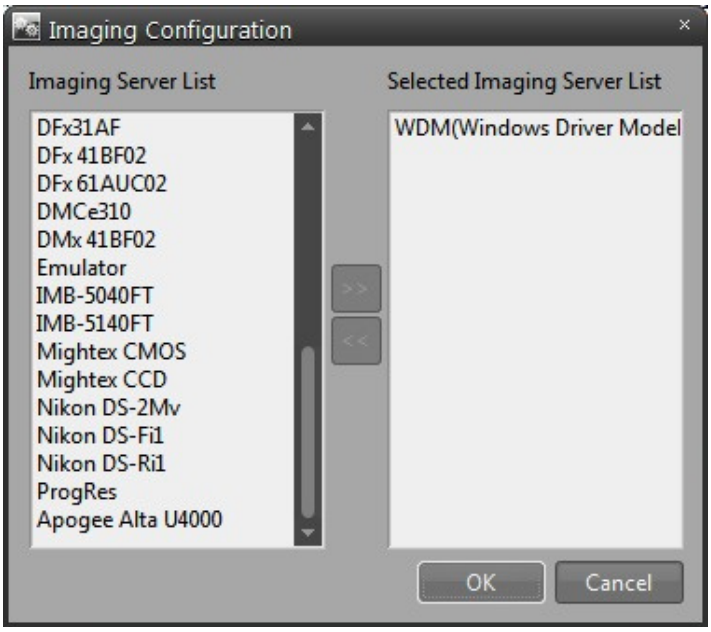
3. Connect the “Dongle (Electronic key)” to a USB port of your computer. Then Windows will find it by itself.

4. Camera Setup

   Procedure:
   A. Camera drivers installed by their own programs.
   B. Run ImagingDrivers.exe on the iWorks Setup CD.
   C. Select Specific model on the list
   (※ Non-Listed camera on iWorks can be connected by WDM/DirectShow Driver)

# Starting iWorks Software

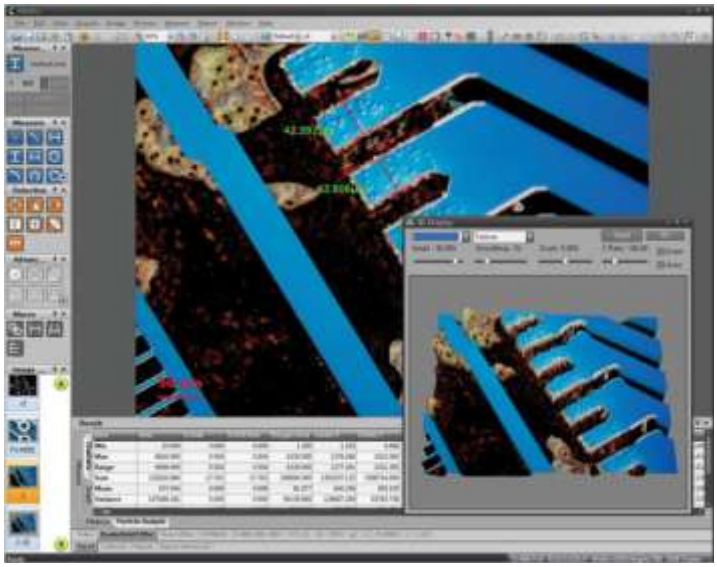
At the first time run iWorks, Imaging Device Configuration automatically starting. Select the camera on the list. If you using not listed camera, please select WDM then send it right side. Camera should be support WDM interface.

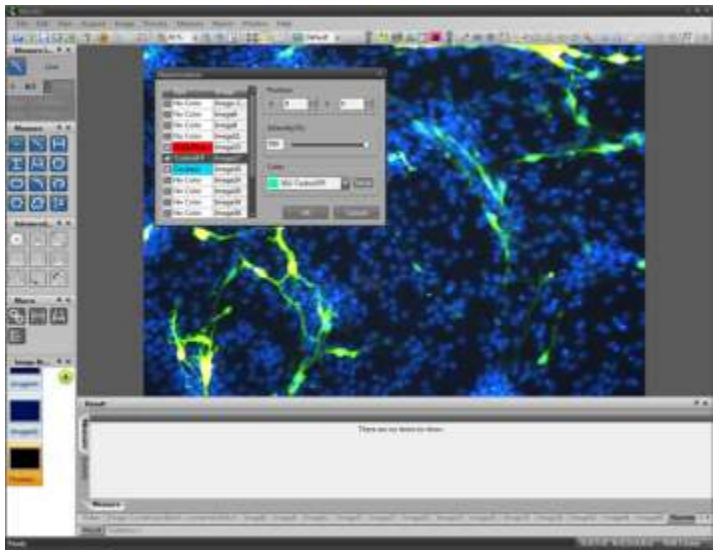



- If you want to change your camera, you can change it on the program menu.
- Start >> Programs >> iWorks >> Image Configuration

# Overview

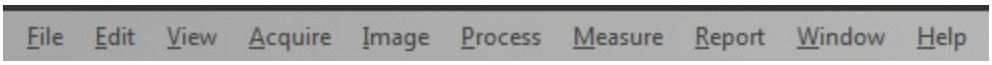
New wave of image processing software, iWorks, supports professional function with interactive user-friendly interface.





# 1. Menu Bar

Each menu activated whenever it’s possible to work. Some of them activated only upper version of iWorks series.




## A. File Menu

**OPEN**

Open command, using this command you can select the path and file you want to load. This command allows you to load several files simultaneously

**CLOSE**

Close command is used to close the opened image widow. If it has unsaved changes, a prompt will be shown to ensure you want to save the image window before closing it

**CLOSE ALL**

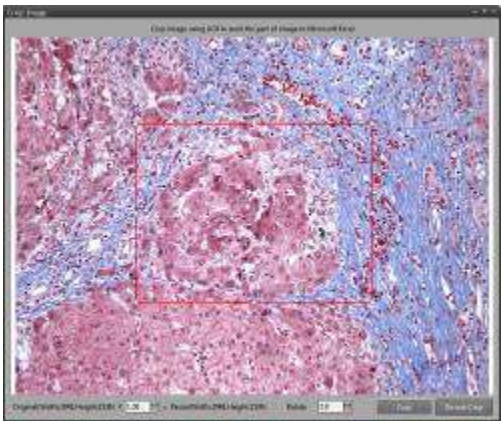
This command is used to close all of opened image windows.

**SAVE**

This command is used to save the image window changes to a file.

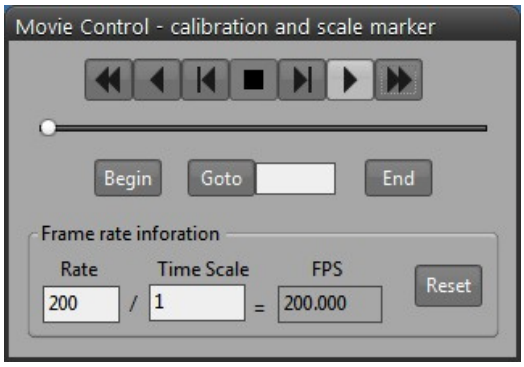
**SAVE CROPPING**

Save cropped image. You can select preferred slice of image as below.



**OPEN MOVIE**

Open saved movie files.
* Control window will pop-up whenever open a movie files.




**RELOAD**

Use the command to reload the active document. This command shows a prompt to ensure you want to reload the active document. If you confirm, it closes the active document and opens it again. All previous changes of this document will be discarded.

**SAVE AS**

This command is used to save the image window changes to a file with a new name.

**SAVE ALL**

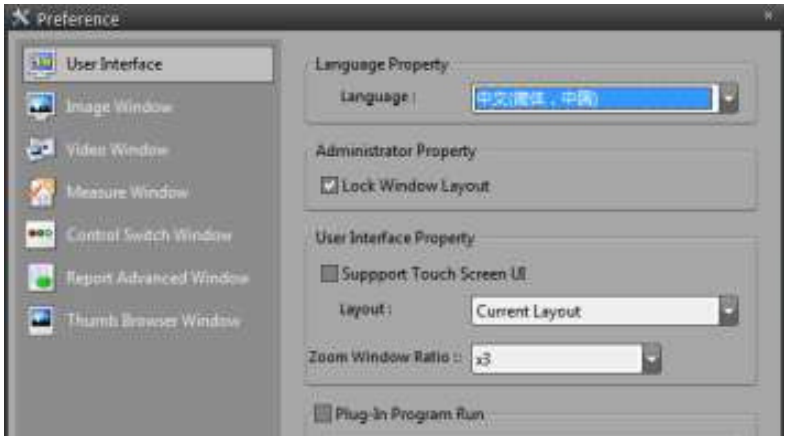
This command is used to save all of opened image windows to a file.

**PREFERENCE SETTING**

This command is used to save all of opened image windows to a file.


**Admin password is four times of number zero: '0000'**

The password can be changed by user's own words.




**Language**

Select basic language for the iWorks software interface. (It needs to restart iWorks program for applying newly selected language.)

**Lock Window Layout**

Lock widow's layout for protecting basic layout and setting. (If you want adjust layout, you have to uncheck this option.)

**Support Touch Screen UI**

Lock widow's layout for protecting basic layout and setting. (If you want adjust layout, you have to uncheck this option.)

**Plug-in Program Run**

Last application as Focus Indicator, Image Tiling, etc. automatically start when you run iWorks again.

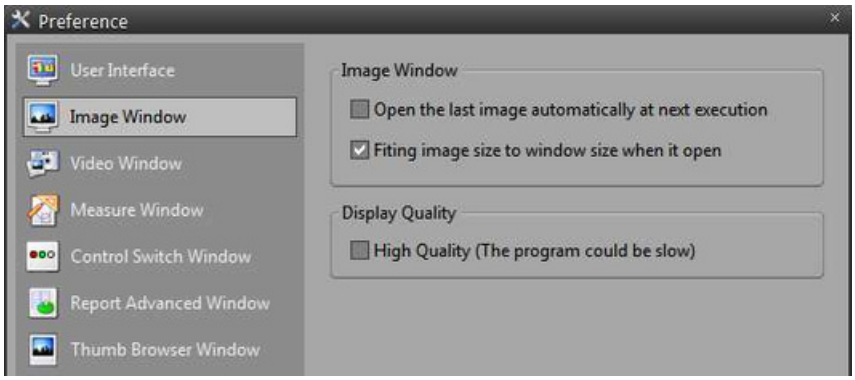
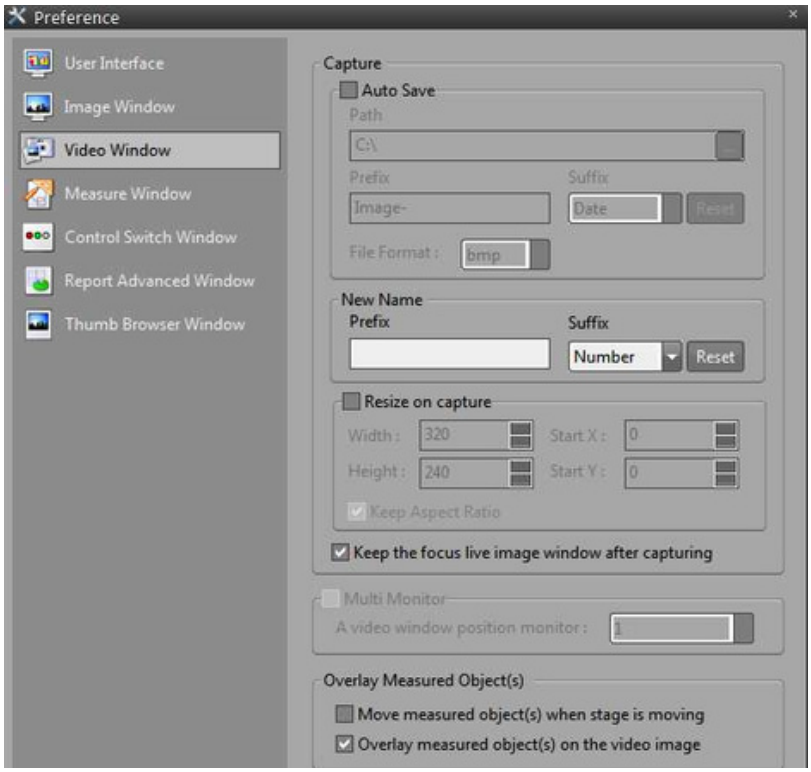



**Image Window**

Open the Last Image when you run iWorks again. Fitting the image size to the widow's size when you run iWorks.




**Capture Option**

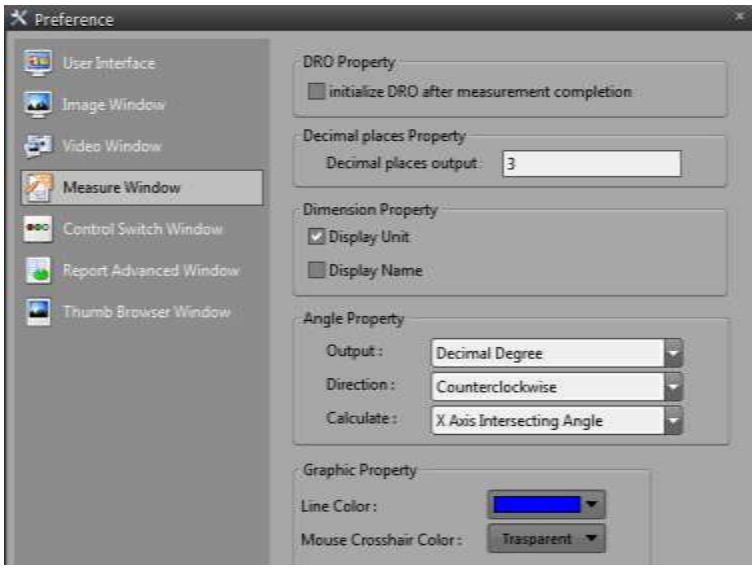
- Auto Save: Capture Image promptly go to base folder with name, date and count.
- Live Window Setting: Live widow will be return after capturing image. This function help to prevent reload active tab.

**Multi Monitor Support**

Select monitor to display a live window whenever using multi-monitor.

**Measuring Overlay Option**

Measured objects are moved with moving stage. Show measuring object on live window




**DRO Setting**

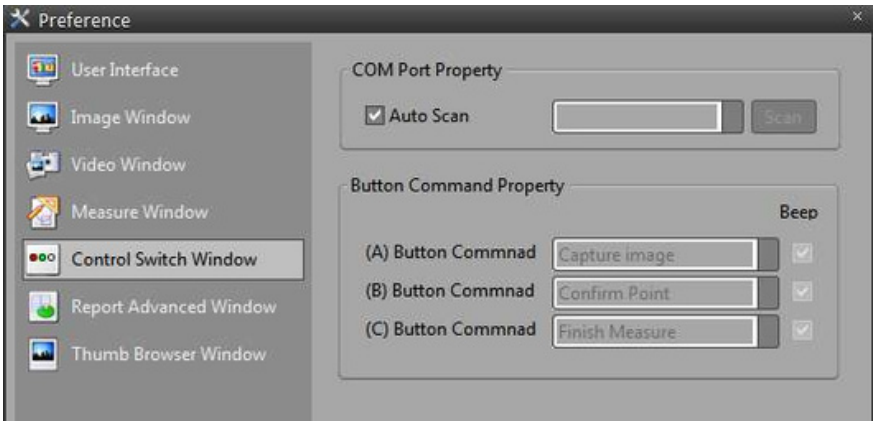
Initialize DRO (Digital Read Out) value as zero after measuring object. This function is support under using measuring microscope and optical comparator.

**Decimal Places Setting**

Change the decimal point of measuring result.

**Angle Setting**

Setting the value of measuring angle.




**External Switch Setting**

Auto-Scanning an external 3-button switch controller.

**Command Setting**

Customize command of 3-button switch controller.

## B. File Menu

**DUPLICATE IMAGE**

This command makes a copy of the original image; the copied image will appear in a new image window. This feature decreases a risk of modifying the original image.

**DELETE**

Delete selected object.

**DELETE ALL**

Delete all of active objects on image window.

**SELECT ALL**

Select all of measured object on the image window.

**AOI (AREA OF INTEREST)**

AOI is an area in an image that is defined by outlines. It allows you to work with the desired part of the image in the same manner as with the whole image, but the rest part of the image will stay untouched.

- Type of AOI: Rectangle AOI, Circle AOI, Arbitrary ROI, and Magic Wand ROI.
- Mode of AOI: Combine, Subtract, Intersection, Reverse, Delete.

**ANNOTATION**

Insert annotation into an active image by line, circle, polygon and text.

**MOUSE ACTION MODE**

 Graphic Selection Mode: Drag an object on the active window for editing.

 Image Selection Mode: Scrolling an active image or live image.

## C. View Menu

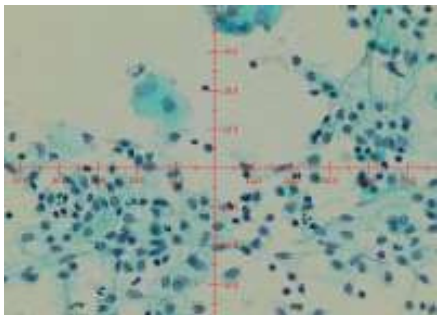
**FULL SCREEN**

Full screen mode supported for vision machine system and presentation purpose. Capturing function supported during full screen mode. (Hot key: TAB button for mode change; ENTER button for capturing image).

**OVERLAY CHART**

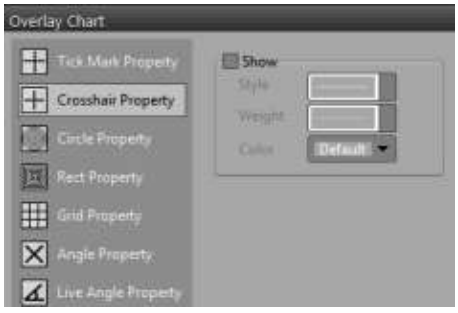
Display overlay chart on live image windows for guide Image Window. You can select as below figure. (Cross, Circle, Grid, Time Stamp and Combine several type of Overlay).

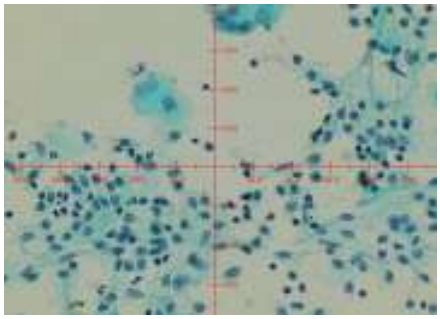
### Thick Mark Overlay Property

- View: Show overlay on the image
- Font: Select font type and size.
- Interval: Set the interval of main scale.
- Subdivisions: Set the division of main scale.
- Decimal Places: Set the decimal places.
- Number of Display: Set the displayed division number by horizontal, vertical division. Default value is zero for display it fit the image.

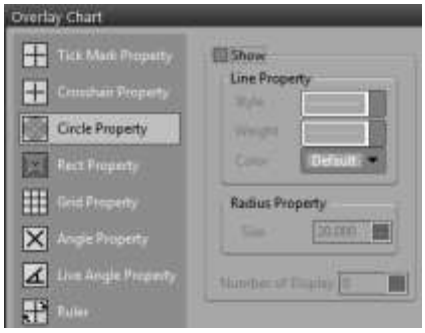
### Crosshair Overlay Property

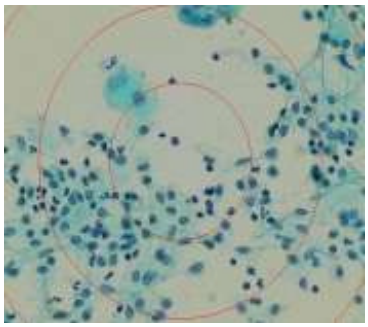


- View: Show overlay on the image.
- Style: Style of displayed line.
- Thickness: Select Thickness.
- Color: Select Color.

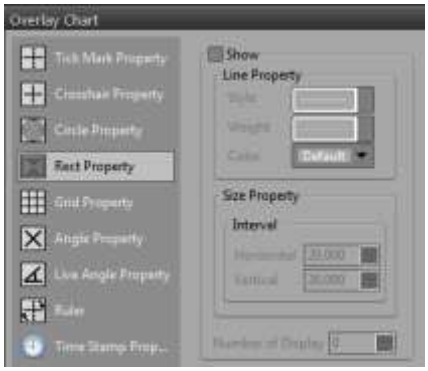
### Circle Overlay Property

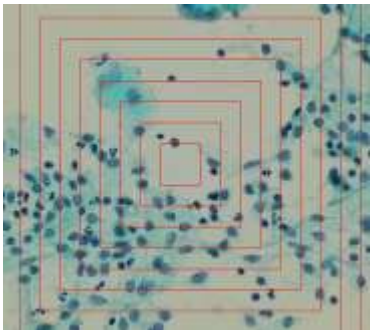


- View: Show overlay on the image
- Line: Select style of line
- Radius: Set the radius of circle.
- Number of Display: Set the number of displayed circle. Default value is zero for display it fit the image.

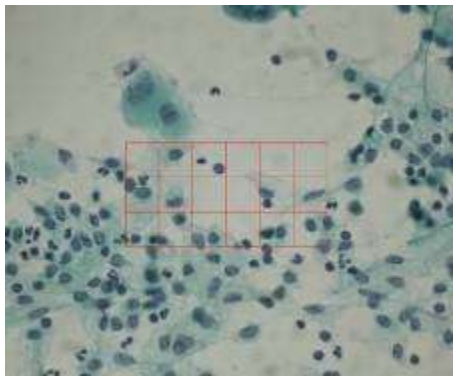
### Rectangular Overlay Property



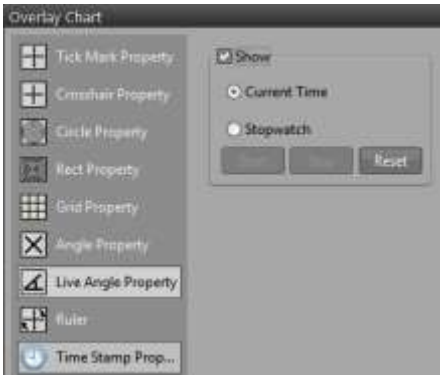
- View: Show overlay on the image
- Line: Select style of line
- Interval distance: Set the interval distance of rectangular.
- Number of Display: Set the number of displayed circle. Default value is zero for display it fit the image.

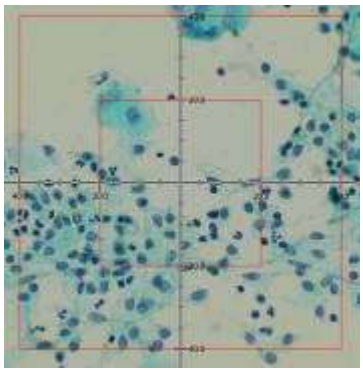
### Grid Overlay Property

- View: Show overlay on the image
- Line: Select style of line
- Interval distance: Set the interval distance of rectangular.
- Number of Display: Set the number of displayed circle. Default value is zero for display it fit the image.

### Time Stamp Overlay Property

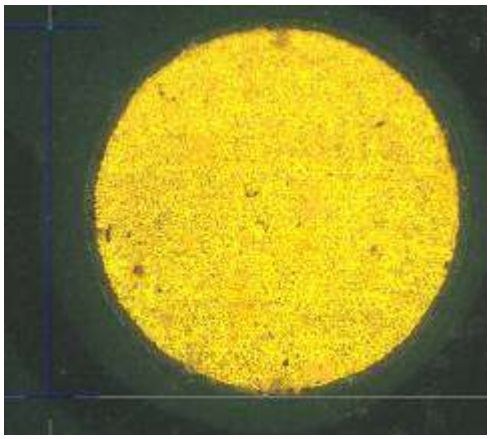


- View: Show overlay on the image.
- Current Time: Display current time.
- Stopwatch: Display stopwatch.
- Start: Start stopwatch.
- Stop: Stop stopwatch
- Initialize: Initialize stopwatch.

**GUIDE LINE**

Display guide line as CAD software for assistance your measuring works.



## D. Acquire Menu

**VIDEO PLAY**

Play real-time video on the video window.

**VIDEO PAUSE**

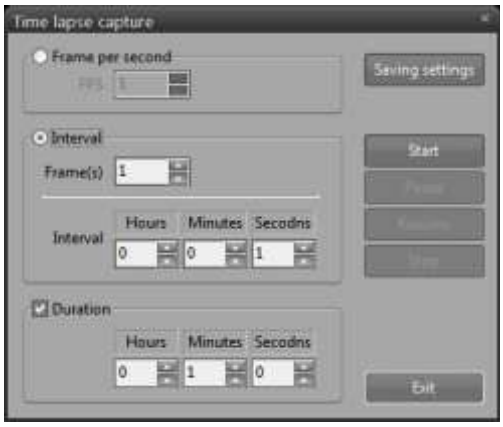
Pause real-time video on the video window.

**IMAGE CAPTURE**

Capture still images into the program.

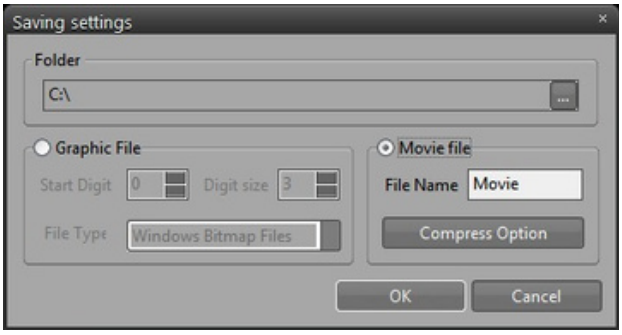
**TIME LAPSE CAPTURE**

Recording a video or capture still images with time-lapse feature.




- Frame Per Second: Set the frame rate of recording video.
- Interval: Set the amount of frame and interval pre still image cut.
- Duration: Set the total recording or capturing time.

### SAVE OPTION OF TIME LAPSE CAPTURE



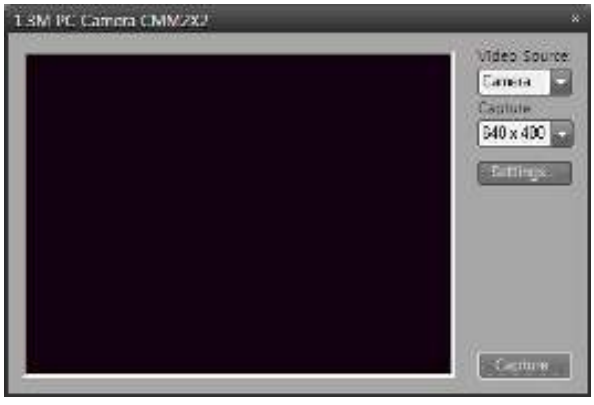

- Folder: select a base folder for recording video or capturing images.
- Graphic file option: Set the file type and count.
- Movie file option: Select a video compression option.

### SETUP IMAGING DEVICE

Imaging device control allows you to specify the device for image-capture operation from a list of devices correctly installed in the system and supported by the program.


### SETUP TWAIN DEVICE

Select a TWAIN-compliant scanner or other input device for digitizing images.




### TWAIN

Capture an image directly from digital cameras or other image input devices.

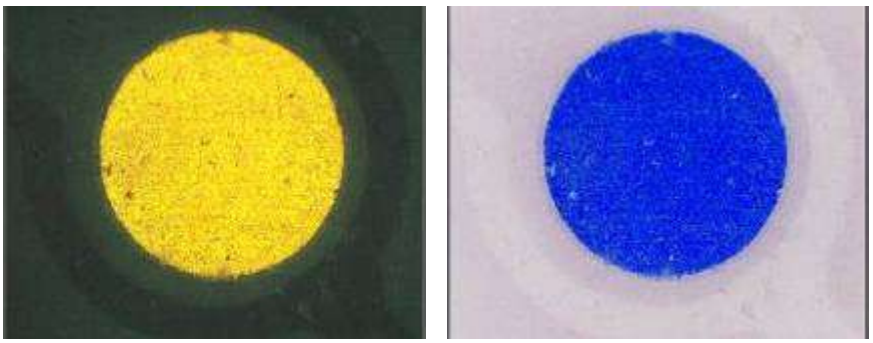
## E. Image Menu

### TYPE CONVERT

Type convert menu contains commands that represent the pixel depth and color model of the active image, and let you change them. (Supporting type: 8 bits, 16 bits, 32 Bits, Float, Gray, RGB, CMYK, HIS, HSV, YUV, YIQ, YcbCr, XYZ, LUV, Lab).

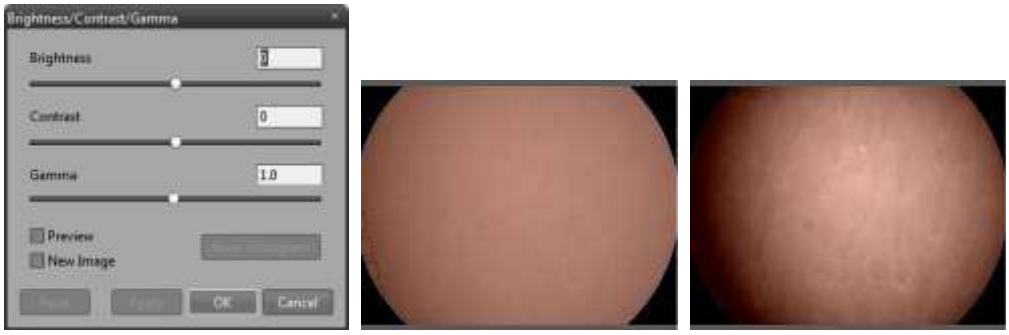
### ENHANCEMENT

INVERT: Use this command to get an inverting image (Negative feature).



### BRIGHTNESS/CONTRAST:

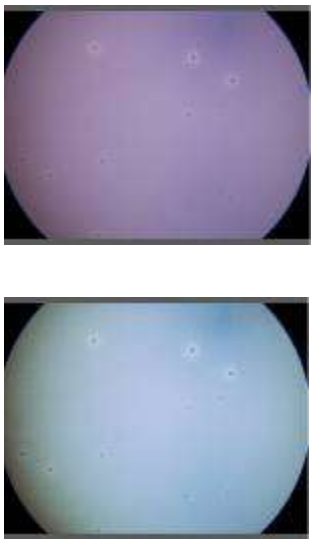
A. CUSTOM SETTING:
Adjust the brightness, contrast, and gamma settings for an active image.

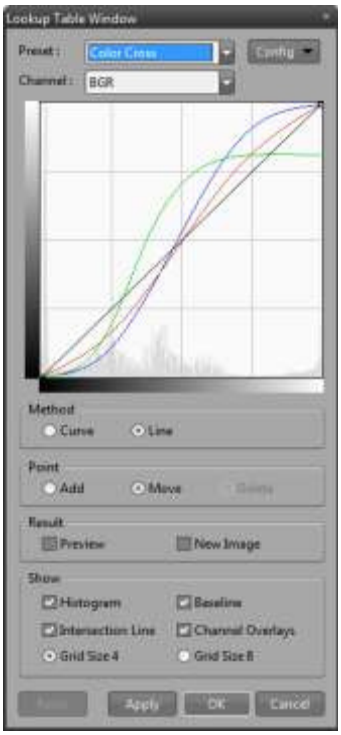



- Preview: Show the effect of changing value on the active image.
- New Image: Create new image file, the original image does not effected.

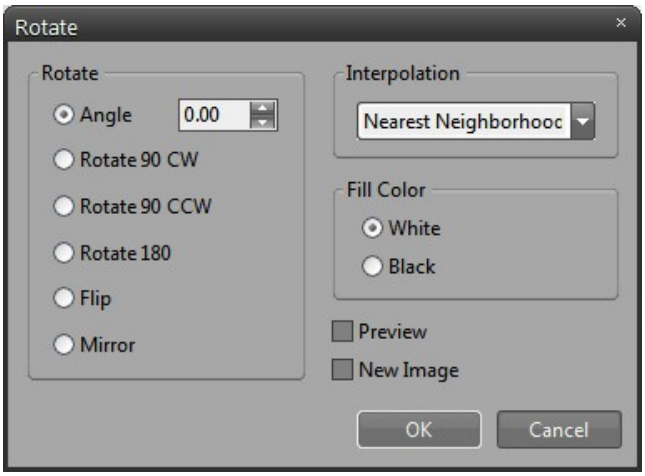
B. CURVES (LOOKUP TABLE):

Adjust the brightness, contrast, and gamma settings for an active image. You can change these settings and apply them to the Luminance channel, or to Red, Blue, and Green color channels separately.



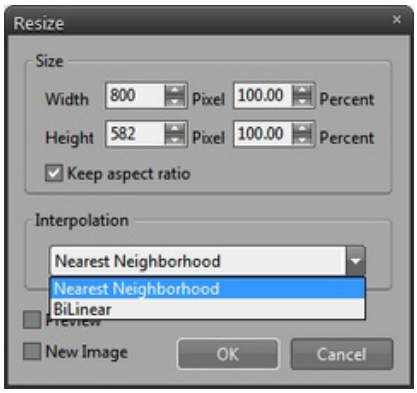



**GEOMETRY**



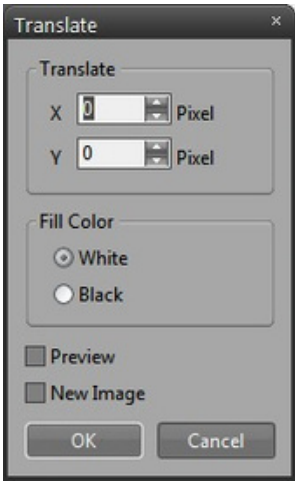

- Rotate: Rotate an image (Custom angle, Clockwise 90 degree, Anti-Clockwise 90 degree, 180 degree, Vertical, Horizontal).
- Interpolation: Image interpolation option.
- Preview: Show the effect of changing value on the active image.
- New Image: Create new image file, the original image does not effected.

## RESIZE IMAGE




- Size: Change an image resolution. * Keep aspect ratio option.
- Interpolation: Apply interpolation algorithm for enlarging images.

## TRANSLATE



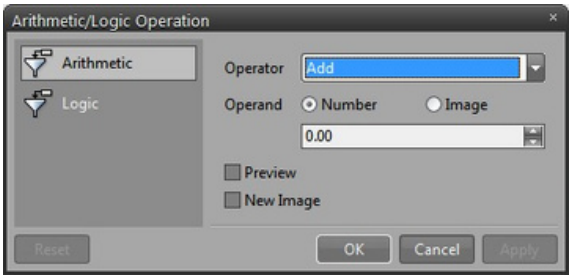

Moving an image in the image window.

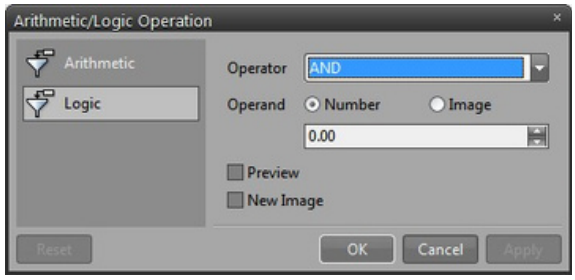
- Fill Color: Select a color for filling an empty area.
- Preview: Show the effect of changing value on the active image.
- New Image: Create new image file, the original image does not effected.

## ARITHMETIC/LOGIC OPERATION

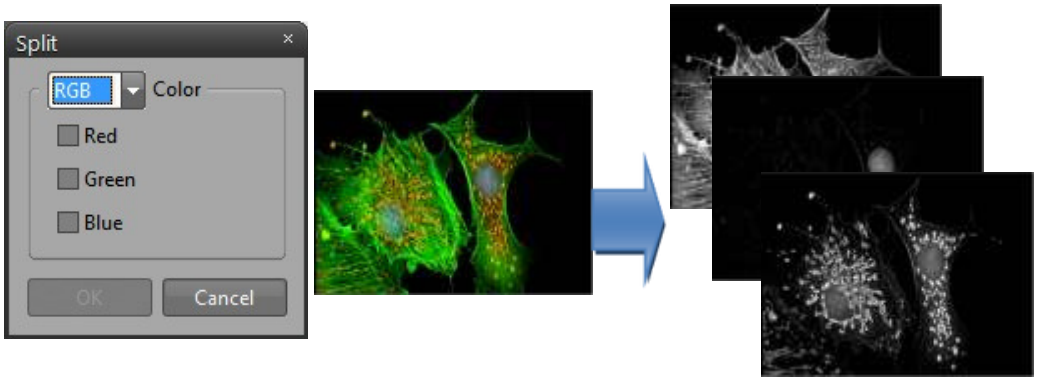
Image processing using arithmetic operation or logic operation.

- Operation: Add, Subtract, Multiply, Different, Average, Maximum,Minimum, AND, OR, XOR, NAND, XNOR, etc.
- Operand: Input a value of operation or open another image.

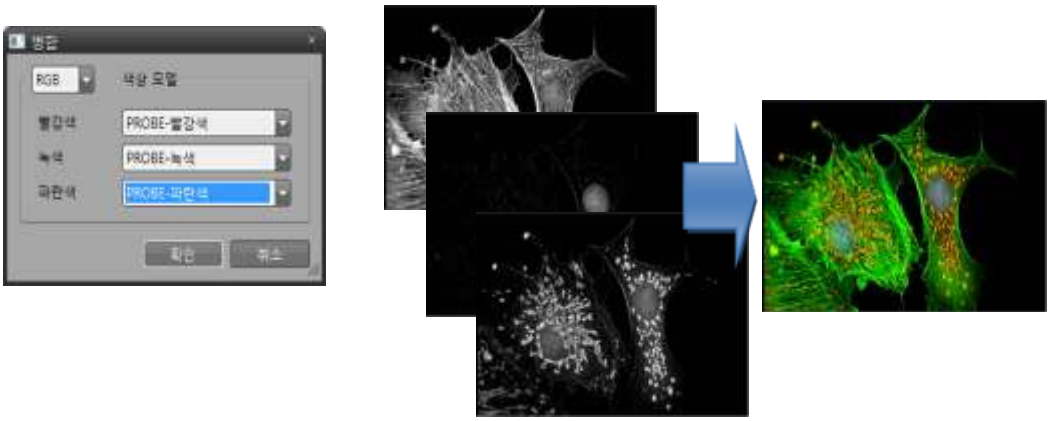


**COLOR SPLIT/MERGE**




Split: This feature used for extracting one or several R/G/B channels from a color image.




Merge: Generate one or several R/G/B grayscale images to a new color image.

## FILTER

### SPATIAL FILTER

Filtering operations are used for image modification. They reduce or increase the rate of change that occurs in the intensity transitions within an image. Areas in which there are sudden or rapid changes in intensity appear as hard edges in an image. Areas where there are gradual changes produce soft edges. Filtering acts to detect and modify the rate of change at these edges. It can increase the intensity differences in a soft edge to make it sharper, or reduce the intensity differences in a hard edge to smooth and soften it.


**MEAN**


**WEIGHTED MEAN**


**MEDIAN**


**MAXIMUM**


**MINIMUM**


**BLUR**


**SOFTEN**


**SHARPEN**

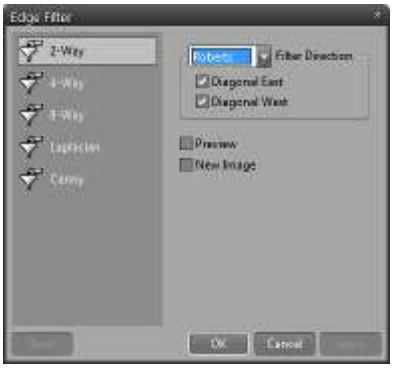

**GAUSSIAN**


**UNSHARP MASK**


**HIGH BOOST**

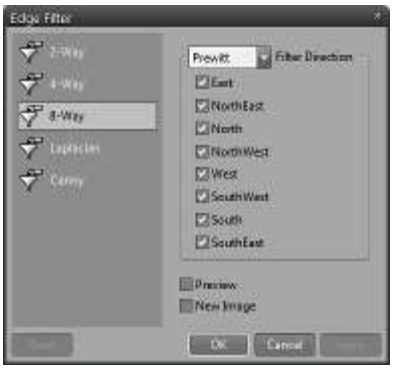
**EDGE FILTER**

Filters of this class detect edges of areas in an image by extracting a high-frequency component of the image, or by calculating the first or second derivative. The edge enhancement operations extract all of the edges in an image, regardless of direction. The resulting image appears as an outline of the objects in the original image. Constant brightness regions become black, while changing brightness regions become highlighted.




**2-WAY**

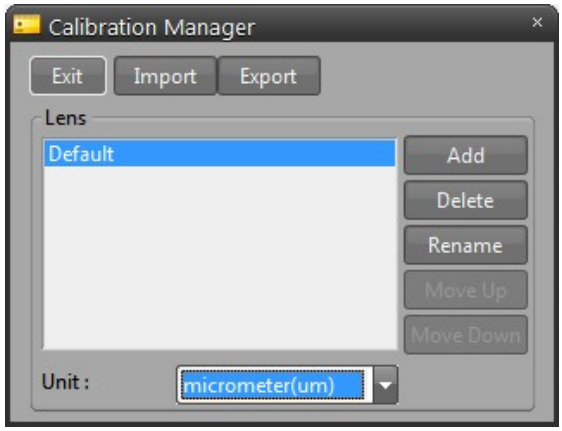

**4-WAY**




**8-WAY**


**LAPLACIAN**

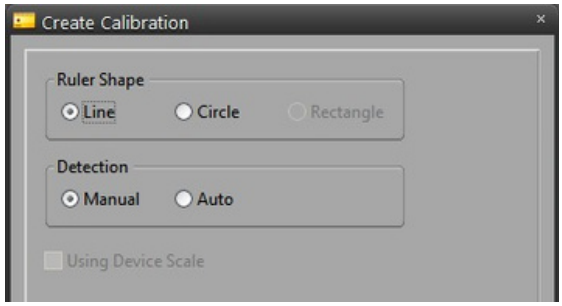
## F. Measure Menu



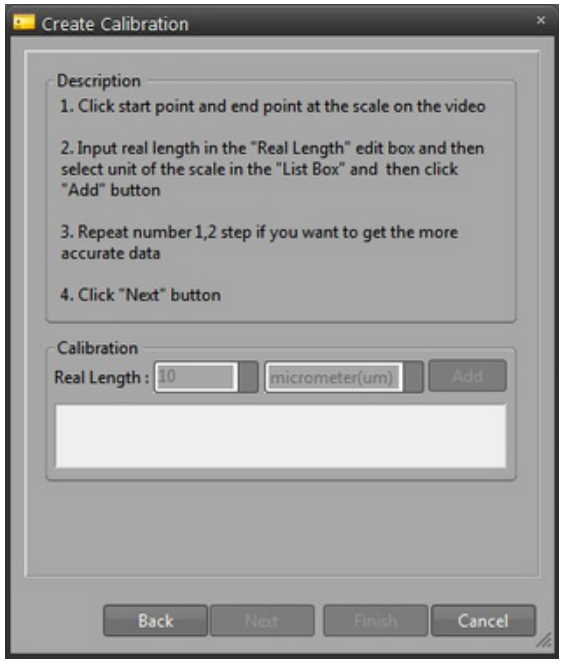

### CALIBRATION

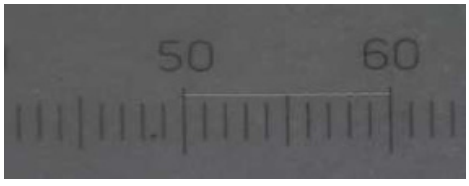
- Quit: Quit calibration setting.
- Import: Load pre-saved calibration data.
- Export: Save current calibration data.
- Add: Create new calibration data.
- Delete: Delete selected calibration data.

Select a type of scale and detection method.

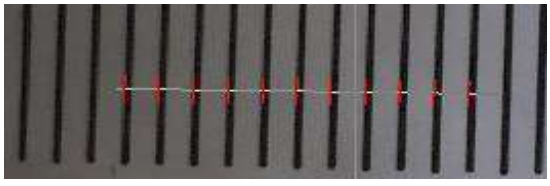



1. Click start point and end point at the scale on the video
2. Input real length in the "Real Length" edit box and then select unit of the scale in the "List Box" and then click "Add" button
3. Repeat number 1,2 step if you want to get the more accurate data



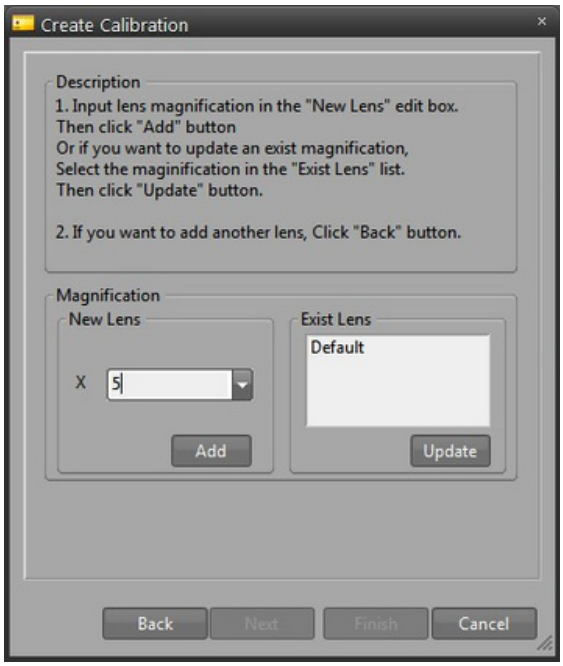




**Manual Calibration**



**Auto Calibration**

- Input lens magnification in the "New Lens" edit box. Then click "Add" button, or if you want to update an exist magnification, select the magnification in the "Exist Lens" list. Then click "Update" button.
- If you want to add another lens, Click "Back" button.



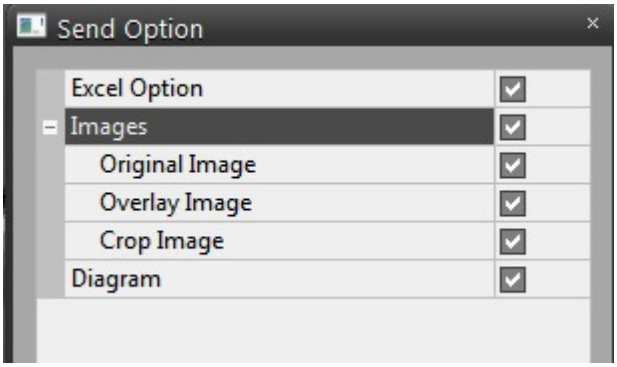

**SCALE MARKER**

This command will place a new marker in the active image window. You can drag the marker to the desired position on your image using the mouse. If you want to change a font type, size and line thickness, double click the marker. Then scale properties pop-up on the screen.


## G. Report Menu

### SEND TO EXCEL

Send activated measurement data and image to Excel sheet.




1. EXCEL OPTION : CUSTOMIZE EXCEL SUB-OPTION
2. IMAGE : ALLOW IMAGE SENDING.
   - ORIGINAL IMAGE : ALLOW ORIGINAL IMAGE TO INSERT EXCEL SHEET
   - OVERLAY IMAGE : ALLOW MODIFIED IMAGE WITH MEASUREMENT DATA TO INSERT EXCEL SHEET.
   - CROP IMAGE : CROP IMAGE TO INSERT EXCEL SHEET.
3. DIAGRAM : ALLOW DIAGRAM ON THE EXCEL SHEET.
4. MEASUREMENT : ALLOW RESULT OF BASIC MEASUREMENT DATA TO INSERT EXCEL SHEET.

LISTED OPTION WILL BE DIFFERENT BY THE ANALYSIS MODULE. SOME OF THEM DOES NOT SHOW ON THE LIST.

### EXCEL OPTION

- ALWAYS NEW DOCUMENT : USE ALWAYS NEW DOCUMENT.
- OPEN : OPEN PRE-CUSTOMIZES EXCEL FILES.
- NEW DOCUMENT : CREATE NEW DOCUMENT.
- DOCUMENT : SELECT OPENED EXCEL SHEET.
- SHEET : SELECT PREFER SHEET.
- NEW SHEET : INSERT NEW SHEET.

# 2. Tool Bar

The toolbar is a set of buttons that represent the program tools. You may customize all the toolbars to include one or all of the tools associated with that particular bar.

## A. Standard Toolbar

| | | |
|---|---|---|
|  | **Open** | Open Image File. |
|  | **Save** | Save active image. |
|  | **Save Cropping** | Save prefer-section on the active image. |
|  | **Send to Excel** | Send Measure/Analysis data to Excel. |
|  | **Delete All Items** | Delete all Measured Objects. |
|  | **Play Video** | Play Live Video Mode. |
|  | **Pause Video** | Pause Live Video Mode. |
|  | **Capture** | Capture Current Image on Live Video window. |
|  | **Property** | Open Camera Property. |

## B. View Toolbar


Guide Line: Show guideline moving with mouse.

Fit to window size: Adjust zoom ratio to fit the window.

Zoom Out

Select Zoom Ratio

Zoom In

## C. Mouse Action Toolbar

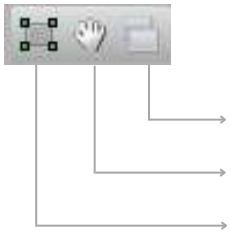


Image Layer

Image Scroll: Scrolling Image for Navigating.

Graphic Object: Grab graphic object on the image.

## D. Text Format / Style Toolbar


Set Text Type, Size, Color, etc.



Set Line Color, Thickness, etc.

## E. Calibration Toolbar


Select magnification on the list.

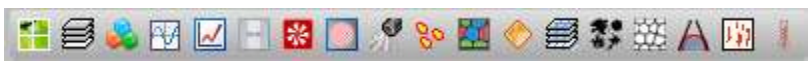
## F. Annotation Toolbar

Annotation Overlay
Insert option for arrow, rectangular, circle, text

## G. AOI Toolbar

Define preferred area with several tools.

## H. Application Toolbar

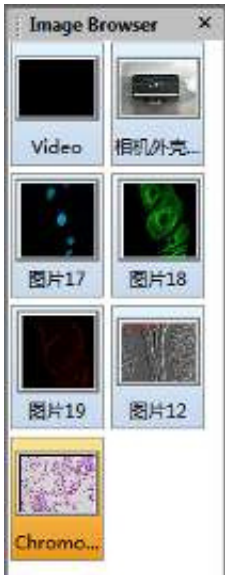


List of Applications.

- Image Tilling
- Multi-Focus
- Display Current Image with 3D
- Display Focus Information
- Line Profile
- Caliper
- Reflected Light
- Corrected Vignette background
- Remove Noise
- Particle Analysis
- Phase Analysis
- Hardness Tester
- Auto Merging System
- Cast Iron
- Grain Analysis
- Tab Analysis
- Non-Metallic Inclusion Rating
- Thermo Record System

# 3. Windows

iWorks docking system can be organized it by your own purpose.




## A. Image Window (Thumbnail Windows)

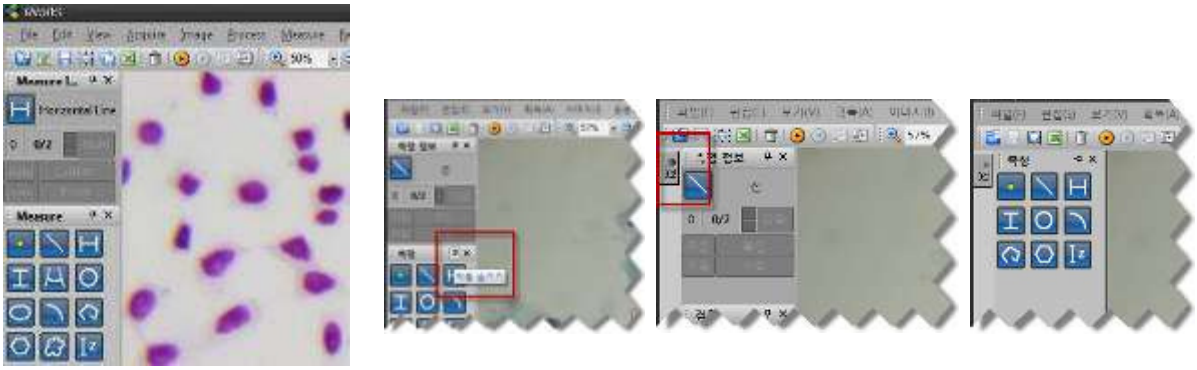
Image windows can display live video, captured image on the list. The activated image on the screen is marked as orange color on it. You can select it one by one and multi check also available.

## B. Window Mode Change

Image windows can display live video, captured image on the list. The activated image on the screen is marked as orange color on it. You can select it one by one and multi check also available.

**Floating Mode**

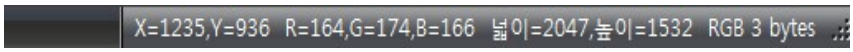
Docking Guide will pop-up with grab a floating title bar by mouse then moving your prefer position.
You can select a poison as red box on the figure, then select a poison for fix it.
* Widows will be shown as transparent on floating mode.



**Docking Mode** **Auto Hide Mode**

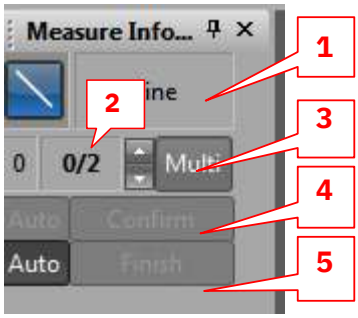
Widows will be changed as auto hide mode by click the pin-clip button. The widows hide automatically, then activated by moving you mouse on the tab.
* You can drag it by your mouse for changing it as floating mode.

## C. Status Bar




Information of image is displayed on the bottom of windows. (Coordinators, height, length and type)

## D. Measure Info Window




1: Selected Measurement Tool
2: Multi-Pointing Tool for measuring (Example: 2-point circle, 3-point circle, multi-point-circle)
3: Activate Multi-Point (On/Off Toggle)
4: Confirm a measure point (Auto: The point will be confirmed automatically under auto edge detection)
5: Finish a multi-point measurement (Auto: The measurement is finished automatically under auto edge detection)

## E. Result Window

- **MEASURE TAB**


The Measurement result will be displayed by each of opened image windows.
* The information changed by moving tab of images.

- **STATISTIC TAB**


Display a statistic base on measurement result.
* The display will be different depends on analysis module.

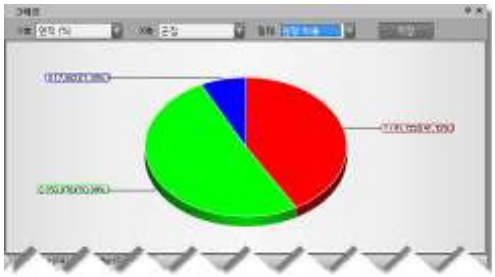
- **GRAPH TAB**

Display a chart of statistic data.

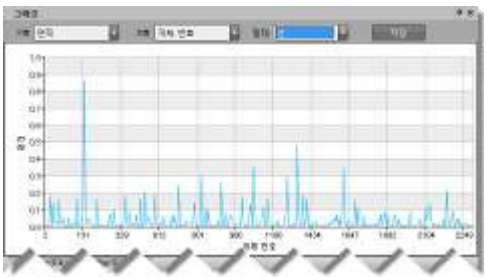

- Y Axis : The value of Y Axis
- X Axis : The value of X Axis.
- Type : Select graph type. (Histogram, Pie, Line, Scatter gram).
- Save : Save a chart as CSV file type

**Histogram**

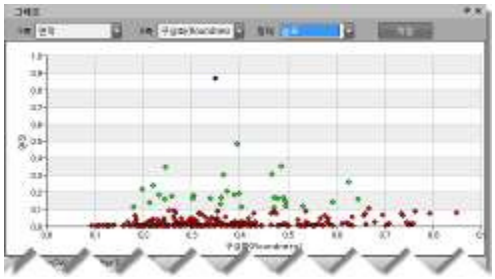
**Pie**



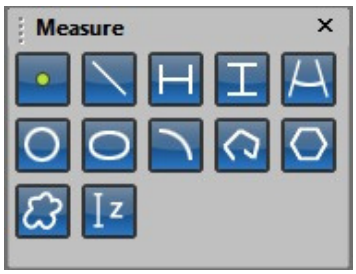
**Line**



**Scatter gram**



## F. Basic Measurement Tools



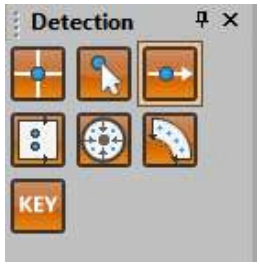

| | | |
|---|---|---|
| | **Point** | Calculates the coordinate of an input point |
| | **Line** | Calculates a line through two or more input points. |
| | **Horizontal Line** | Calculates a horizontal line through two or more input points. |
| | **Vertical Line** | Calculates a vertical line through two or more input points. |
| | **Circle** | Calculates a circle through three or more input points. |
| | **Arc** | Calculates a arc through three or more input points. |
| | **Polyline** | Calculates a length of polyline. |
| | **Polygon** | Calculates a length and area of polygon. |
| | **Z Difference** | Calculates a Z difference through two input points. |

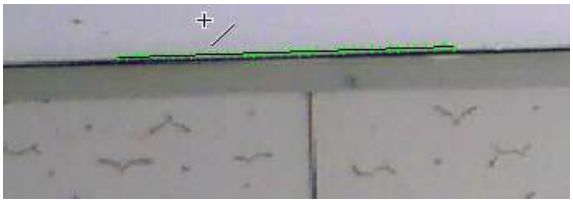
* You can open a measurement property by click right-side mouse button on the icons.

## G. Advanced Measurement Tools


| | | |
|---|---|---|
| | **Segment Point** | Construct segment point from the selected line, arc or circle. |
| | **Intersection Point** | Construct intersecting point between the selected measure objects. |
| | **Distance** | Construct distance between two selected measure objects |
| | **Line** | Construct line from the selected measure objects. Line can be constructed from points, lines, arcs and circles. |
| | **Circle** | Construct circle from the selected measure point, lines and rectangle |
| | **Angle** | Construct angle between two selected measure lines. |

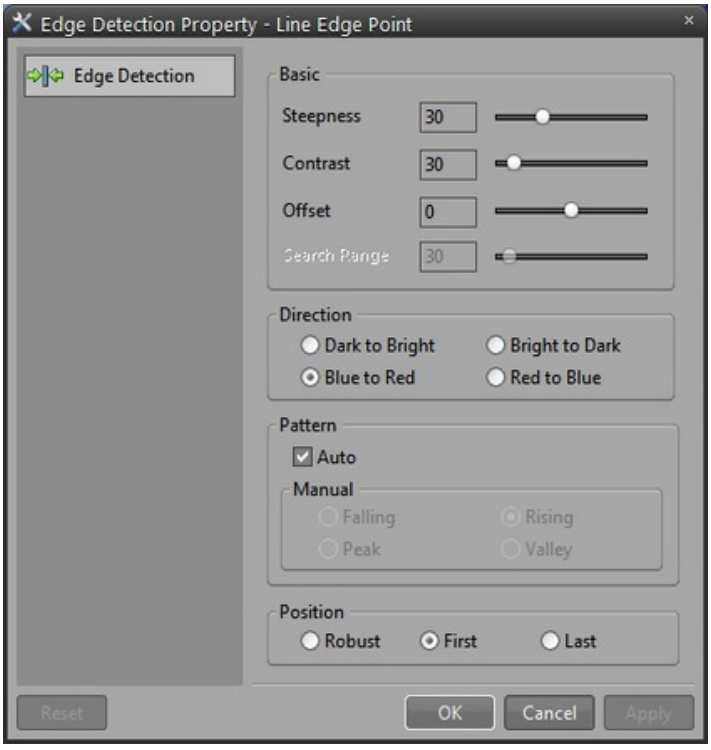
## H. Detection Tools



| | | |
|---|---|---|
|  | **Click Point** | Use when directly input click points as data. |
|  | **Line Edge Point** | Use when the detection point is cross edge point of the line. |
|  | **Line** | Use when the detection point is edge points of the line's optional area. |
|  | **Circle** | Use when the detection point is edge points of the circle's optional area. |
|  | **Arc** | Use when the detection point is edge points of the arc's optional area. |
|  | **Key Input** | Use when directly key input point as data. |

* You can find Detection Profile window by click right-side mouse button on the edge detection tools for adjusting intensity, direction, pattern and position.



# 4. Process

## A. Image Tiling

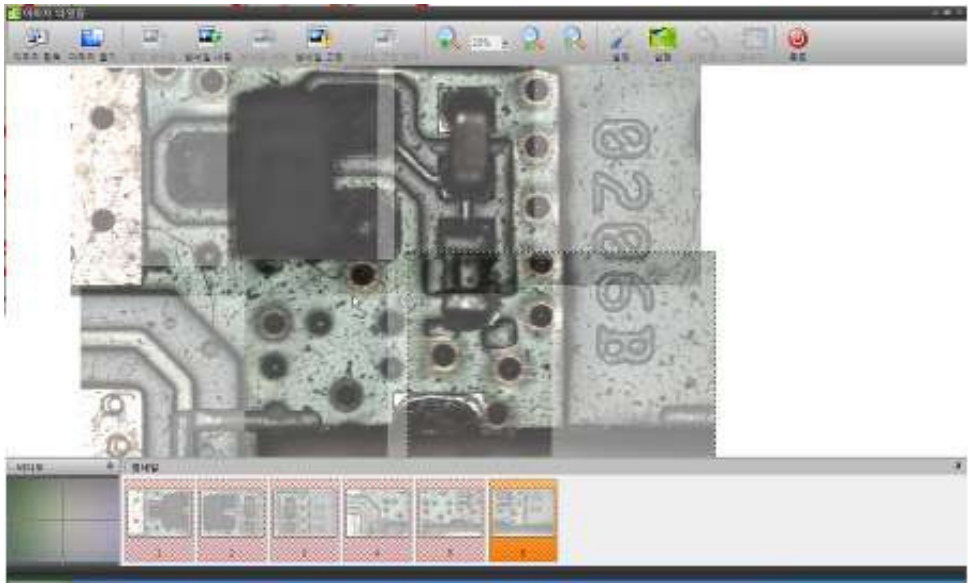
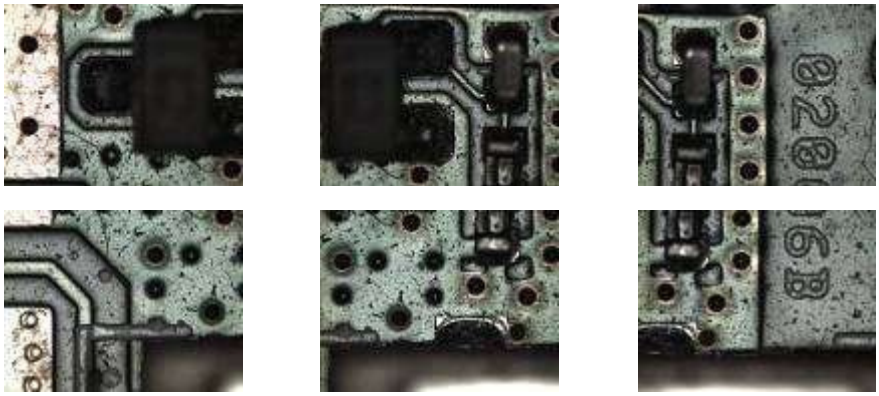


Image Tiling is a very useful function when you need to create a high-resolution image of a big object with an area that exceeds the frame borders captured by the camera. If it is not desirable to decrease the magnification and miss some small important details, the tiling function helps to join several overlapped images acquired in series.

**PROCEDURE**

1. Run Image Tilling Application.
2. Grab images from acquisitions or open all images needs for tilling.
3. Load image on workspace, then move the image to the targeting position. iWorks will assist adjusting position automatically.
4. Run create button for image tilling.
5. Send the result image to iWorks main windows. *Before sending an image to iWorks main windows, you can crop a prefer area by adjusting red rectangle.



**Original images**

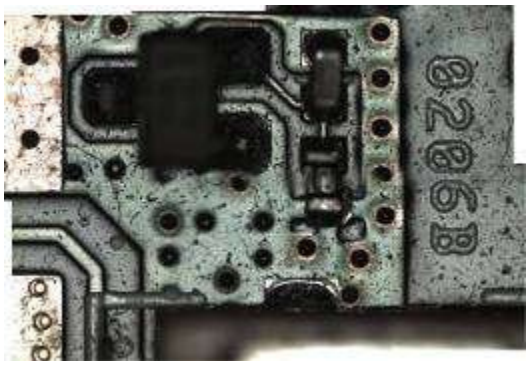


**Image after tiling**


**CAPTURE**
Capture an image from live video window.

**OPEN**
Open saved image files.

**LOAD**
Selected thumbnail images send to workspace.

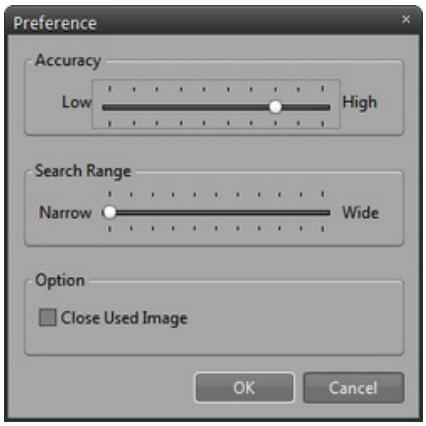
**UNLOAD**
The image on the workspace sends to thumbnail list.

**DELETE**
Delete selected image on the thumbnail list.

**LOCK**
Lock the selected image on the workspace.

**UNLOCK**
Unlock the locked image.

**PREFERENCE**




Recommend Setting:

- Accuracy: Middle (60~80%)
- Search Range: Narrow (0~10%)

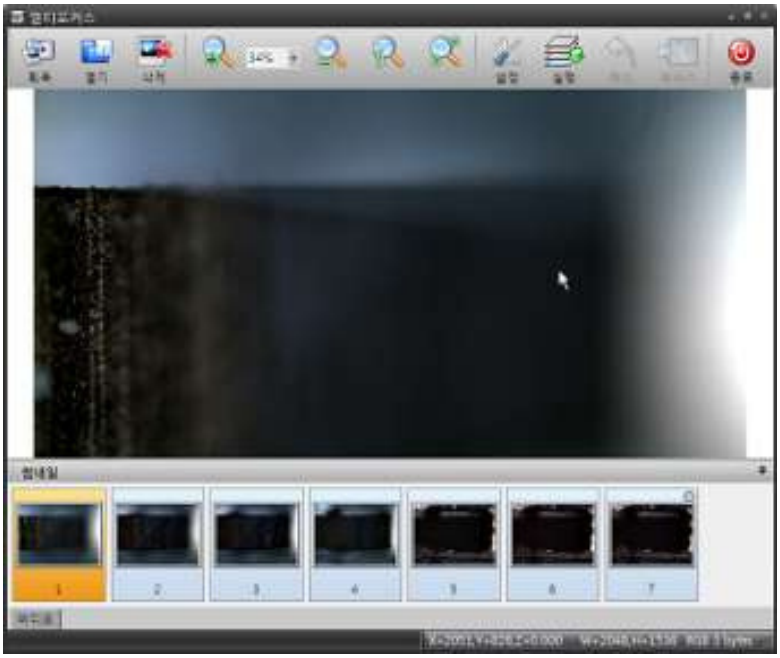
**CREATE**
Run image tilling.

**UNDO**
Undo image tilling.

**SEND**
Send the result image to the iWorks main window.

**QUIT**
Quit image-tilling application.

## B. Multi-Focus (Extended Depth of Field)



Multi-focus is combine several unfocused images into one sharp image. This operation is used if you have failed to bring all object parts into focus while capturing.

**PROCEDURE**

1. Run Multi-Focus Application.
2. Grab all of images from acquisitions or open all images needs for multi-focus.
3. Run create button for multi-focus.
4. Send the result image to iWorks main windows. * If your microscope or another measuring machine has motorized controller of Z-axis, you can get a sharper multi-focus image. If you don't have it, you don't need to worry about iWorks will assist doing multi-focus based on the value of setting.

**Original images**

**Image after stacked**


**CAPTURE**
Capture an image from live video window.

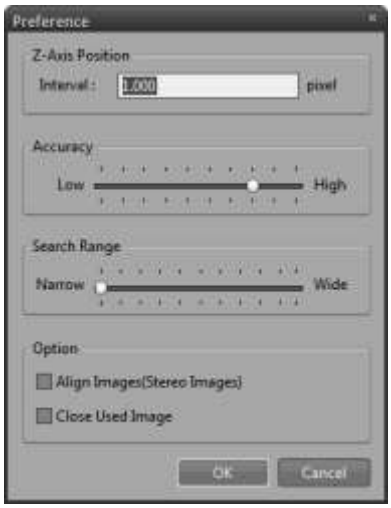
**OPEN**
Open saved image files.

**DELETE**
Delete selected image on the thumbnail list.

**PREFERENCE**

Recommend Setting:

- Accuracy: Middle (60~80%)
- Search Range: Narrow (0~10%)




- Z interval: If your system does not have z-motor, set the interval of Z depth.
- Align Images (Stereo Multi-focus): Align image option for stereoscopic microscope.

**CREATE**
Run multi-focus.

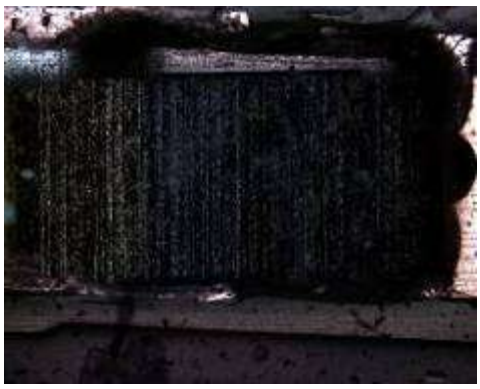
**UNDO**
Undo multi-focus.

**SEND**
Send the result image to iWorks main window.

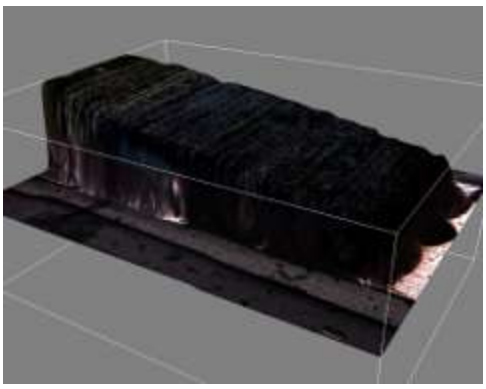
**QUIT**
Quit multi-focus application.

## C. 3D Display

The 3D display function creates a polygon-based, 3D surface model from the planar image. The 3D display is created from the image's grayscale as if it were a height map. A bright area of the image corresponds to a hill in the 3D plot, while a dark area corresponds to valley. The original image colors are used as surface texture. The user interface described below provides wide capability to control visualization of the 3D model.

**Original image**



**3D display image**

**TEXTURE SOURCE**
Select image for texture mapping on the image list.

**DISPLAY METHOD**

- Dot : Dot type 3D Display.
- Line frame : Line frame 3D Display.
- Texture : Texture Mapping 3D Display.

**SEND:** Send the result image to iWorks main window.

**OK:** Quit 3D display application.

**DETAIL:** Setting the quality of surface detail.

**SMOOTHING:** Moderate surface setting.

**SCALE:** Set zoom in zoom out percentage.

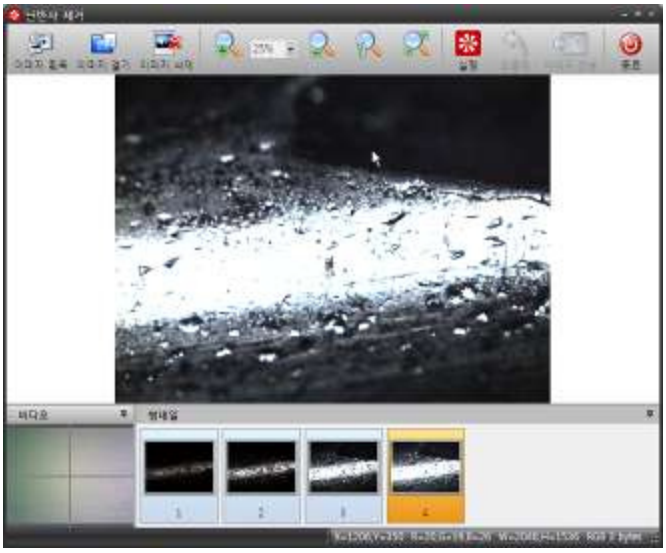
**Z RATIO:** Setting the percentage of z-axis.

**INVERT:** Invert z-axis.

**AXIS:** Display axis information on the image.

## D. Reflected Light

This application corrects the diffused reflection on the specimen. Diffused reflection occurs used to be happen metallic specimen. You can decrease the aspect by using this application.



**Original image**

**Corrected image**

**IMAGE ACQUISITION**
Capture an image from live video window.

**OPEN**
Open saved image files.

**DELETE**
Delete selected image on the thumbnail list.

**CREATE**
Run this application.

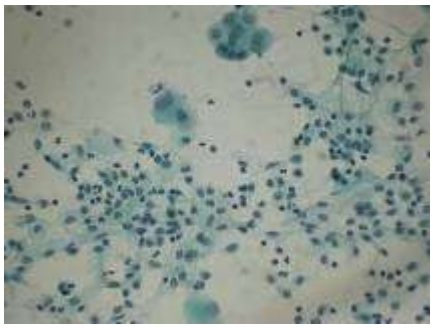
**UNDO**
Undo this application.

**SEND**
Send the result image to iWorks main window.

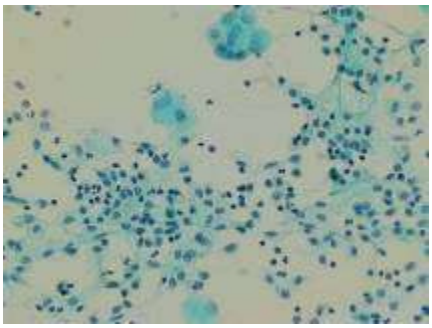
**QUIT**
Quit multi-focus application.

## E. Background Correction

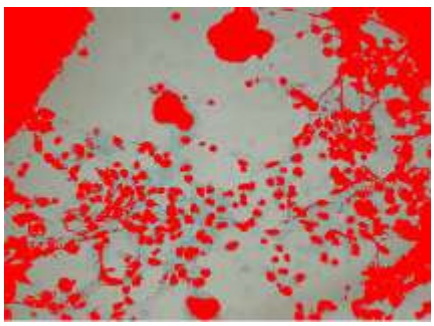
Image correction for vignetting aspect, decrease outside shade of an image. It helps to increase the accuracy of analysis data.

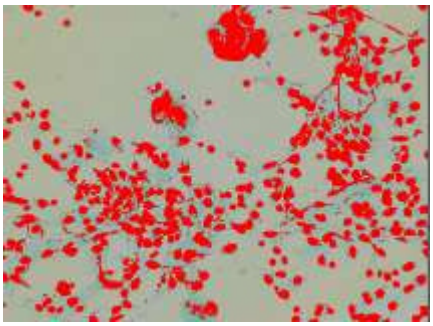


**Original image**



**Corrected image**





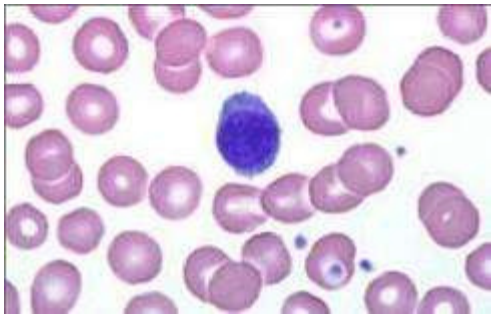
**The Result of Particle Count applied on both images**

## F. Noise Reduction

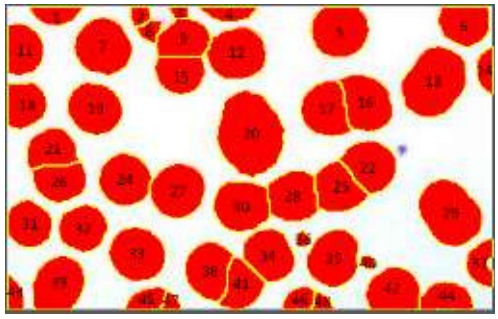
This application decreases noise of the image. Noise can be easily happened because of low light and higher gain control of camera.

## G. Particle Analysis

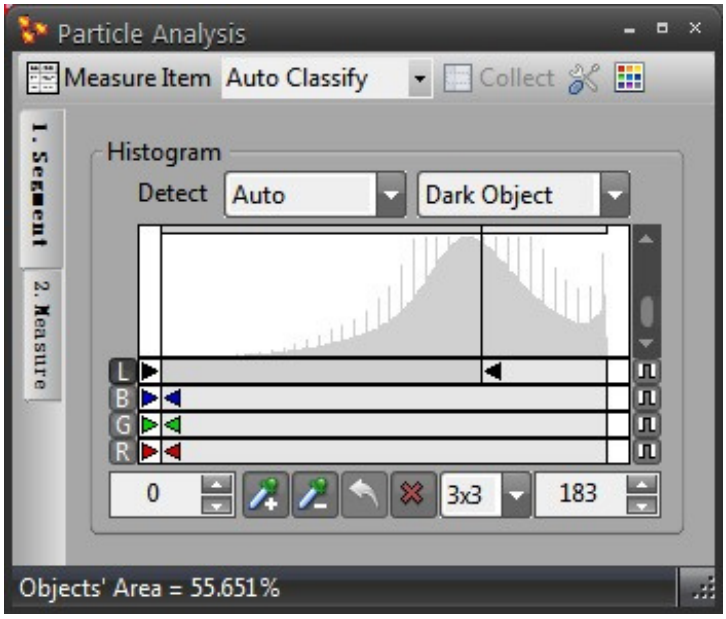
When measurements are made, the program highlights the measuring outlines and assigns reference numbers to the objects in your image. iWorks introduce to advanced particle analysis gets an object by simple click of your mouse then measure and analysis all of object by automatically.



**Original image**

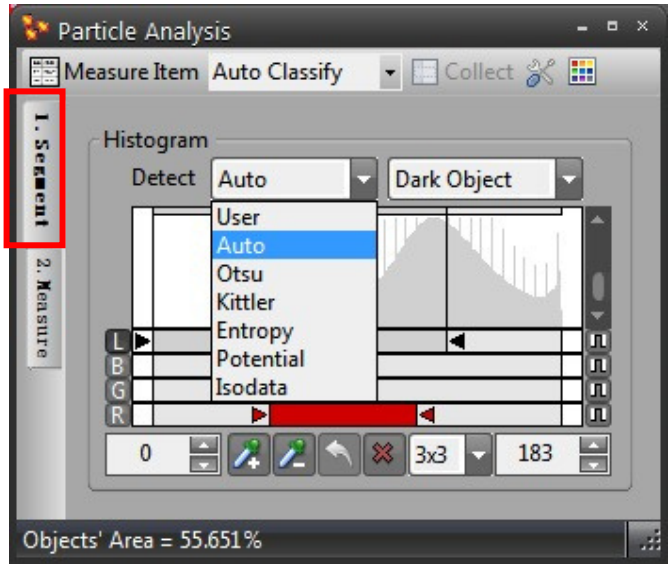


**Corrected image**




**Left Tabs (1. Segmentation 2. Measure) is procedure of works.**

## 1. SEGMENTATION

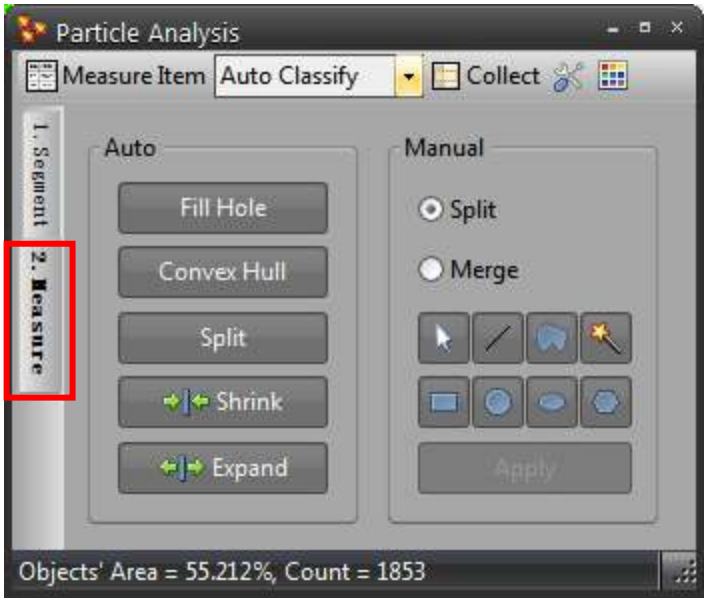



**Histogram:**
Select L (luminosity), B (Blue), G (Green), R (Red), then move a bar to allow you to perform intensity threshold of your images. Threshold is designed to operate upon grayscale and color images. For color images, values of the image's combined luminosity are used. You can also perform threshold upon separate color channels of an image.


Select detect algorism methods and object type on the pull-down menu.


You can segment an image by using mouse. The object has same value will be detected automatically. The auto detection range can be selected 1x1, 3x3, 5x5, 7x7, and 9x9.

## 2. MEASURE



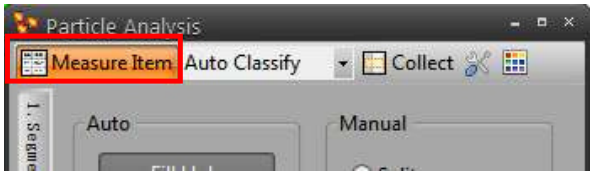

**Auto adjustment**

- Fill Hole : Fill hole of detected objects
- Convex Hull : Re-detect objects by outline.
- Split : Auto segmentation.
- Shrink : Shrink range of objects.
- Expand : Expand range of objects

**Manual Adjustment**

Split / Merge: Split or merge detected objects using manual tool

## 3. SELECT MEASUREMENT ITEM




This table list allows you to set various measuring parameters. This lists the measuring parameters that can be performed upon your objects. You can limit the value of bottom and top to get prefer value.

**Area**

This measurement reports the area of each object excluding any holes. The area comprises pixels having intensity values within the selected range. It does not include the holes area.Area (Polygon)

**Area (Polygon)**

This measurement reports the area of each object using outline’s pixel.

**Center X**

This measurement reports the X-coordinate of the object's center of gravity, from the upper left corner of an image.

**Center Y**

This measurement reports the Y-coordinate of the object's center of gravity, from the upper left corner of an image.

**Convex Area**

Convex Area

**Convex Center X**

This measurement reports the X-coordinate of the convex object's center of gravity, from the upper left corner of an image.

**Convex Center Y**

This measurement reports the Y-coordinate of the convex object's center of gravity, from the upper left corner of an image.

**Hole Area**

This measurement reports the area of all the holes within an object. A hole is defined as any contiguous set of pixels within an object that has intensity values outside the selected range for objects.

**Hole Ratio**

This measurement reports the percentage of the area of except hole.

**Hole Count**

Hole count per object.

**Perimeter**

Perimeter.

**Convex Perimeter**

Convex Perimeter.

**Perimeter with Hole**

Perimeter with Hole.

**Bound Area**

Bound Area.

**Bound Width**

Bound Width

**Bound Height**

Bound Height

**Bound Ratio**

Bound Ratio

**Bound Center X**

Bound Center X

**Bound Center Y**

Bound Center Y

**Feret Max**

It reports the longest of the all Feret diameters. The Feret diameters are projections of the object shape to the set of axes, which consecutively rotate 15° relative to each other beginning from the X-axis.

**Feret Mean**

It reports the mean of the all Feret diameters. The Feret diameters are projections of the object shape to the set of axes, which consecutively rotate 15° relative to each other beginning from the X-axis.

**Feret Min**

It reports the smallest of all the Feret diameters. The Feret diameters are projections of the object shape to the set of axes, which consecutively rotate 15° relative to each other beginning from the X-axis.

**Feret Breath**

Max length of vertical on Feret Max

**Feret Area**

Feret area.

**Feret Orientation**

Angle of Feret Max.

**Density Gray Max**

This measurement reports the maximum intensity within the object.

**Density Gray Mean**

This measurement reports the mean value of intensity within the object. This value is a sum of intensities of all the points of the object divided by the total number of its points.

**Density Gray Min**

This measurement reports the minimum intensity within the object.

**Density Gray Sum**

This measurement reports the sum of all object points' intensities.

**Density Gray Variance**

This measurement reports the variance of all object points' intensities.

**Density Gray Std. Dev.**

This measurement reports the std. dev. of all object points' intensities.

**Density Blue Max**

It reports the max value of the blue color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Blue Mean**

It reports the mean value of the blue color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Blue Min**

It reports the min value of the blue color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Blue Sum**

This measurement reports the sum of all object points' blue color intensities.

**Density Blue Variance**

This measurement reports the variance of all object points' blue color intensities.

**Density Blue Std. Dev.**

This measurement reports the std. dev. of all object points' blue color intensities.

**Density Green Max**

It reports the max value of the green color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Green Mean**

It reports the mean value of the green color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Green Min**

It reports the min value of the green color intensity of the object. It takes values 0 – 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Green Sum**

This measurement reports the sum of all object points' green color intensities.

**Density Green Variance**

This measurement reports the variance of all object points' green color intensities.

**Density Green Std. Dev.**

This measurement reports the std. dev. of all object points' green color intensities.

**Density Red Max**

It reports the max value of the red color intensity of the object. It takes values from 0 to 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Red Mean**

It reports the mean value of the red color intensity of the object. It takes values from 0 to 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Red Min**

It reports the min value of the red color intensity of the object. It takes values from 0 to 255 for 8 bits/channel images or 0 – 65,535 for 16 bits/channel images.

**Density Red Sum**

This measurement reports the sum of all object points' red color intensities.

**Density Red Variance**

This measurement reports the variance of all object points' red color intensities.

**Density Red Std. Dev.**

This measurement reports the std. dev. of all object points' red color intensities.

**Circularity**

This measurement reports the ratio of the object area to the object's longest Feret diameter.

**Roundness**

A circle has number 1 or above. As the figure is farther from a circle, the number goes higher.

**% Area**

This measurement reports the area of each object to the total area of the image as the percent of total.

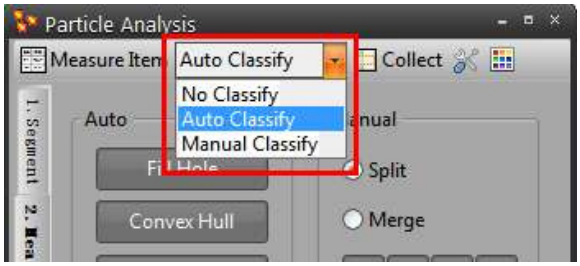
**% AOI Area**

This measurement reports the area of each object to the total area of the image as the percent of AOI.

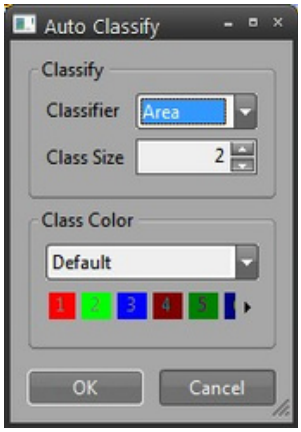
**Samples**

Count objects.

## 4. MEASURE



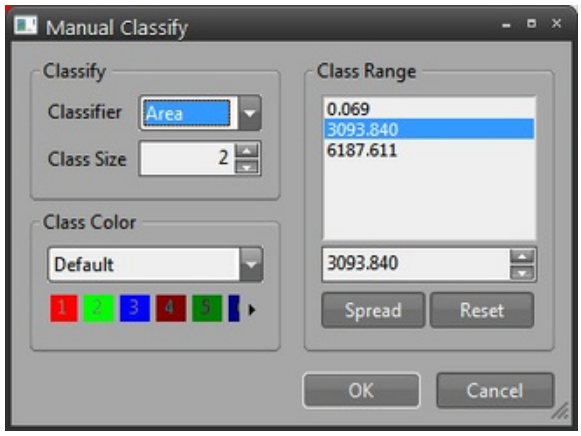

### AUTO CLASSIFY




**Classify**
Classifier: Set the value of class. Class Size: Set the number of class.

**Class Color**
Set the type of class color.

### MANUAL CLASSIFY



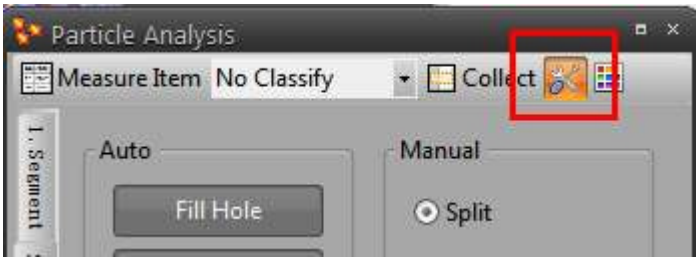

**Classify**
- Classifier: Set the value of class.
- Class Size: Set the number of class.

**Class Color**
Set the type of class color.

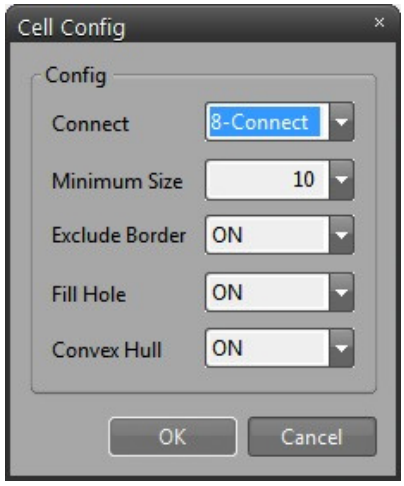
**Class Range**
Set the range of class.

- Arrange: Arrange the limit automatically by the order of low & high value.
- Re-Arrange: Arrange the limit automatically by the order of measured value.

### OPTION



**CELL CONFIG**




Connect Way

- 4-Way, Check the link between objects by 4-way.
- 8-Way, Check the link between objects by 8-way.

Fill Hole

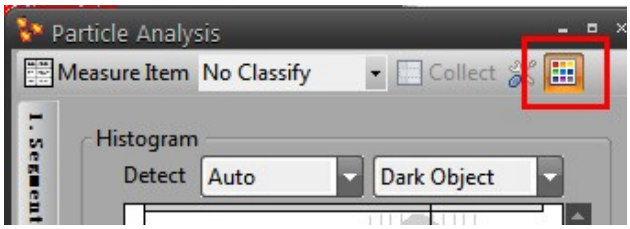
Convex： Make outline of the objects convex

Object Filter

- Minimum Size : Limit minimum size objects.
- Exclude Border: Remove boundary of objects.

**DISPLAY SETTING**

Set the color of inside, outside, hole, text of Particle Analysis.




# TECHNICAL SUPPORT

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Specifications are subject to change without any obligation on the part of the manufacturer.

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