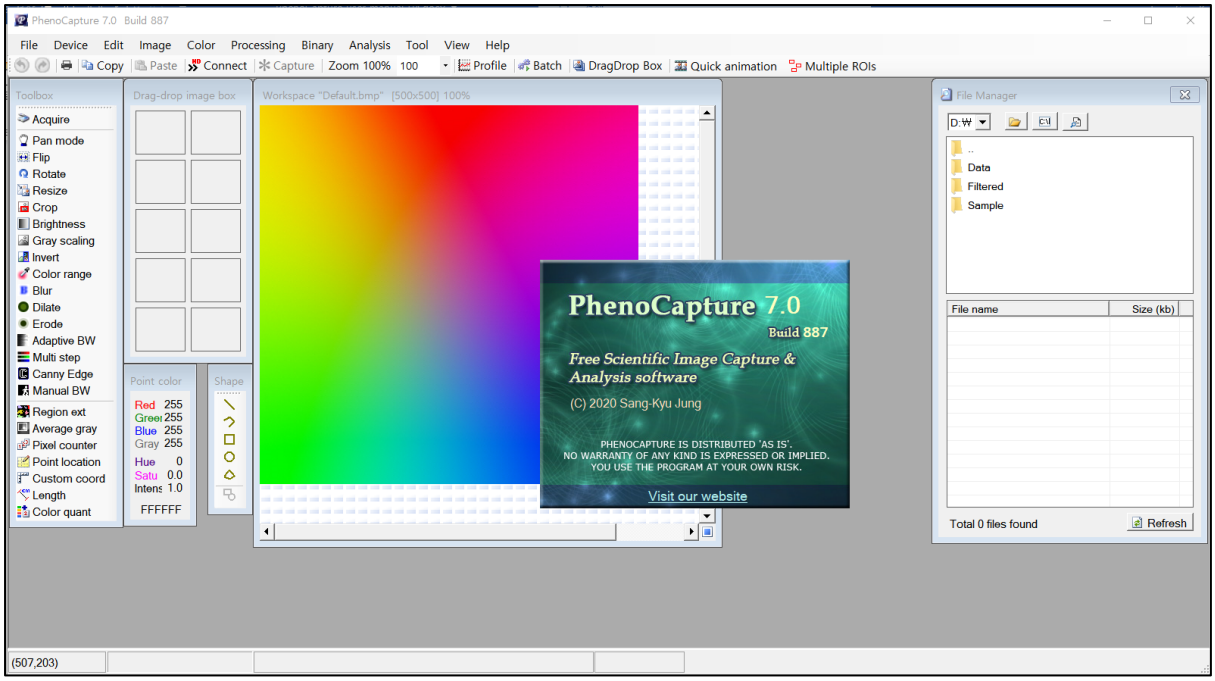
PhenoCapture

User Manual

Last updated on 4/14/2021 (v 19)



1. Copyright & Disclaimer

The PhenoCapture is freeware, and anyone can download and install software at home, college, school, or any other public place. PhenoCapture is distributed 'as is'. No warranty of any kind is expressed or implied. You use the program at your own risk. If you want to use the software in a company, please contact us.

2. System requirements

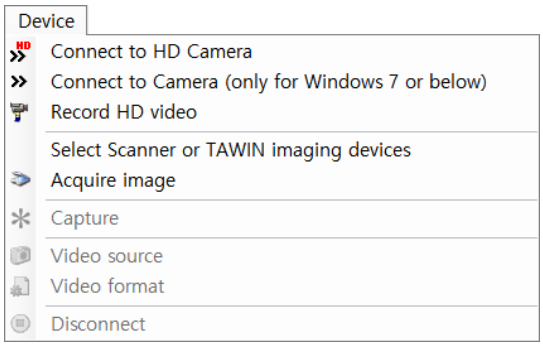
- Operating system: Microsoft Windows XP, Vista, 7, 8, and 10 (Both 32 & 64 Bit OS supported)
- CPU: 800 MHz or higher (Recommend 2 GHz or better)
- Ram: 1 GB or higher (Recommend 2 GB or more)
- Disk storage space: 10 MB free space for installation

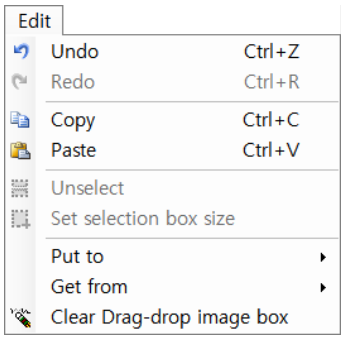
3. Software installation

PhenoCapture software is provided as a compressed file (zip or 7z). After extracting it, run 'PhenoCapture.exe'. Users may have to install Microsoft .NET (dot net) framework 4.0 or higher.

4. Program menu

The 'Device' menu has the function to connect imaging devices and change imaging settings. The 'Image' menu is used to change the image size or rotation, color adjustment, noise removal, etc. The 'Color' menu has color-related functions, including gray scaling, color channel extraction, and color conversion. The 'Processing' menu has functions such as binarization and edge detection. The 'Binary' menu has various binary operations. The 'Analysis' menu has functions to extract image information. The 'Tool' menu has various tool functions, including batching processing, image transmission functions, etc.


Device
Connect to HD Camera
Connect to Camera (only for Windows 7 or below)
Record HD video
Select Scanner or TAWIN imaging devices
Acquire image
Capture
Video source
Video format
Disconnect


Edit
Undo Ctrl+Z
Redo Ctrl+R
Copy Ctrl+C
Paste Ctrl+V
Unselect
Set selection box size
Put to
Get from
Clear Drag-drop image box

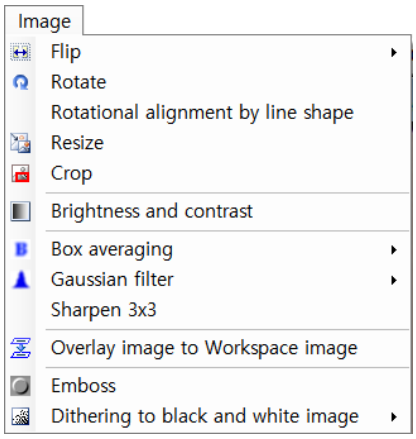
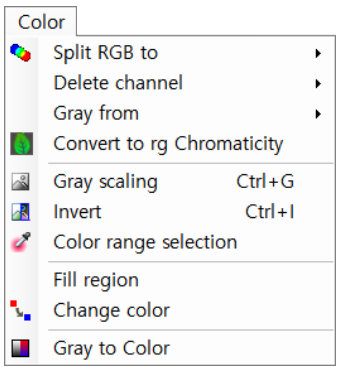
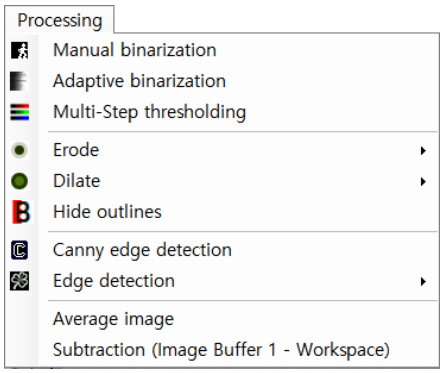
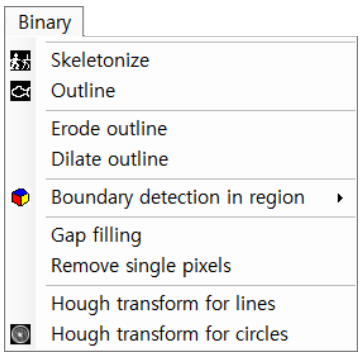
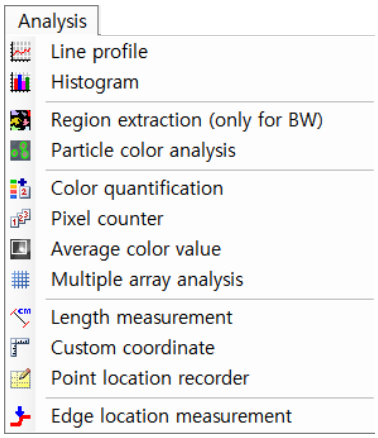


Image
Flip
Rotate
Rotational alignment by line shape
Resize
Crop
Brightness and contrast
Box averaging
Gaussian filter
Sharpen 3x3
Overlay image to Workspace image
Emboss
Dithering to black and white image


Color
Split RGB to
Delete channel
Gray from
Convert to rg Chromaticity
Gray scaling Ctrl+G
Invert Ctrl+I
Color range selection
Fill region
Change color
Gray to Color


Processing
Manual binarization
Adaptive binarization
Multi-Step thresholding
Erode
Dilate
Hide outlines
Canny edge detection
Edge detection
Average image
Subtraction (Image Buffer 1 - Workspace)


Binary
Skeletonize
Outline
Erode outline
Dilate outline
Boundary detection in region
Gap filling
Remove single pixels
Hough transform for lines
Hough transform for circles


Analysis
Line profile
Histogram
Region extraction (only for BW)
Particle color analysis
Color quantification
Pixel counter
Average color value
Multiple array analysis
Length measurement
Custom coordinate
Point location recorder
Edge location measurement

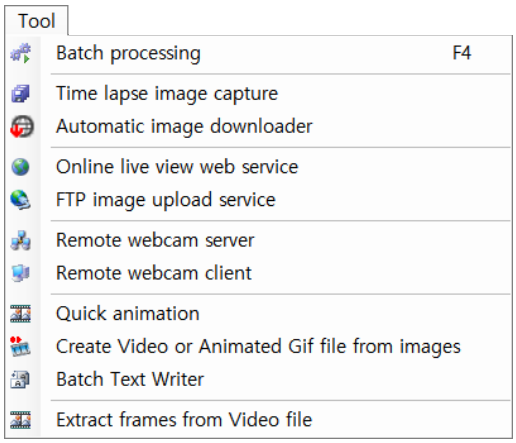

Tool
Batch processing F4
Time lapse image capture
Automatic image downloader
Online live view web service
FTP image upload service
Remote webcam server
Remote webcam client
Quick animation
Create Video or Animated Gif file from images
Batch Text Writer
Extract frames from Video file

Table 1. Summary of menu functions

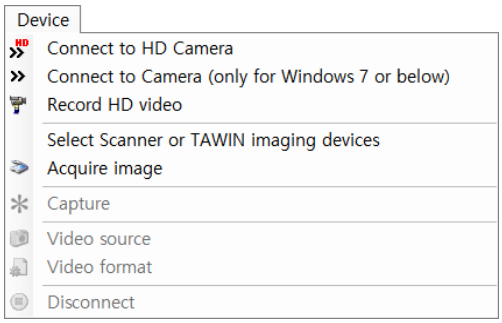
Main menu	Submenu	Description
File	Open	Open an image file Supported image format: bmp, gif, jpg, jpeg, png, tiff, tif
	Saveas	Write the current image to an image file Supported image format: bmp, gif, jpg, jpeg, PNG, tiff, tif
	Print	Print the current image
	Exit	Terminate the program
Device	Connect to HD Camera	After selecting a camera, it allows a user to view a real-time image. This is necessary to begin image capture
	Connect to Camera (only for Windows 7 or below)	It can be used when using an incompatible old camera
	Record HD video	Record as a video
	Select Scanner or TWAIN imaging device	It allows you to capture an image after connecting a scanner or a device that supports the TWAIN interface
	Acquire image	Acquire image from scanner or device that supports the TWAIN interface
	Capture	Capture an image from the currently active camera
	Video source	It allows a user to select a camera from among multiple cameras
	Video format	Set video format
	Disconnect	Disconnect the currently active camera
Edit	Undo	Back to the previous image
	Redo	Restore image that previously has been undone
	Copy	Copy image to the clipboard
	Paste	Paste image to the workspace
	Unselect	Unselect an ROI (region of interest)
	Set selection box size	Set a selection box size
	Put to	Put the image to the drag drop box
	Get from	Get an image from the image buffer
	Clear Drag-drop image box	Clear the drag-drop image box
Image	Flip	Flip image
	Rotate	Rotate image
	Rotational alignment by line shape	Rotation image in line with the line
	Resize	Resize image
	Crop	Crop image
	Brightness and contrast	Adjust image brightness and contrast

	Box averaging	Apply a blur filter (neighborhood averaging filter)
	Gaussian filter	Apply Gaussian filter
	Sharpen 3x3	Sharpen image (filter box size: 3x3)
	Overlay image to Workspace image	Overlay one of the images in the drag-drop box onto the workspace image
	Emboss	Emboss image
	Dithering to black and white image	Dithering image to a binary image (Options: Ordered color, Floyd Steinberg)
Color	Split RGB to	Split a color image to a designated color channel (Color channel options: red, green, blue, hue, saturation, intensity, cyan, magenta, yellow, K black, L, a, b, rg chromaticity red, green, blue)
	Delete channel	Remove one of the red, green, and blue color channels from the color image
	Gray from	Convert one of the red, green, and blue color channels to a gray image
	Convert to rg Chromaticity	Convert a color image to an rg Chromaticity
	Gray scaling	Convert a color image to a gray image
	Invert	Invert image
	Color range selection	Extract pixels similar to a specific color from an image
	Fill region	Paint the current image with the specified color
	Change color	Change pixels of a specific color in the image to a different color
	Gray to Color	Convert a gray image to a color image displayed in red and blue
Processing	Manual binarization	After specifying the threshold value, the color image is converted to a binary image
	Adaptive binarization	Convert a color image to a binary image using an adaptive thresholding algorithm
	Multi-step thresholding	Reduce the number of colors with a stair-shaped look-up-table
	Erode	Apply erode filter
	Dilate	Apply dilate filter
	Hide outlines	Remove outlines
	Canny edge detection	Apply Canny edge filter to detect edges
	Edge detection	Apply edge detection filters (Filter options: homogeneity, Sobel, left-hand edge, upper left-hand edge)

	Average image	The average image is generated from multiple images
	Subtraction (Image Buffer 1 - Workspace)	Create a differential image between the workspace image and image the buffer of the drag drop image box
Binary	Skeletonize	Extract skeletal lines from the binary image
	Outline	Extract the borderline from the binary image
	Erode outline	Erase the borderline of white pixels in the binary image
	Dilate outline	Add a white pixel outline to the binary image
	Boundary detection in region	Detect bounders in the binary image
	Gap filling	Fill the gap
	Remove single pixels	Remove single white pixels
	Hough transform for lines	Perform Hough transform to detect lines (experimental)
	Hough transform for circles	Perform Hough transform to detect circles (experimental)
Analysis	Line profile	Extract color along a straight line
	Histogram	Calculate color histogram
	Region extraction (only for BW)	Extract regions in the binary image
	Particle color analysis	Extract particles from a color image and calculate color values
	Color quantification	Count the number of pixels per color
	Pixel counter	Count the number of pixels with a specified color
	Average color value	Count the average color value
	Multiple array analysis	Calculate color values at various locations with a grid-type ROI
	Length measurement	Calculate the distance between two locations
	Custom coordinate	Extract the location of the points in the chart image
	Point location recorder	Extract the location of the points by clicking on the image
	Edge location measurement	Extract the location of the points where the color changes rapidly
Tool	Bach processing	Performs multiple tasks of image processing sequentially
	Time-lapse image capture	Take time-lapse images
	Automatic image downloader	Download images from a specific IP address or web address

	Online live view web service	Provide camera video streaming to view real-time images on the web browser
	FTP image upload service	Upload images to FTP server regularly
	Remote webcam server	Build a webcam server so that other PCs can see the camera image on the server-side
	Remote webcam client	Connect to the webcam server and download the image
	Quick animation	Show animation from 2 ~ 5 images and create an animated GIF file
	Create Video or Animated Gif from images	Create a video or animated GIF file from multiple images
	Batch Text Writer	Write text sequentially on multiple images
	Extract frames from Video file	Extract frame images from a video file
View	Zoom in	Zoom in the current image
	Zoom out	Zoom out the current image
	Zoom 100%	Set the current image zoom to 100%
	Zoom to fit	Automatically set the magnification of the current image
	Multiple ROIs	Show the Multiple ROIs window
	File manager	Show the File manager window
	Drag Drop Image Box	Show the Drag Drop Image Box window
	Drag Drop Image File Box	Show the Drag Drop Image File Box window
	Toolbox	Show the toolbox window
	Reset window layout	Reset the current window layout
Help	About	The logo window is displayed
	Visit our website	Open a web browser and connect to *www.phenocapture.net*

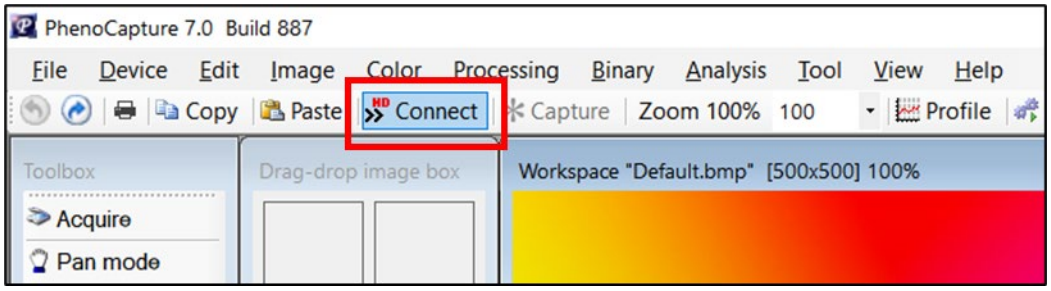
5. Device control



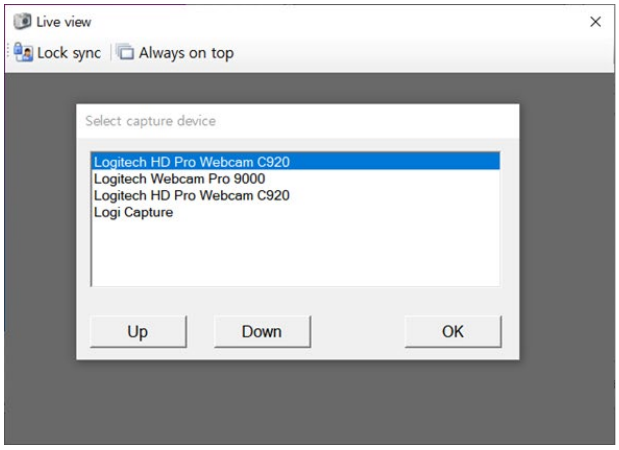
Connect to HD Camera	After selecting a camera, it allows a user to view a real-time image. This is necessary to begin image capture
Connect to Camera (only for Windows 7 or below)	It can be used when using an incompatible old camera
Record HD video	Record as a video
Select Scanner or TWAIN imaging device	It allows you to capture an image after connecting a scanner or a device that supports the TWAIN interface
Acquire image	Acquire image from scanner or device that supports the TWAIN interface
Capture	Capture an image from the currently active camera
Video source	It allows a user to select a camera from among multiple cameras
Video format	Set video format
Disconnect	Disconnect the current active camera

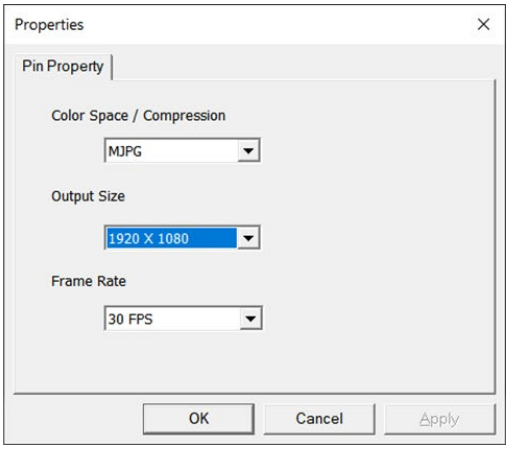
5.1 Camera connection and capture

The 'Device' menu on the main toolbar provides the ability to connect to capture devices. The user can click 'Connect to HD Camera' in the 'Device' menu. The user can also connect to the capture device by clicking the 'Connect' button on the main toolbar.

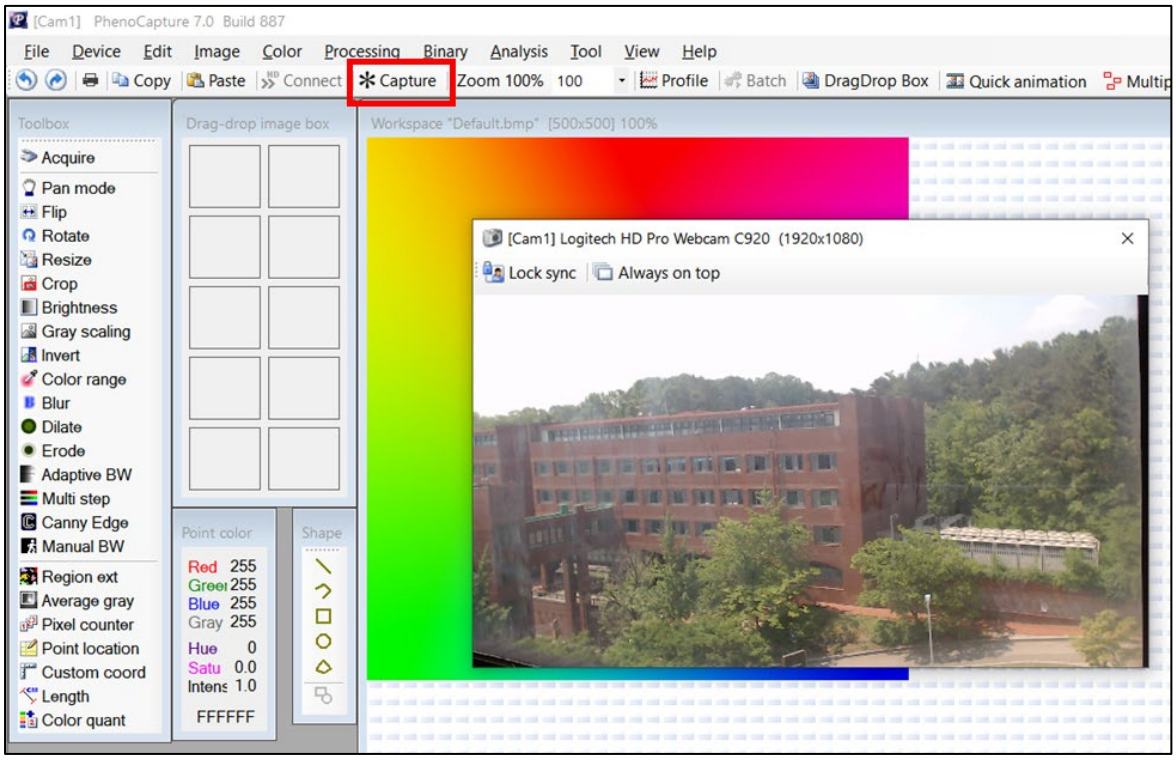


The user can select one of several cameras and then set values including the image size and frame rate soon.



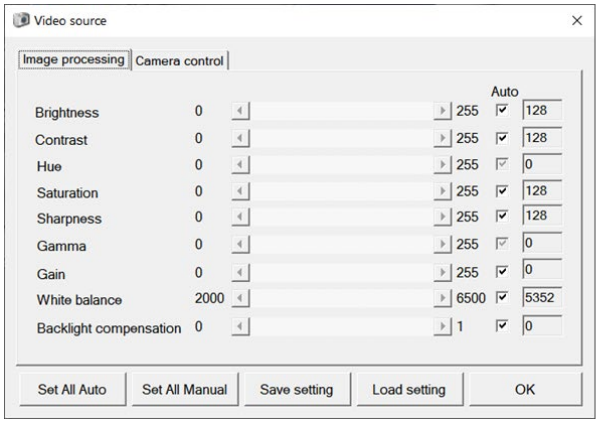


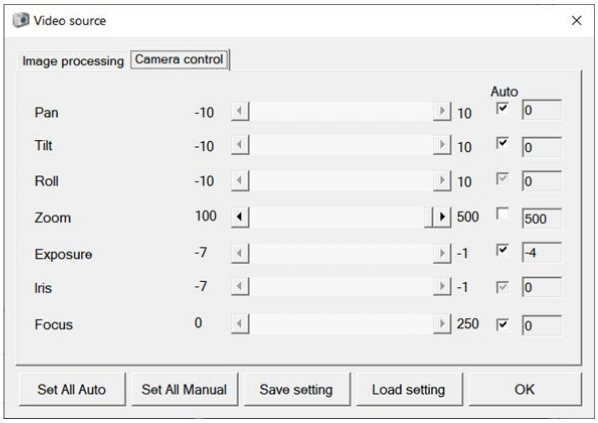
After connecting the camera, the user can view the image in real-time. Press the 'Capture' button on the main toolbar to take the image.


[Cam1] PhenoCapture 7.0 Build 887
File Device Edit Image Color Processing Binary Analysis Tool View Help
Copy Paste Connect Capture Zoom 100% 100 Profile Batch DragDrop Box Quick animation
Toolbox
Acquire
Pan mode
Flip
Rotate
Resize
Crop
Brightness
Gray scaling
Invert
Color range
Blur
Dilate
Erode
Adaptive BW
Multi step
Canny Edge
Manual BW
Region ext
Average gray
Pixel counter
Point location
Custom coord
Length
Color quant
Drag-drop image box
Point color
Red 255
Green 255
Blue 255
Gray 255
Hue 0
Satu 0.0
Intens 1.0
FFFFFF
Shape
Workspace "Default.bmp" [500x500] 100%
[Cam1] Logitech HD Pro Webcam C920 (1920x1080)
Lock sync
Always on top

5.2 Camera configuration

When connected to the camera, the 'Video source' menu in the 'Device' menu is activated. Clicking it brings up a window to change various options of the camera. To set all options automatically, press 'Set All Auto' button. To manually adjust the value, press 'Set All Manual' button. The camera settings can be saved as a file by pressing the 'Save setting' button. To reload the saved camera settings file, press the 'Load setting' button.





5.3 Image acquisition from scanner

Select the scanner from the 'Select Scanner or TWAIN imaging device' menu and press the Acquire image to load the image being scanned.

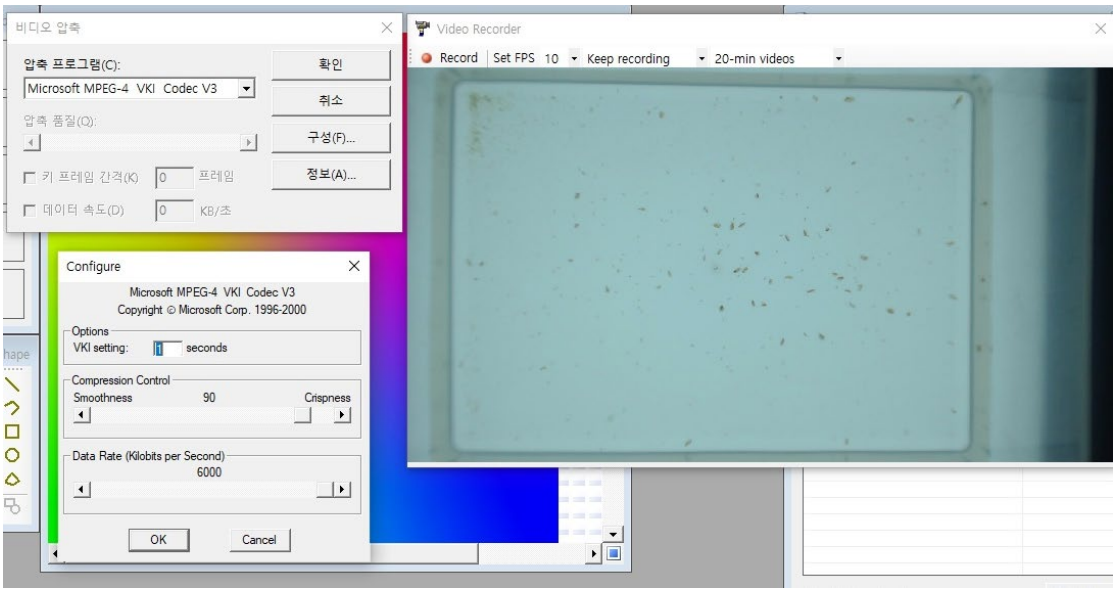
5.4 Video recording

Click the 'Record HD video' menu to save the camera image as a video file. After specifying the folder to save the video file, the window for the compression codec and various settings will appear first. Users can use the option to automatically create new video files at regular intervals. The following codecs are recommended for video recording codecs. Users may have to install codecs before using them. By the way, since PhenoCapture does not provide a separate video codec, users will have to install the codec themselves.

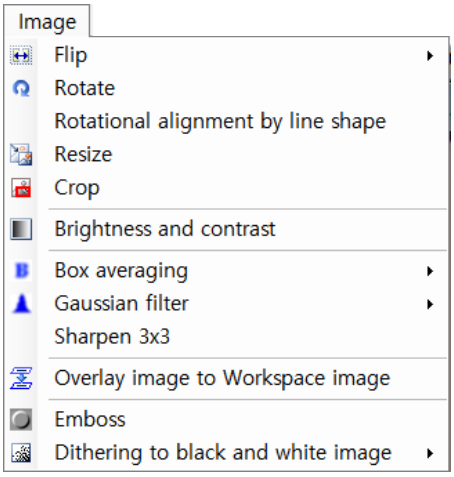
-Microsoft Window Media Video 9 (WMV): Very high quality and recommended for research purposes

-Microsoft MPEG-4 VKI Codec V1/V2/V3: The image quality is slightly lower than WMV, but the video file size is smaller than WMV due to its high compression rate.

-Lagarith lossless: A lossless compression codec with low compression rate but excellent real-time compression performance (FPS)



6. Image adjustment

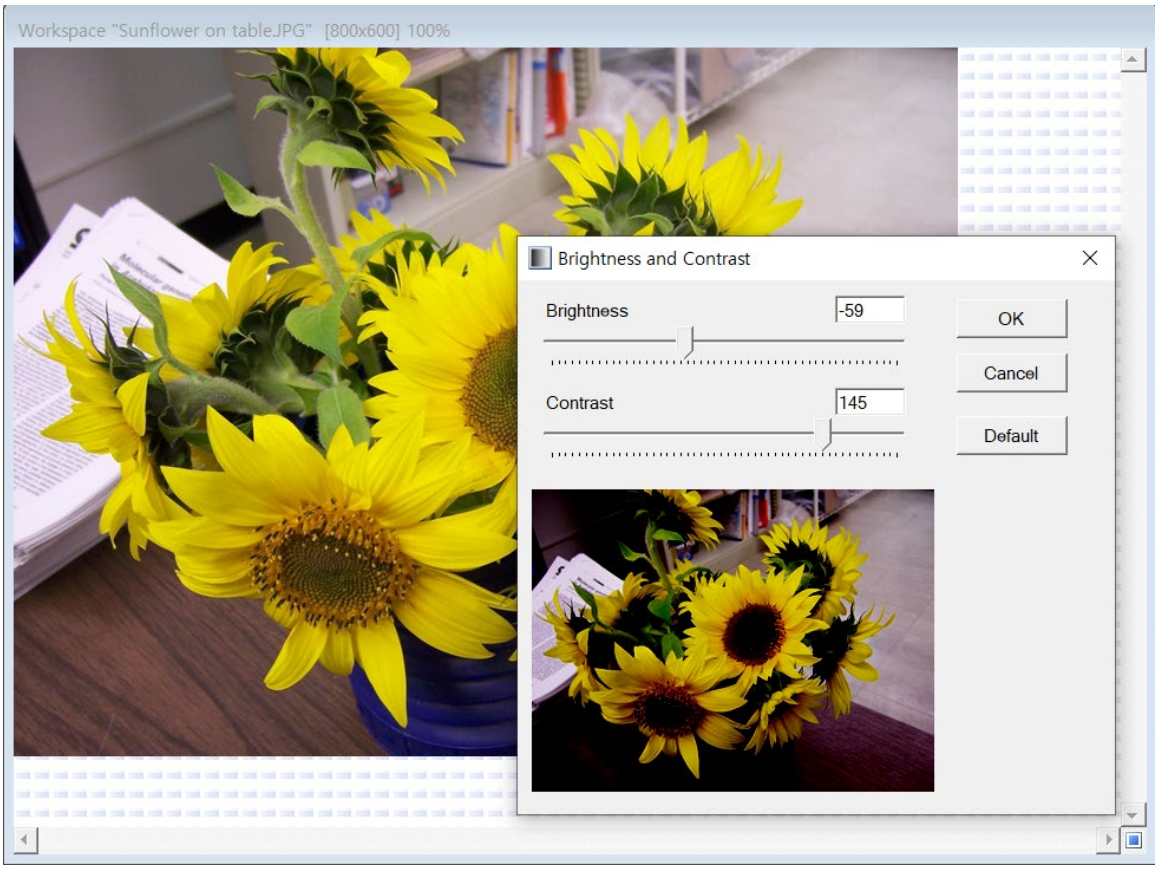


Flip	Flip image
Rotate	Rotate image
Rotational alignment by line shape	Rotation image in line with the line
Resize	Resize image
Crop	Crop image
Brightness and contrast	Adjust image brightness and contrast
Box averaging	Apply a blur filter (neighborhood averaging filter)

	Gaussian filter	Apply Gaussian filter
	Sharpen 3x3	Sharpen image (filter box size: 3x3)
	Overlay image to Workspace image	Overlay one of the images in the drag-drop box onto the workspace image
	Emboss	Emboss image
	Dithering to black and white image	Dithering image to a binary image (Options: Ordered color, Floyd Steinberg)

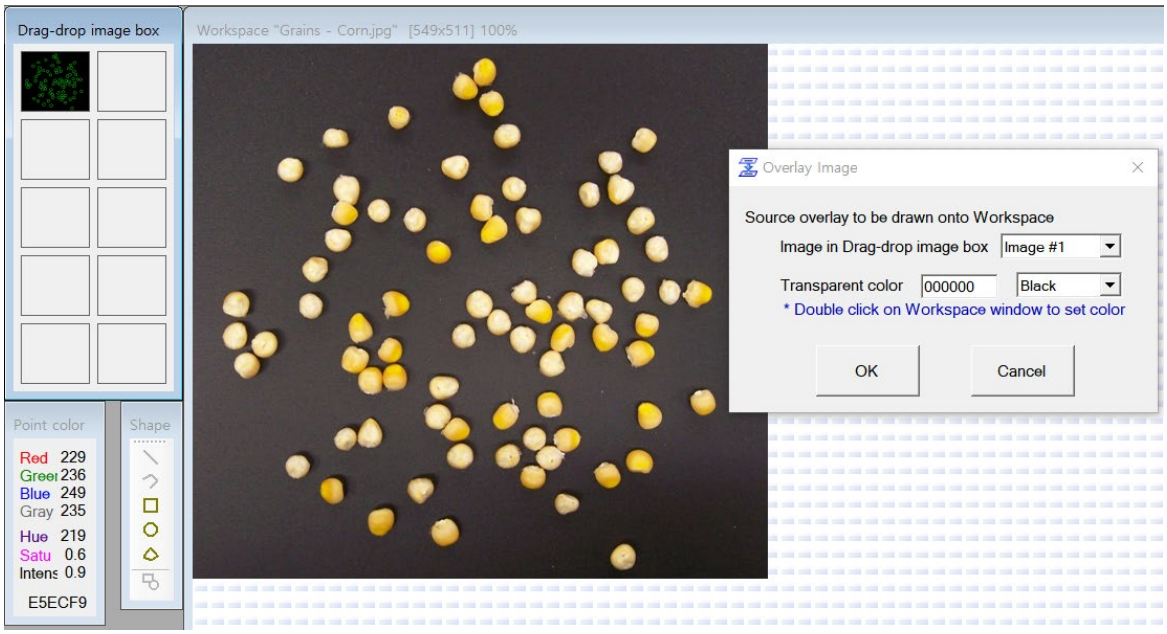
6.1 Brightness and contrast

The user can adjust the brightness and contrast of the image.



6.2 Overlay image

The function overlays one of the images in the drag-drop box onto the workspace image. Insert the image to be overlayed into the drag-drop image box, select the 'Image in Drag-drop image box' in the 'Overlay image' window, and select 'Transparent color'. Then, press the 'OK' button to get the final overlayed image.

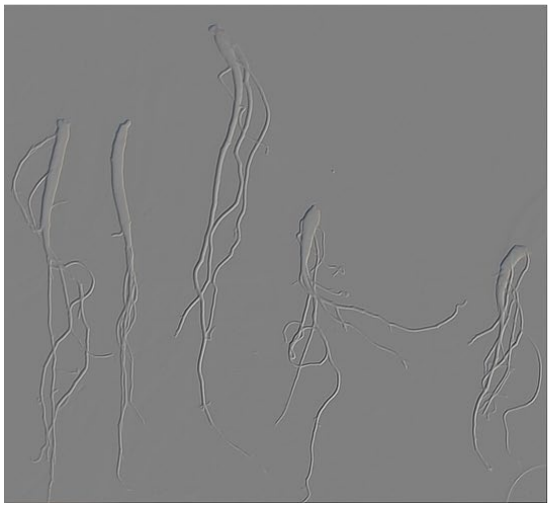


6.3 Emboss

This feature makes the image emboss, making it look as if the image is projecting or entering.

Original image

Emboss

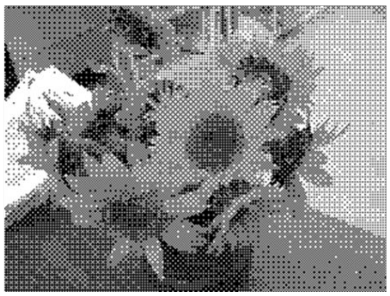


6.4. Dithering

The user can convert a color image to a binary image consisting only of black and white pixels. Two algorithms are provided: Ordered color and Floyd Steinberg.

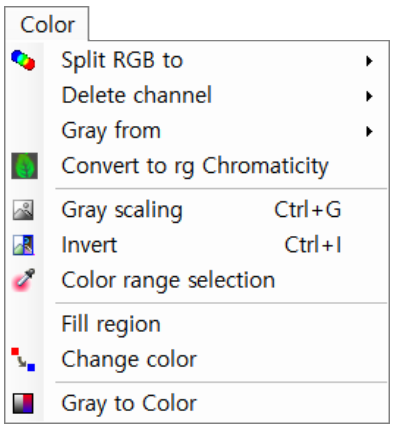
Original image

Using ordered color



Using Floyd Steinberg

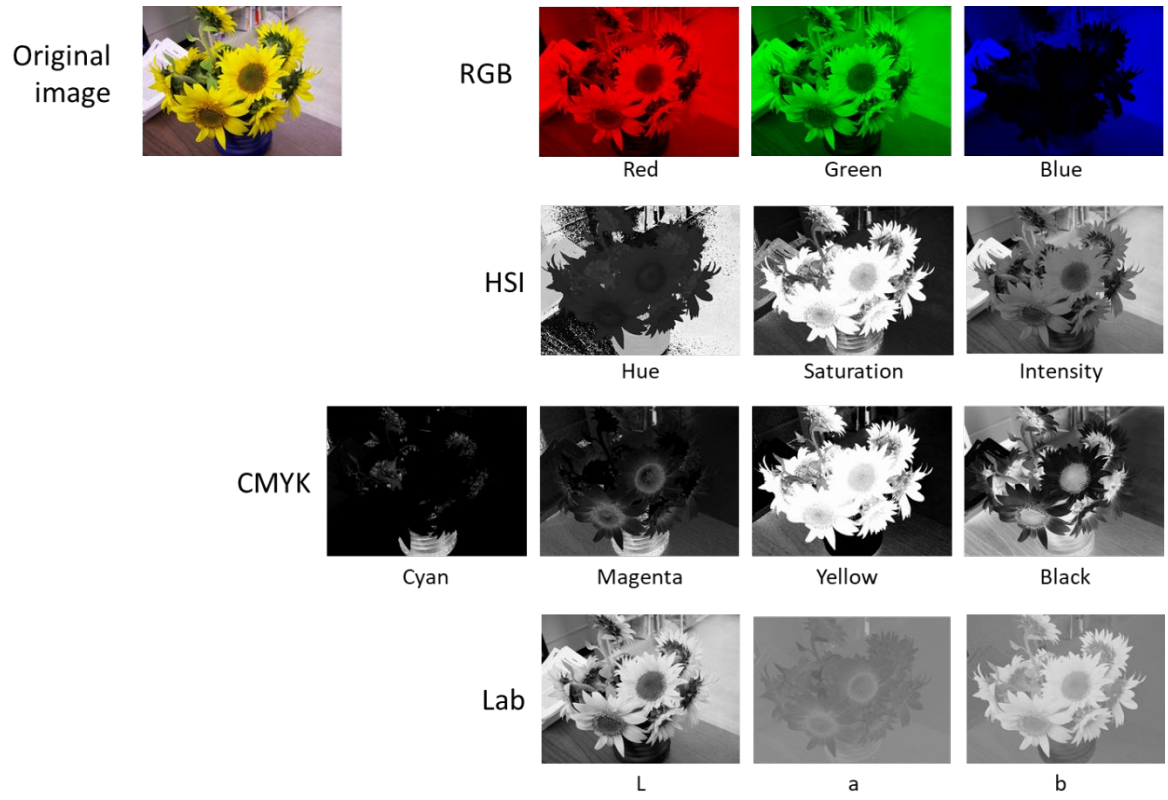
7. Color processing



Split RGB to	Split a color image to a designated color channel (Color channel options: red, green, blue, hue, saturation, intensity, cyan, magenta, yellow, K black, L, a, b)
Delete channel	Remove one of the red, green, and blue color channels from the color image
Gray from	Convert one of the red, green, and blue color channels to a gray image
Convert to rg Chromaticity	Convert a color image to an rg Chromaticity
Gray scaling	Convert a color image to a gray image
Invert	Invert image
Color range selection	Extract pixels similar to a specific color from an image
Fill region	Paint the current image with the specified color
Change color	Change pixels of a specific color in the image to a different color
Gray to Color	Convert a gray image to a color image displayed in red and blue.

7.1 Color extraction

The 'Split RGB to' menu can be used to split a color image into specified color channels. The supported color spaces are RGB, HSI, CMYK and Lab.



7.2 Gray scaling

The user can convert a color image to a black and white image with the 'Gray scaling' menu. The formula used for gray scaling is as follows.

Gray = 0.299 × Red + 0.587 × Green + 0.114 × Blue

The original color image becomes a gray image by making the red, green, and blue channels of the color image equal to the calculated gray value.

Original image

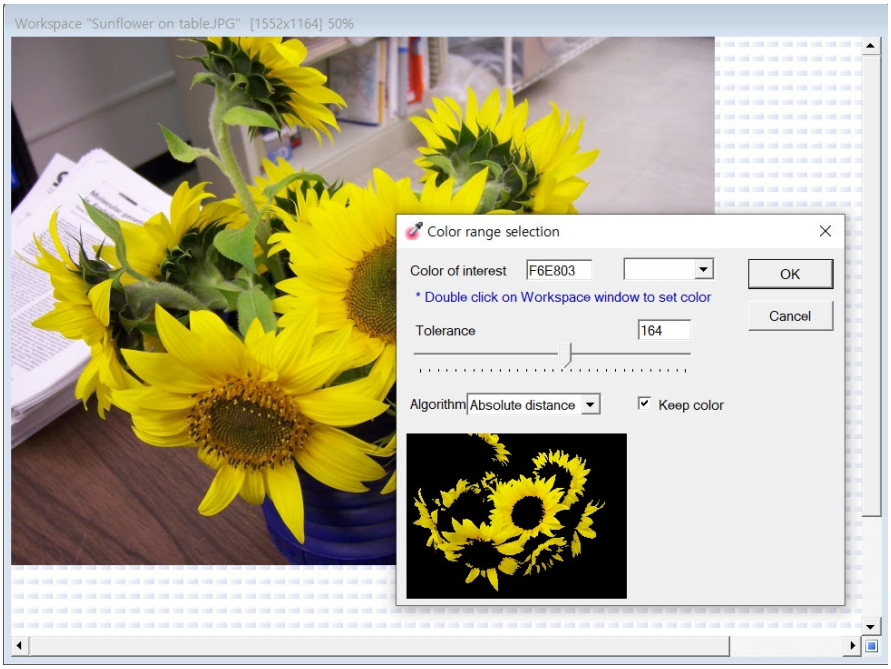
Gray image

7.3 Color range selection

The user can extract parts of a specific color in the image. After placing the mouse cursor on the image and clicking the mouse, the user can specify the color value of the 'Color of interest' and adjust the 'Tolerance' to set a similar color range. The algorithms for determining the color range are ‘Absolute distance’ and ‘R2 distance’. Ref (reference) means the color value of the ‘Color of interest’.

Absolute distance = $|R-R_{ref}| + |G-G_{ref}| + |B-B_{ref}|$

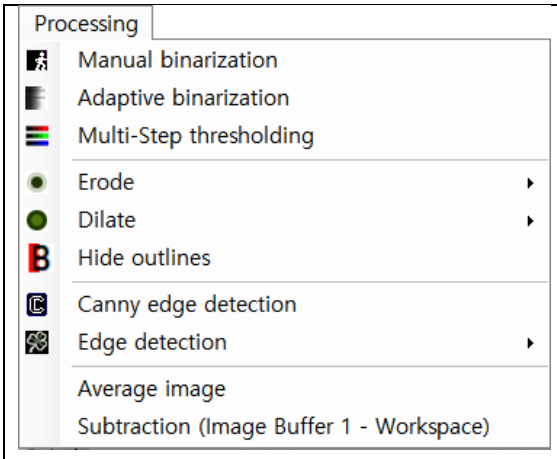
R2 distance = $SQRT\ (\ (R-R_{ref})^2 + (G-G_{ref})^2 + (B-B_{ref})^2\ )$



Original image

New image with color range selection

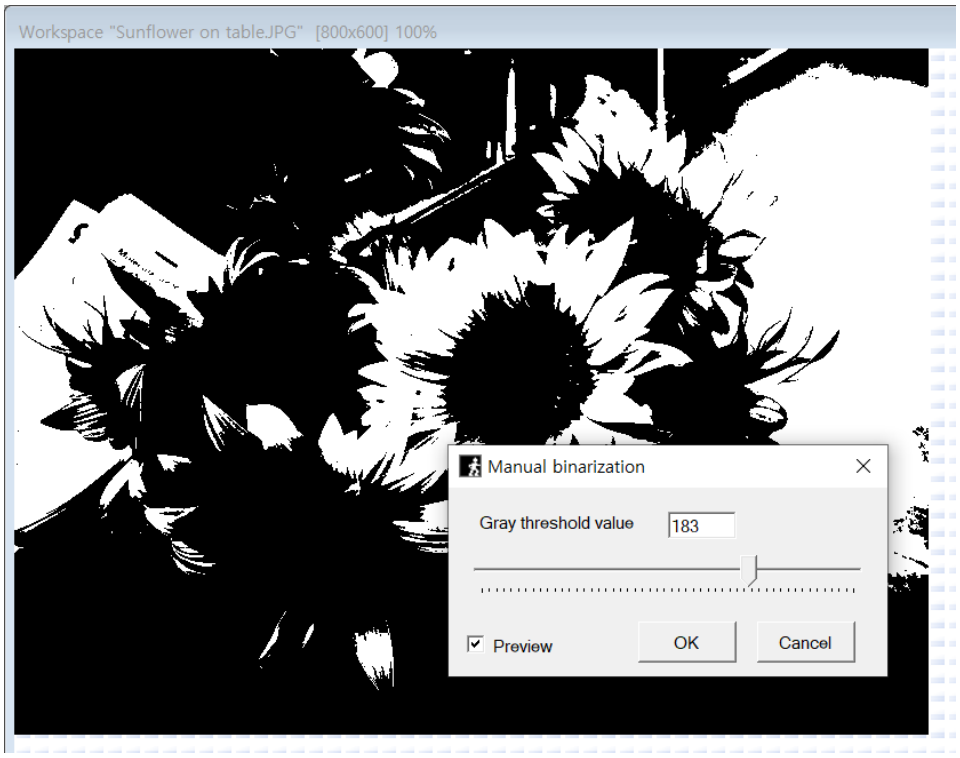
8. Image processing



Manual binarization	After specifying the threshold value, the color image is converted to a binary image
Adaptive binarization	Convert a color image to a binary image using an adaptive thresholding algorithm
Multi-step thresholding	Reduce the number of colors with a stair-shaped look-up-table
Erode	Apply erode filter
Dilate	Apply dilate filter
Hide outlines	Remove outlines
Canny edge detection	Apply Canny edge filter to detect edges
Edge detection	Apply edge detection filters (Filter options: homogeneity, Sobel, left-hand edge, upper left-hand edge)
Average image	The average image is generated from multiple images
Subtraction (Image Buffer 1 - Workspace)	Create a differential image between the workspace image and image the buffer of the drag drop image box

8.1. Manual binarization

The user can convert the image to a binary image. After setting the threshold value, if the gray value of the image pixel is lower than the threshold, it is converted to black, and if it is higher than the threshold, it is converted to white value to obtain a binary image. This function applies to color images as well as gray images.

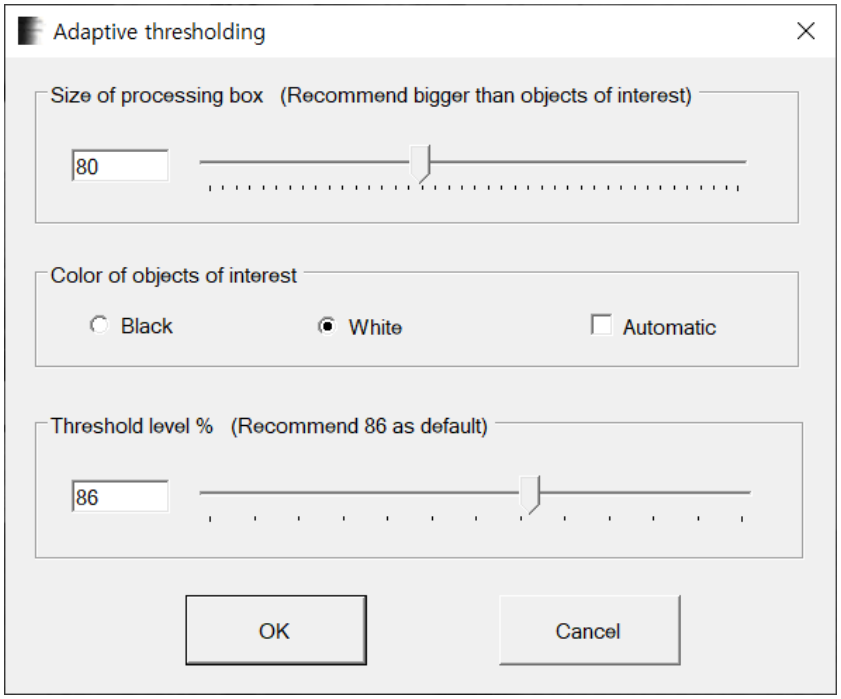


Original image

Manual binarization applied

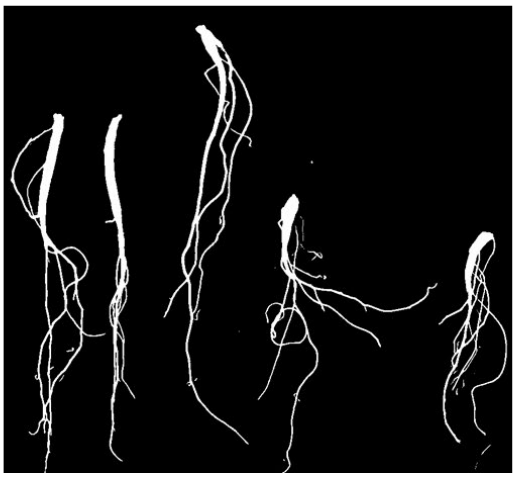
8.2. Adaptive binarization

The user can convert the image into a binary image through the 'Adaptive binarization' that uses an adaptive thresholding algorithm. The user can set the processing box size, set whether the object to be detected is black or white, and specify the threshold level. The higher the threshold level is, the more sensitive it is, the more objects are detected.



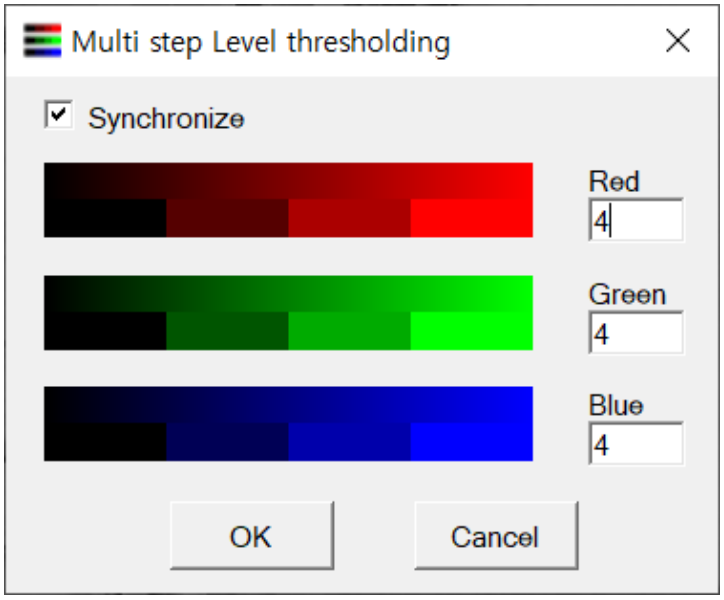
Original image

Adaptive binarization applied



8.3. Multi-step level thresholding

The 'Multi-step thresholding' function reduces the color by applying a stair shaped look-up-table. If the 'Synchronize' is unchecked, the total number of colors to be converted for each R, G, B color can be set.



Original image

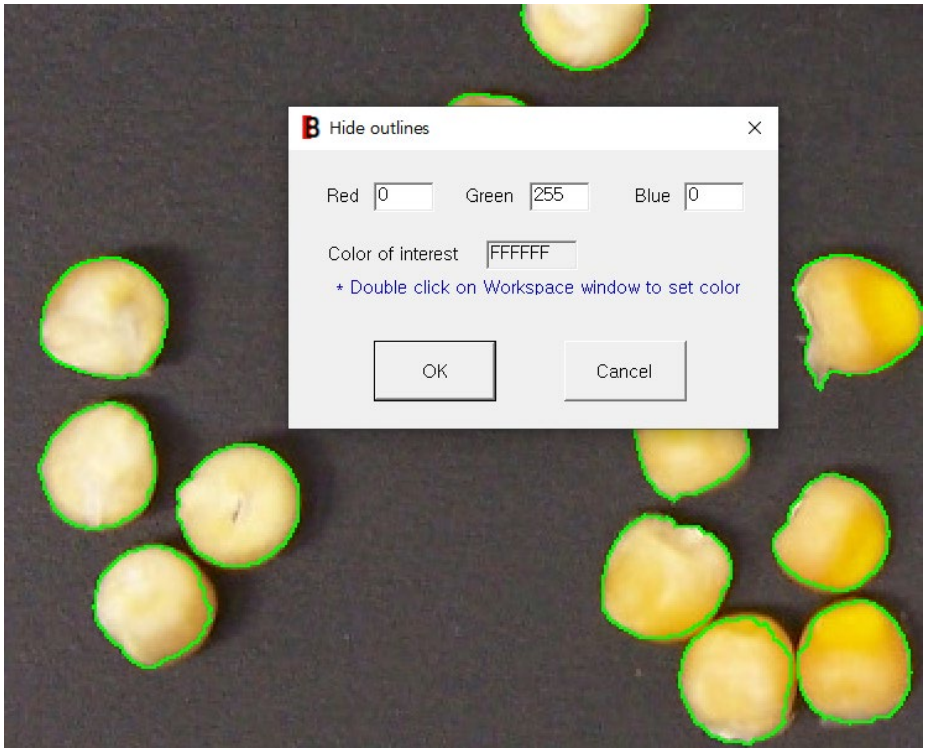
Multi step thresholding applied

8.4. Erode & Dilate

Erode and dilate are applied to color images. Erode enlarges the dark areas of the image and dilate enlarges the bright areas.

8.5. Hide outlines

This function is used to remove outlines with a specific color from an image. When removing the outline, it naturally removes the outline by replacing it with the average of the surrounding colors.

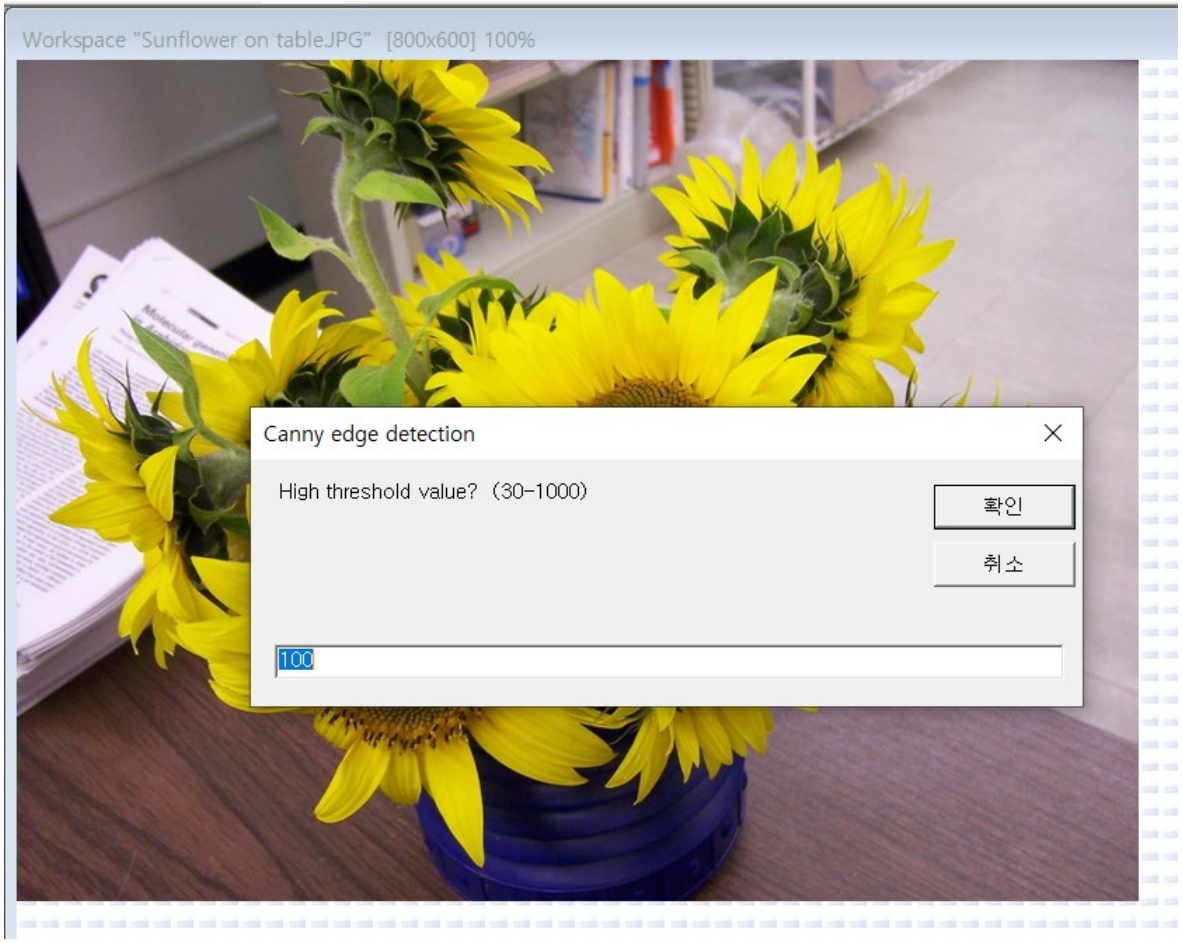


Original image

Outlines removed

8.6. Canny edge detection

Canny edge detection is a good algorithm for extracting contours from images. The user can adjust the extraction sensitivity by specifying the threshold value. The smaller the threshold value, the greater the extraction sensitivity. The default value is 100.



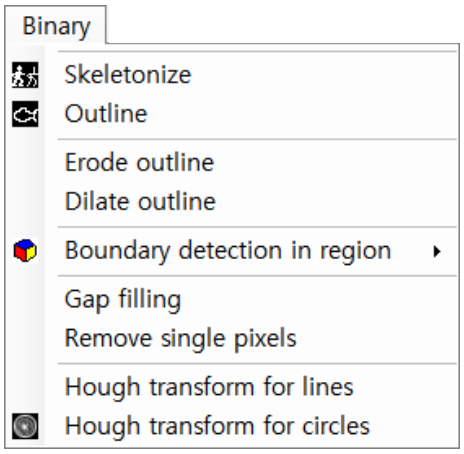
Original image

Canny edge detection applied

8.7. Average image

The "Average image" function creates an average image from multiple images. Users can set whether the average image they want to create is color or gray.

9. Binary processing

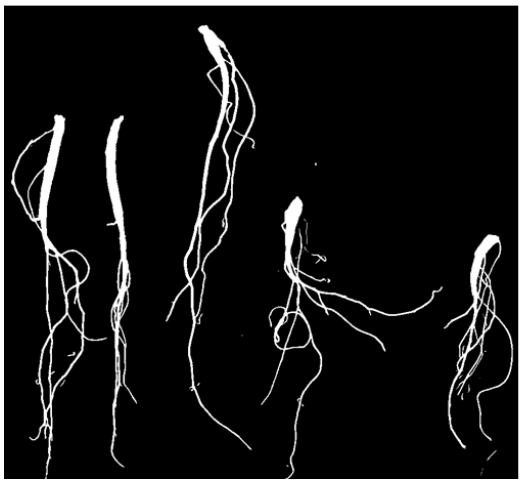


Skeletonize	Extract skeletal lines from the binary image
Outline	Extract the borderline from the binary image
Erode outline	Erase the borderline of white pixels in the binary image
Dilate outline	Add a white pixel outline to the binary image
Boundary detection in region	Detect bounders in the binary image
Gap filling	Fill the gap
Remove single pixels	Remove single white pixels
Hough transform for lines	Perform Hough transform to detect lines (experimental)
Hough transform for circles	Perform Hough transform to detect circles (experimental)

9.1. Skeletonize

In the binary image, skeleton lines are extracted from white pixel objects.

Original image

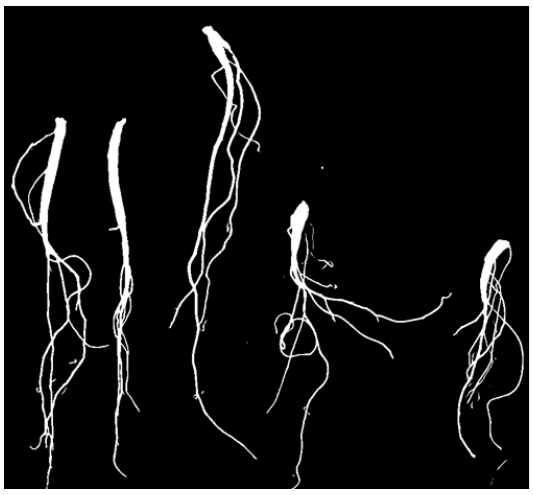


Skeletonized image

9.2. Outline

In the binary image, borderlines are extracted from white pixel objects.

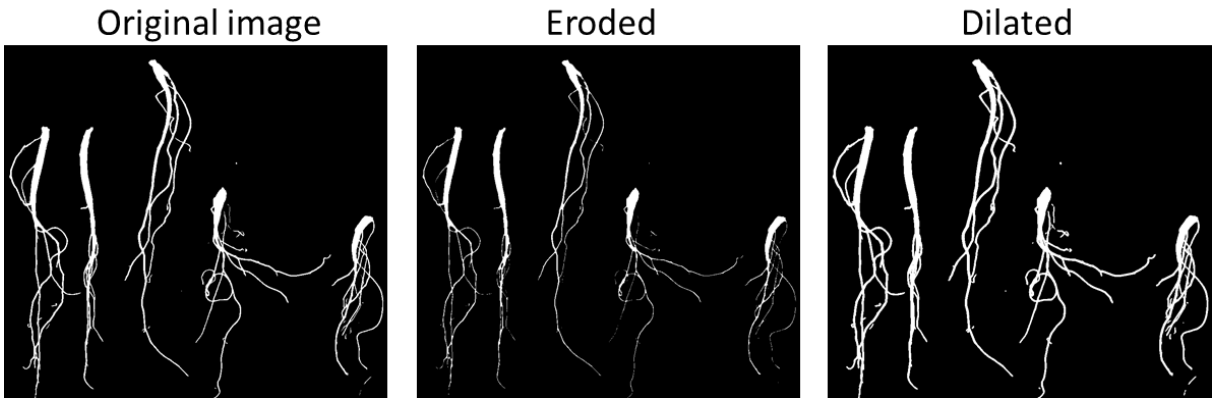
Original image



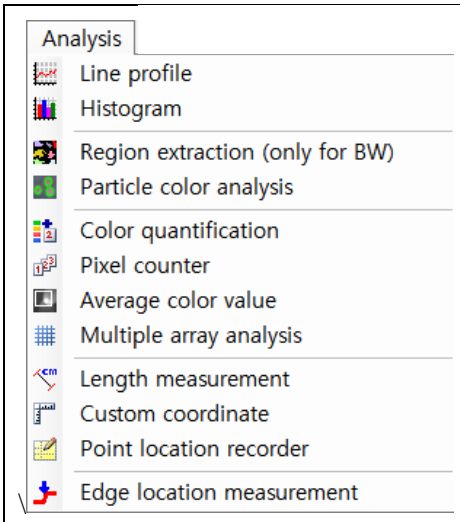
Outline image

9.3. Erode & Dilate

Erode and dilate are applied to binary images. Erode enlarges the dark areas of the image and dilate enlarges the bright areas. By using erode and dilate properly, various binary morphology operations can be made.



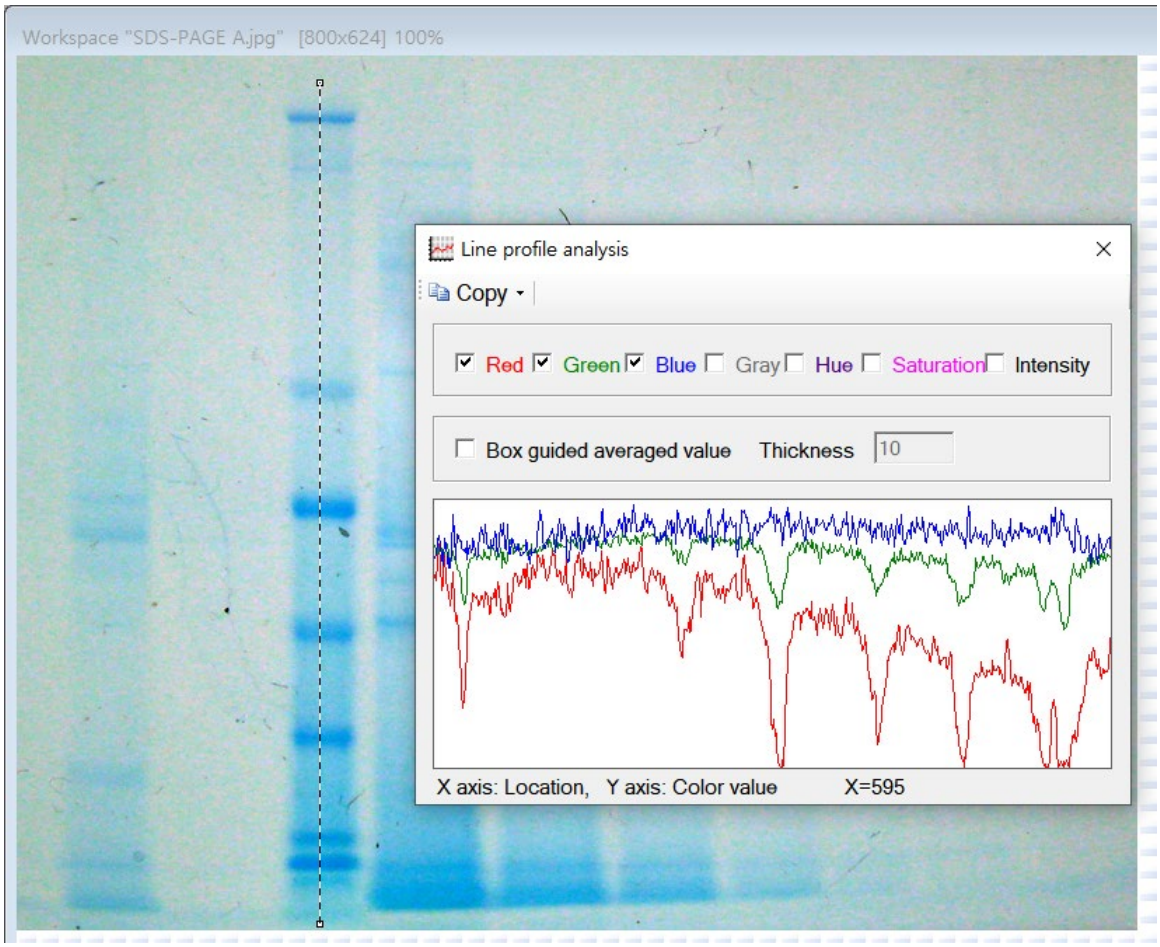
10. Image analysis



Line profile	Extract color along a straight line
Histogram	Calculate color histogram
Region extraction (only for BW)	Extract regions in the binary image
Particle color analysis	Extract particles from a color image and calculate color values
Color quantification	Count the number of pixels per color
Pixel counter	Count the number of pixels with a specified color
Average color value	Count the average color value
Multiple array analysis	Calculate color values at various locations with a grid-type ROI
Length measurement	Calculate the distance between two locations
Custom coordinate	Extract the location of the points in the chart image
Point location recorder	Extract the location of the points by clicking on the image
Edge location measurement	Extract the location of the points where the color changes rapidly

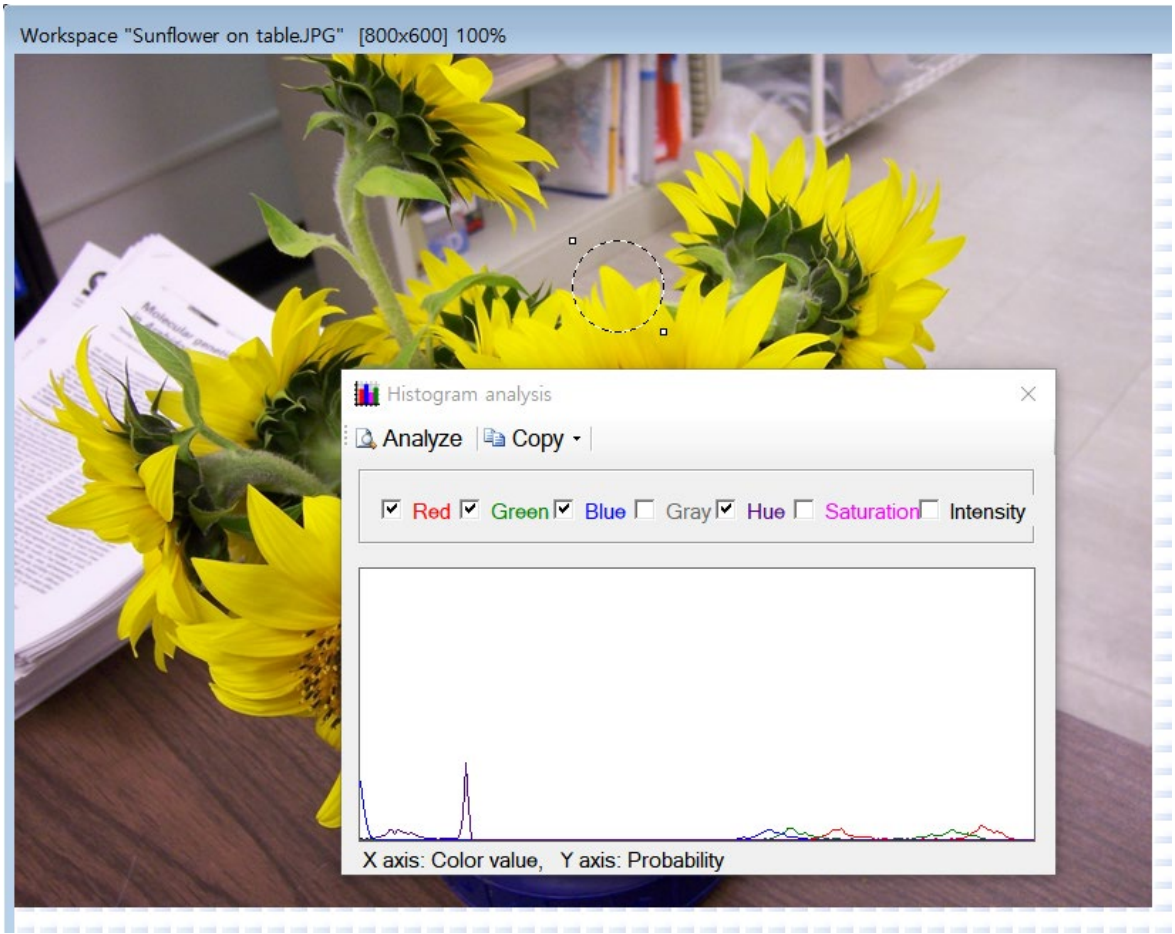
10.1. Line profile

After selecting a line on the shape toolbar, placing it on the image, and selecting the 'Line profile' menu, the user can check the color values of the pixels on the line graphically. When 'Box guided averaged value' is checked, a graph is drawn with the color average value of pixels located at right angles to a specific position of the line. Thickness is the length of the right angle line. After placing the mouse cursor on the graph and pressing the left button, the position in the image is displayed.



10.2. Histogram

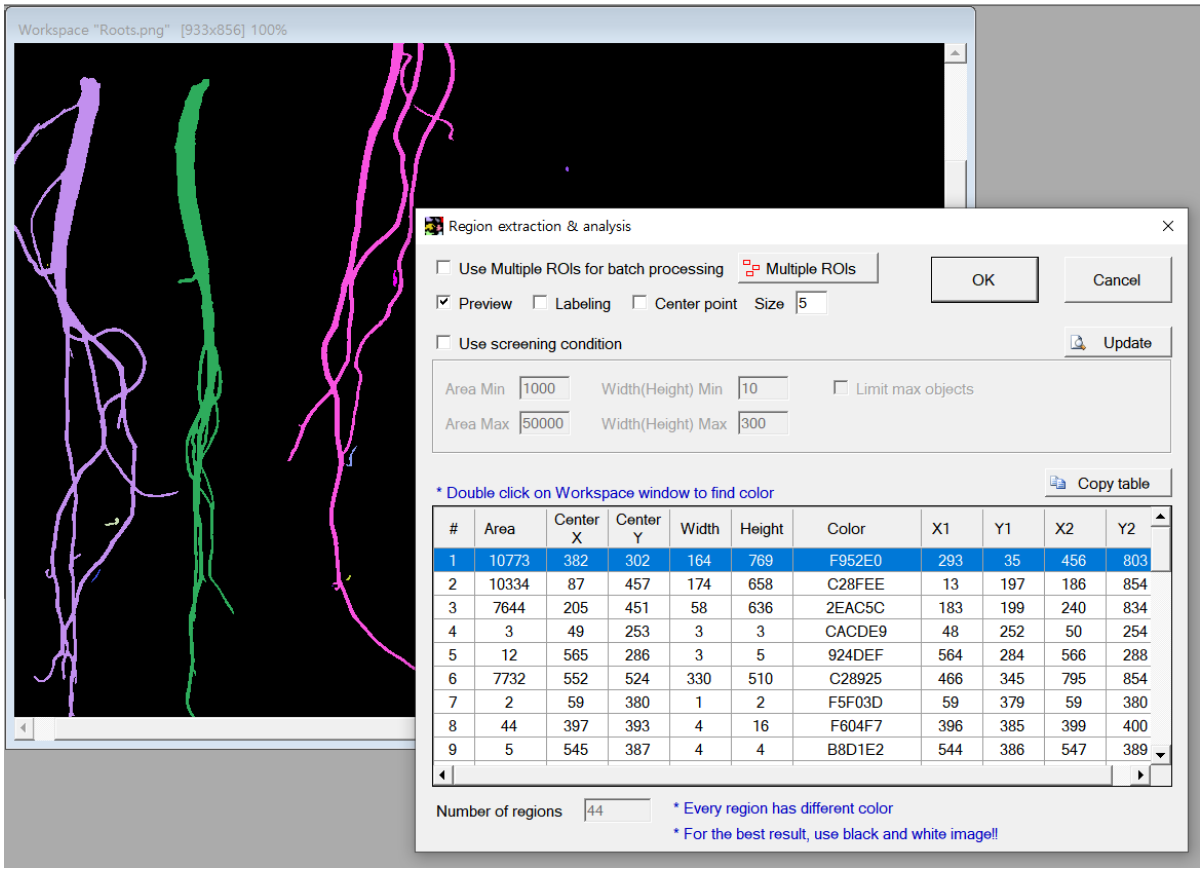
The user can graph the color histogram of the image. Here, the histogram refers to the percent according to the color value. In the graph, the x-axis is a range of color values (for example, 0 on the left, 255 on the right), and the percent range on the y-axis (0 on the bottom and 100% on the top).



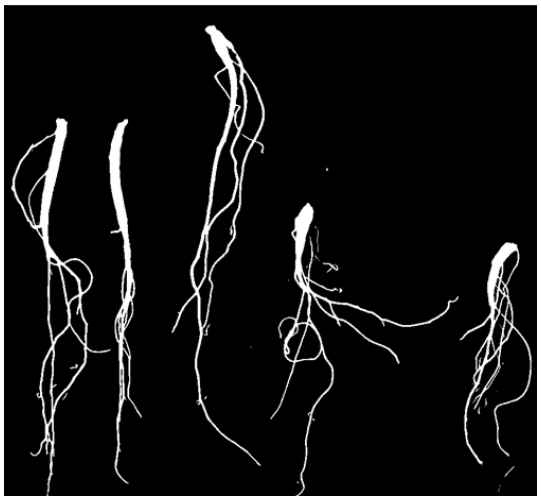
10.3. Region extraction (only for BW)

Region extraction is performed on the binary image to detect objects of white spots. The detected objects are colored in different colors and the calculated parameters are displayed in the table. When the user places the mouse cursor on the image and clicks the colored object, information about the selected object can be viewed in the table.

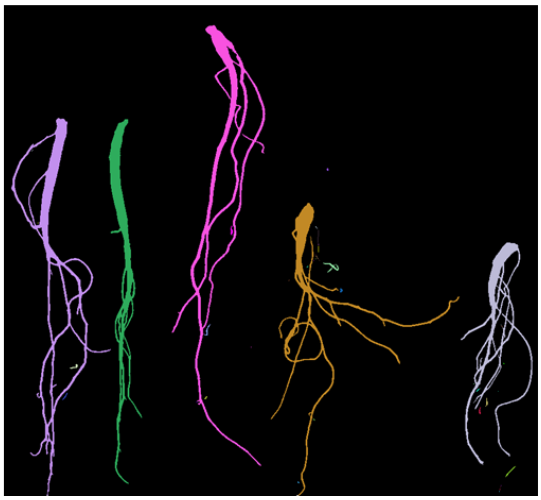
The 'Use Multiple ROIs for batch processing' option can be selected to perform image analysis on multiple ROIs in one image. The 'User screening condition' option can be checked to specify the minimum and maximum area and width of the objects to be detected and limit the number of the objects to be detected.



Original image

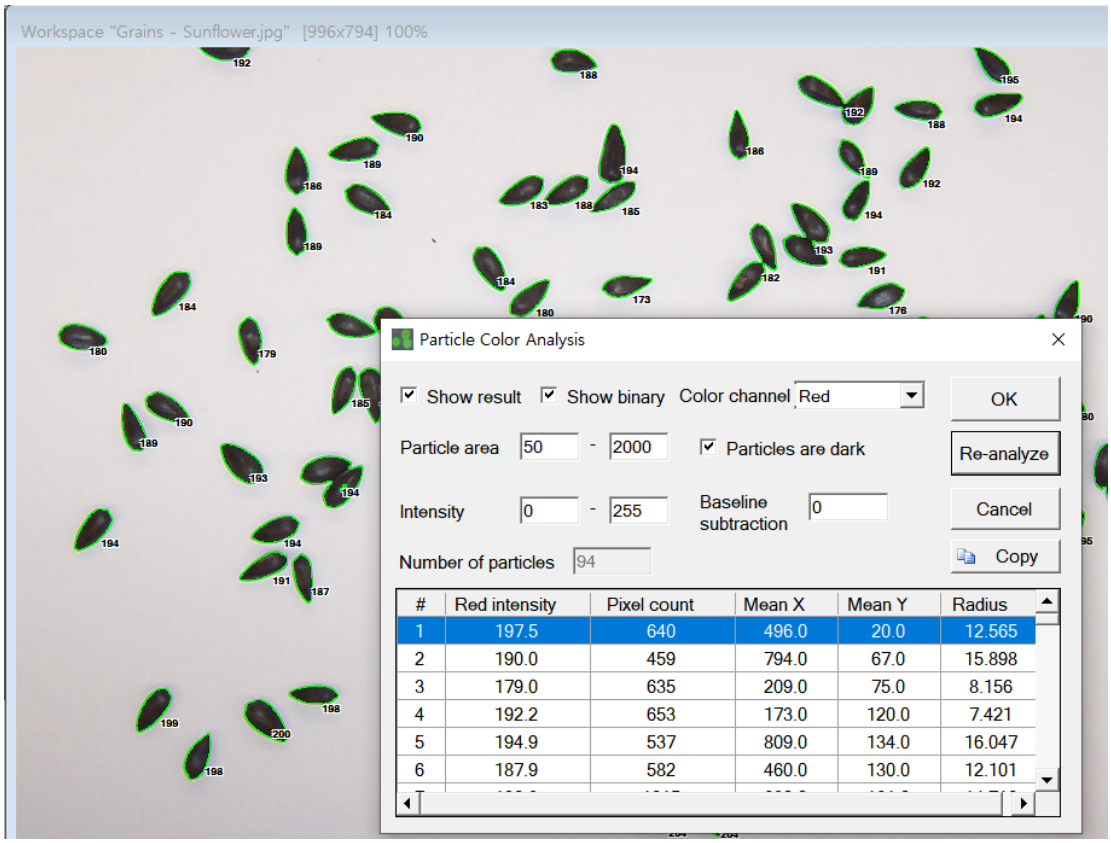


Region extracted



10.4. Particle color analysis

Image particles (regions) can be detected automatically. In order to detect objects in a color image, several stages of image processing must be performed. However, this function integrates these tasks so that users can easily analyze images. In addition to being able to detect objects, the average color of red, green, or blue of individual objects is also extracted.

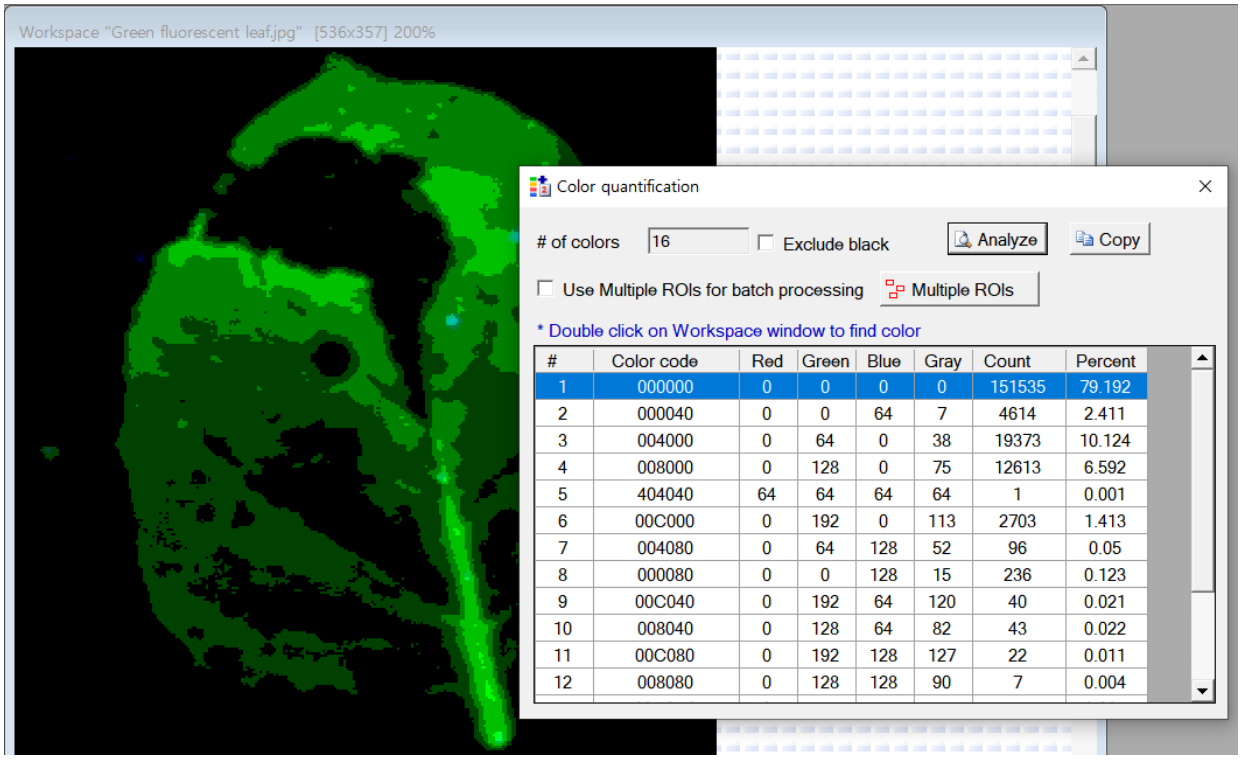


Original image

Detected regions

10.5. Color quantification

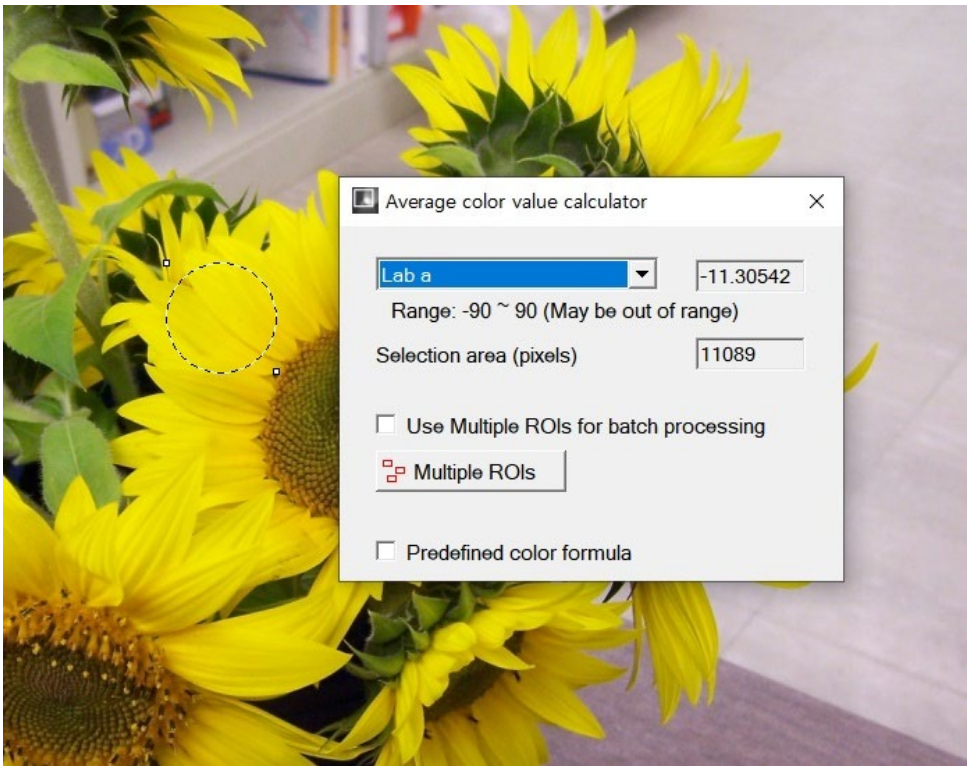
Users can know the number of colors in the image. In the case of an image composed of a small number of colors, it is useful when determining the number of pixels per color.

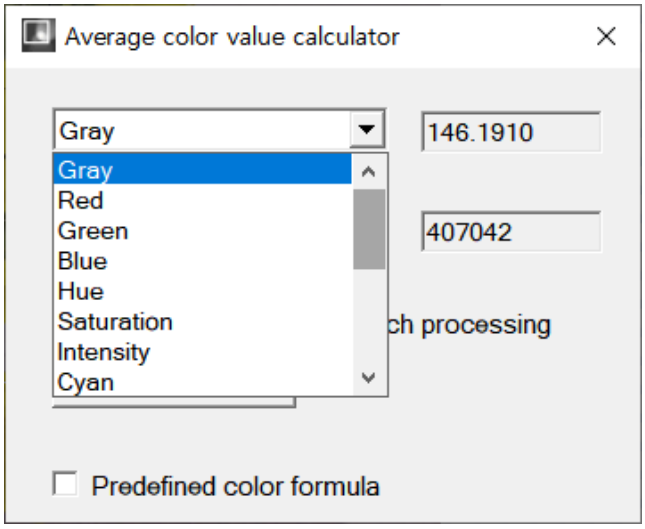


#	Color code	Red	Green	Blue	Gray	Count	Percent
1	000000	0	0	0	0	151535	79.192
2	000040	0	0	64	7	4614	2.411
3	004000	0	64	0	38	19373	10.124
4	008000	0	128	0	75	12613	6.592
5	404040	64	64	64	64	1	0.001
6	00C000	0	192	0	113	2703	1.413
7	004080	0	64	128	52	96	0.05
8	000080	0	0	128	15	236	0.123
9	00C040	0	192	64	120	40	0.021
10	008040	0	128	64	82	43	0.022
11	00C080	0	192	128	127	22	0.011
12	008080	0	128	128	90	7	0.004

10.6. Average color value

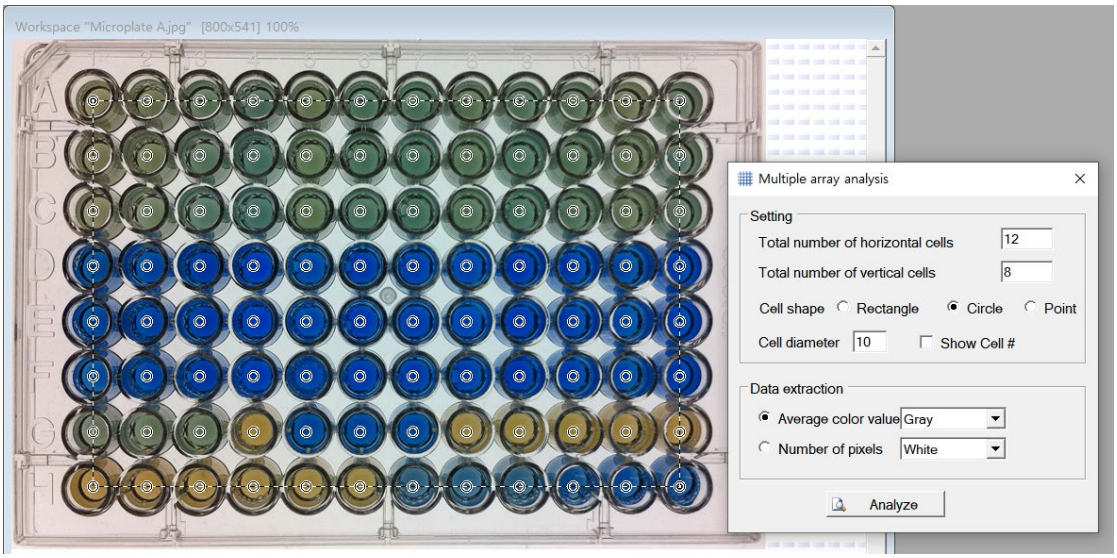
Users can use this function to compute the average color value of a specific area of the image.





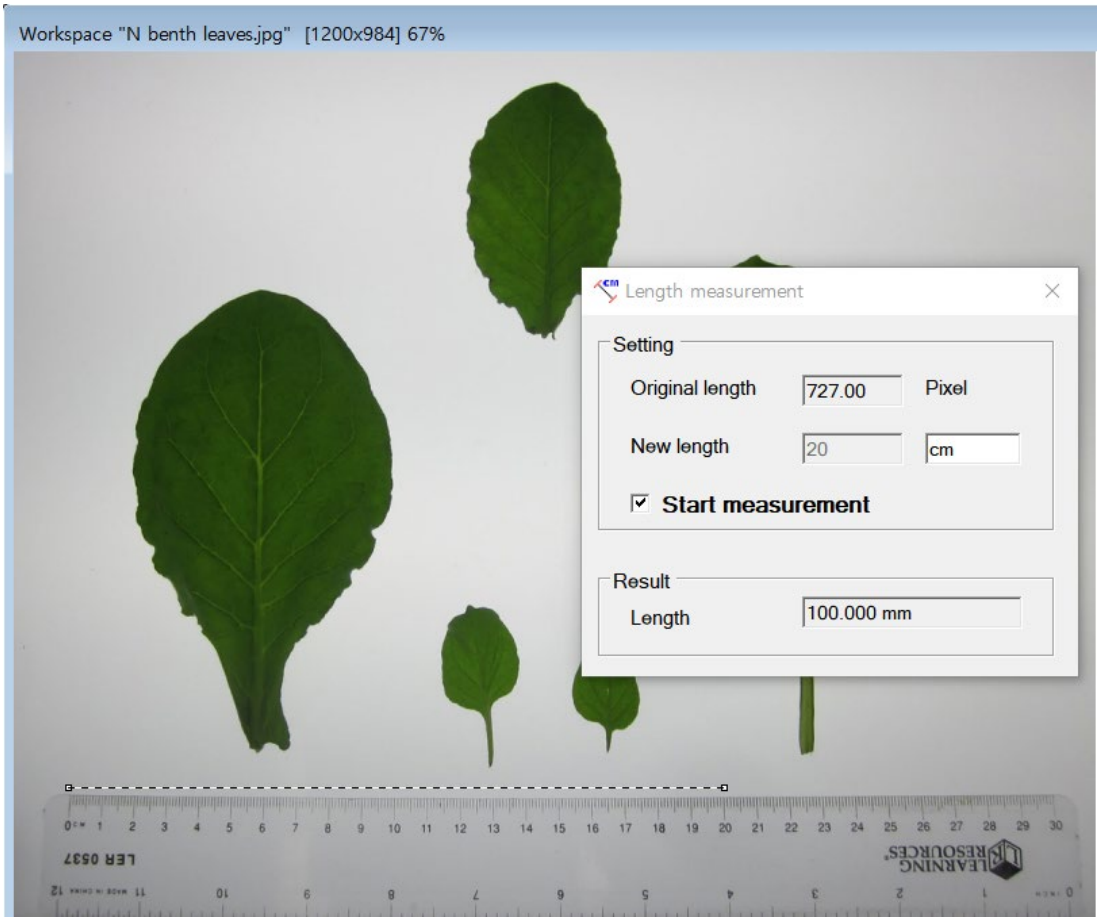
10.7. Multiple array analysis

This is useful when analyzing the color for each well of a multi-well plate. After selecting a rectangular ROI, specify the number of horizontal and vertical wells, and then specify the shape and size of the cell to be analyzed. Then, press the 'Analyze' button to copy the analyzed result to the clipboard. The user can count the number of specific colors as well as the average color.

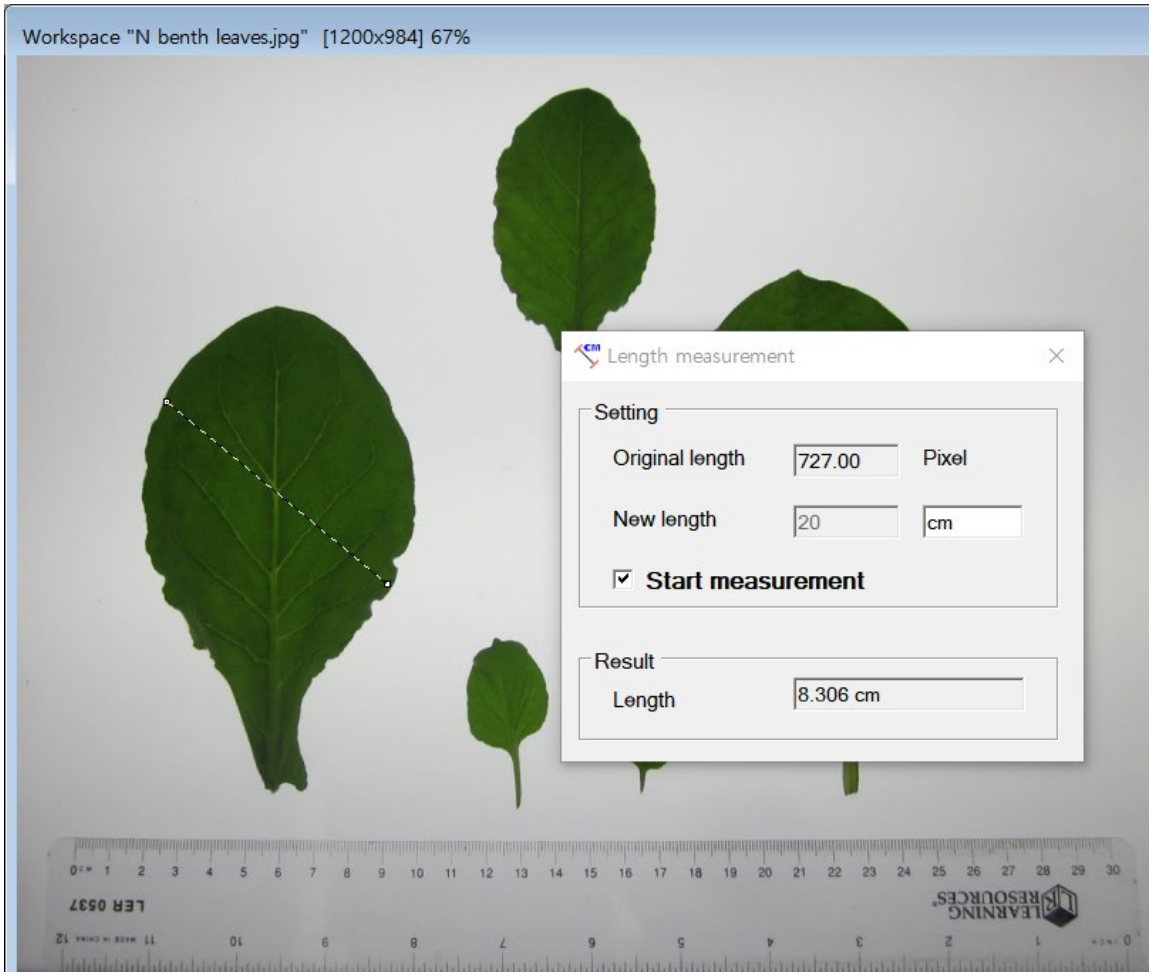


10.8. Length measurement

Since the distance between two points in the image is in pixel units, which is not the actual length, it is useful to convert the distance between two points from pixels to cm (or other units). The user needs to set the conversion factor to convert between units. Using the line shape, the user needs to place the line shape in an object (ruler for example) whose actual length is known. Then enter the actual length (cm) in the 'New length".



Press the 'Start measure' button to fix the conversion factor between the length in pixels and the length in cm. Then, using the line shape to select any two points in the image, the distance between the two points is displayed in units of the length actually entered.


Workspace "N benth leaves.jpg" [1200x984] 67%
Length measurement
Setting
Original length
727.00
Pixel
New length
20
cm
Start measurement
Result
Length
8.306 cm

10.9. Custom coordinate

The user can extract the position of points from chart images. The selection tool of the rectangle shape is positioned so that the x- and y-axes of the graph chart match. Then enter the minimum and maximum values for the x- and y-axes in 'X-axis' and 'Y-axis', respectively. The unit is entered for user convenience.

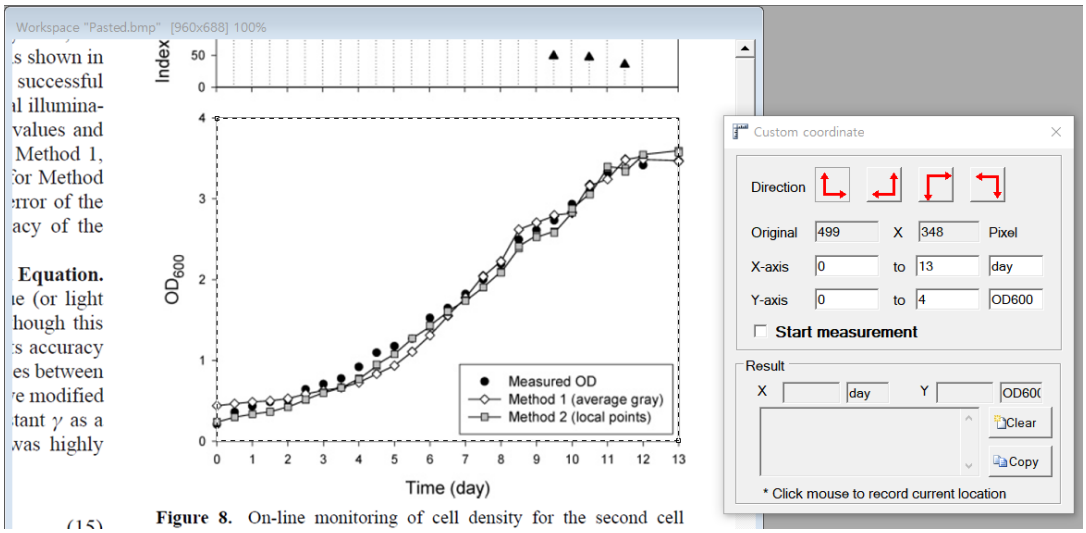


Figure 8. On-line monitoring of cell density for the second cell

Then press the 'Start measurement' button. The coordinate then appears in the 'Result' panel when the mouse cursor is positioned at a specific position on the graph and then the left button is pressed. For other positions on the graph, click the mouse button to record the coordinates.

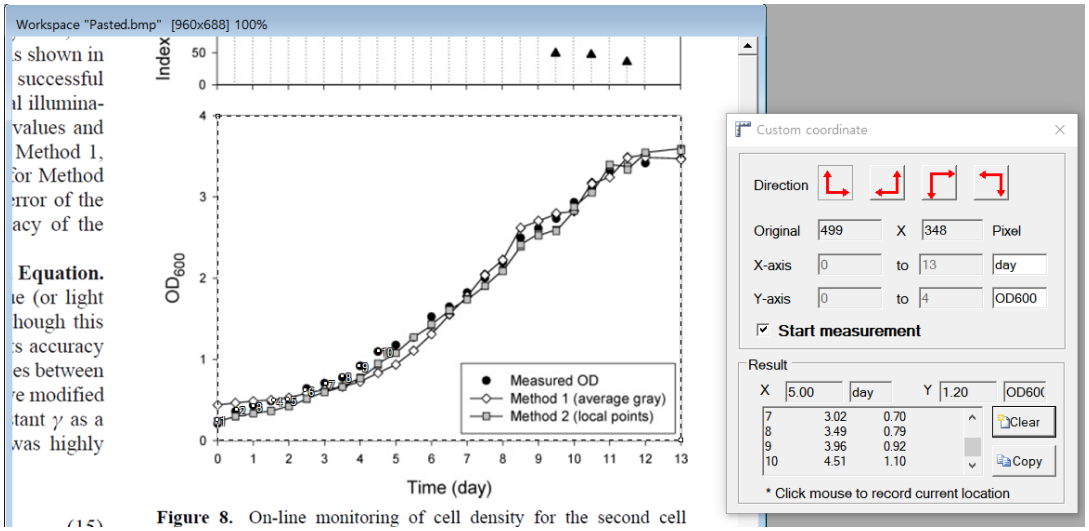
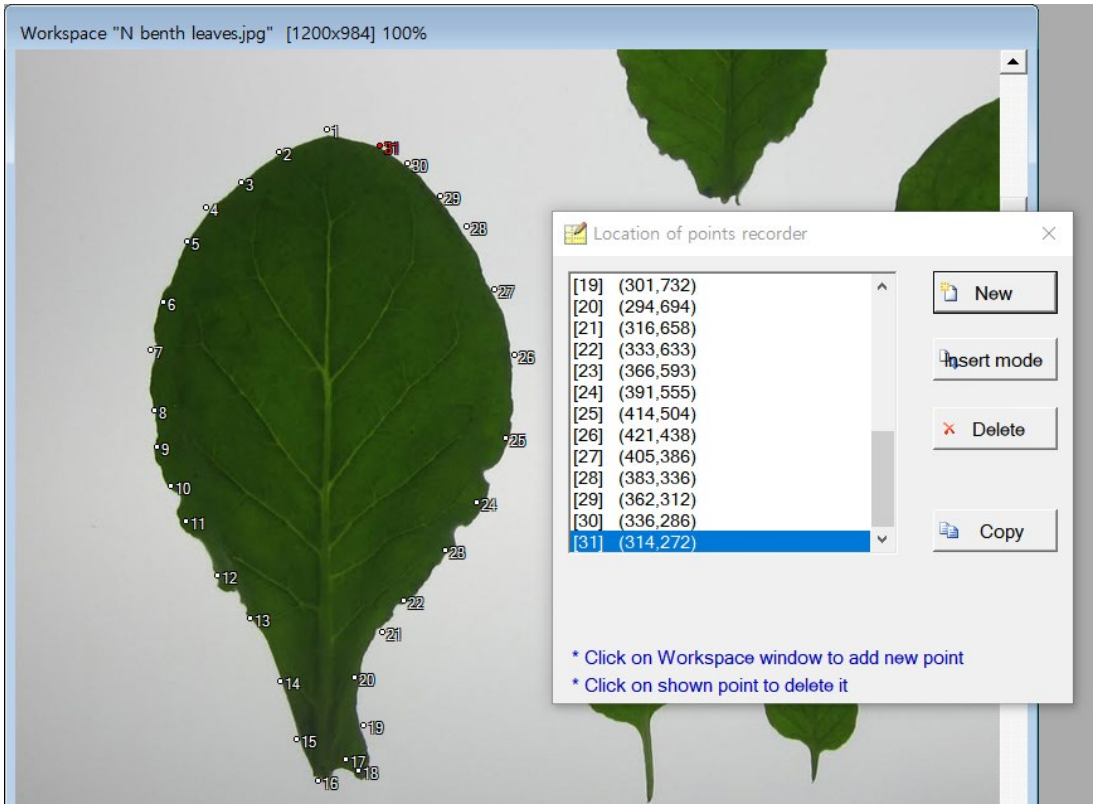


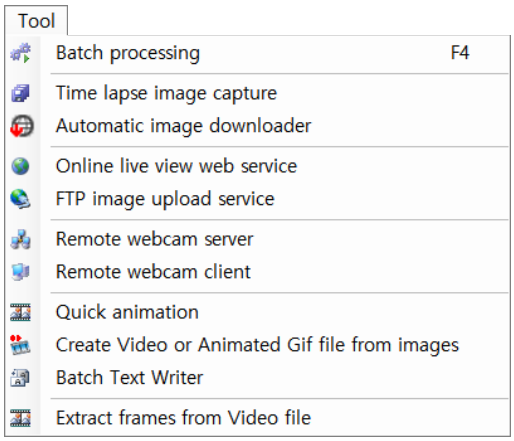
Figure 8. On-line monitoring of cell density for the second cell

10.10. Point location recorder

This function is a continuous extraction of coordinates from specific locations in the picture. After positioning the mouse cursor in the image, click the left button to record the coordinates of the x- and y-axes.



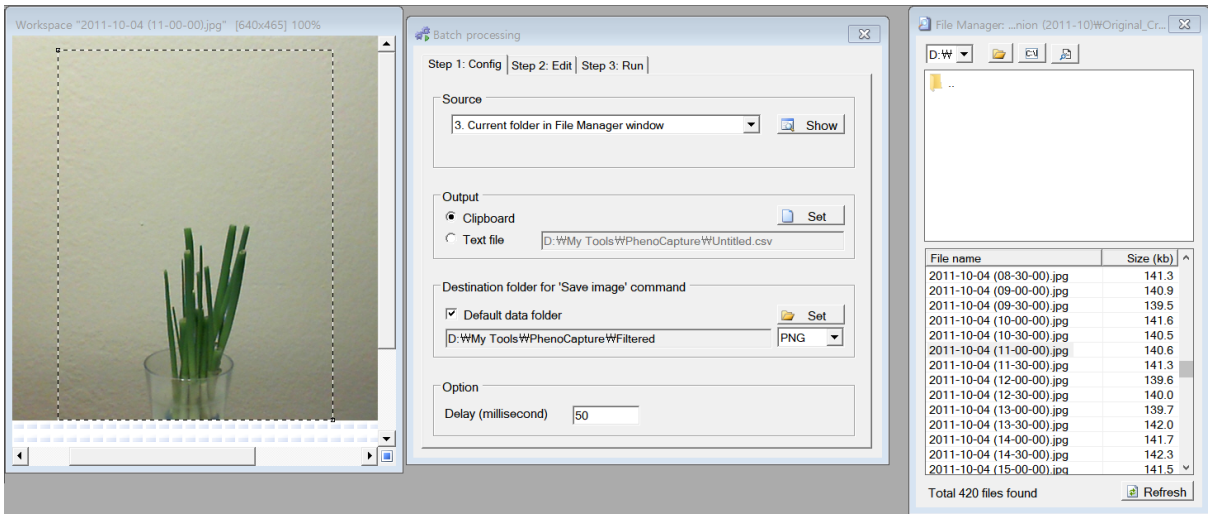
11. Tool



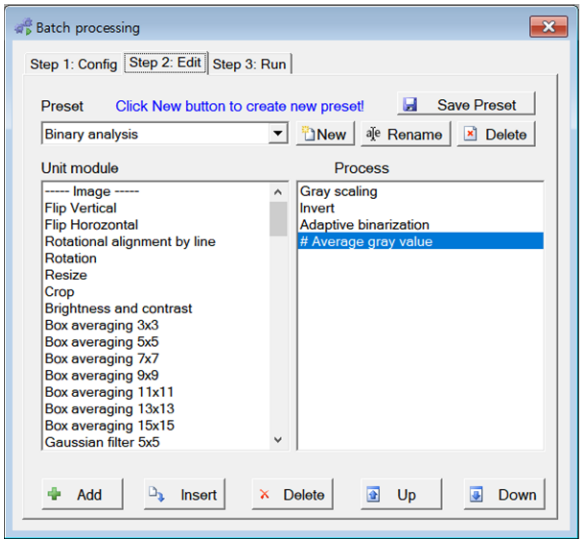
Bach processing	Performs multiple tasks of image processing sequentially
Time-lapse image capture	Take time-lapse images
Automatic image downloader	Download images from a specific IP address or web address
Online live view web service	Provide camera video streaming to view real-time images on the web browser
FTP image upload service	Upload images to FTP server regularly
Remote webcam server	Build a webcam server so that other PCs can see the camera image on the server-side
Remote webcam client	Connect to the webcam server and download the image
Quick animation	Show animation from 2 ~ 5 images and create an animated GIF file
Create Video or Animated Gif from images	Create a video or animated GIF file from multiple images
Batch Text Writer	Write text sequentially on multiple images
Extract frames from Video file	Extract frame images from a video file

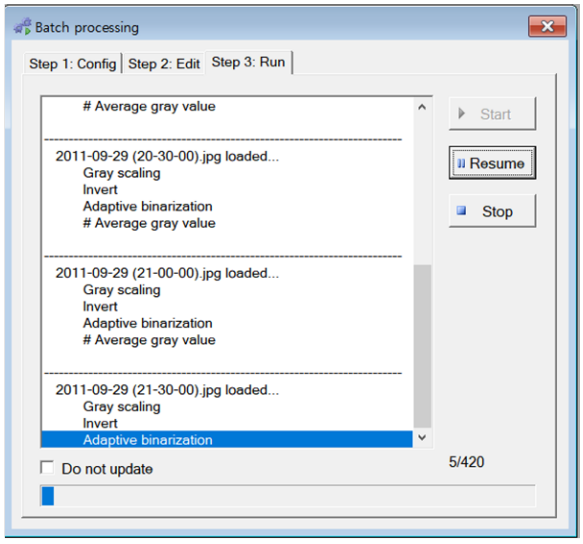
11.1. Batch processing

This function allows multiple image processing operations to be performed sequentially. This is especially useful when analyzing multiple time-lapse images. First, set 'Source', which includes images. In the 'Output' option, the user can set whether to save the image analysis results to the clipboard or record them as text files. If the user executes the 'Save image' command to save the currently processed image, set the folder in the 'Destination folder for 'Save image' command. Delay in 'Option' refers to the delay between each image processing.



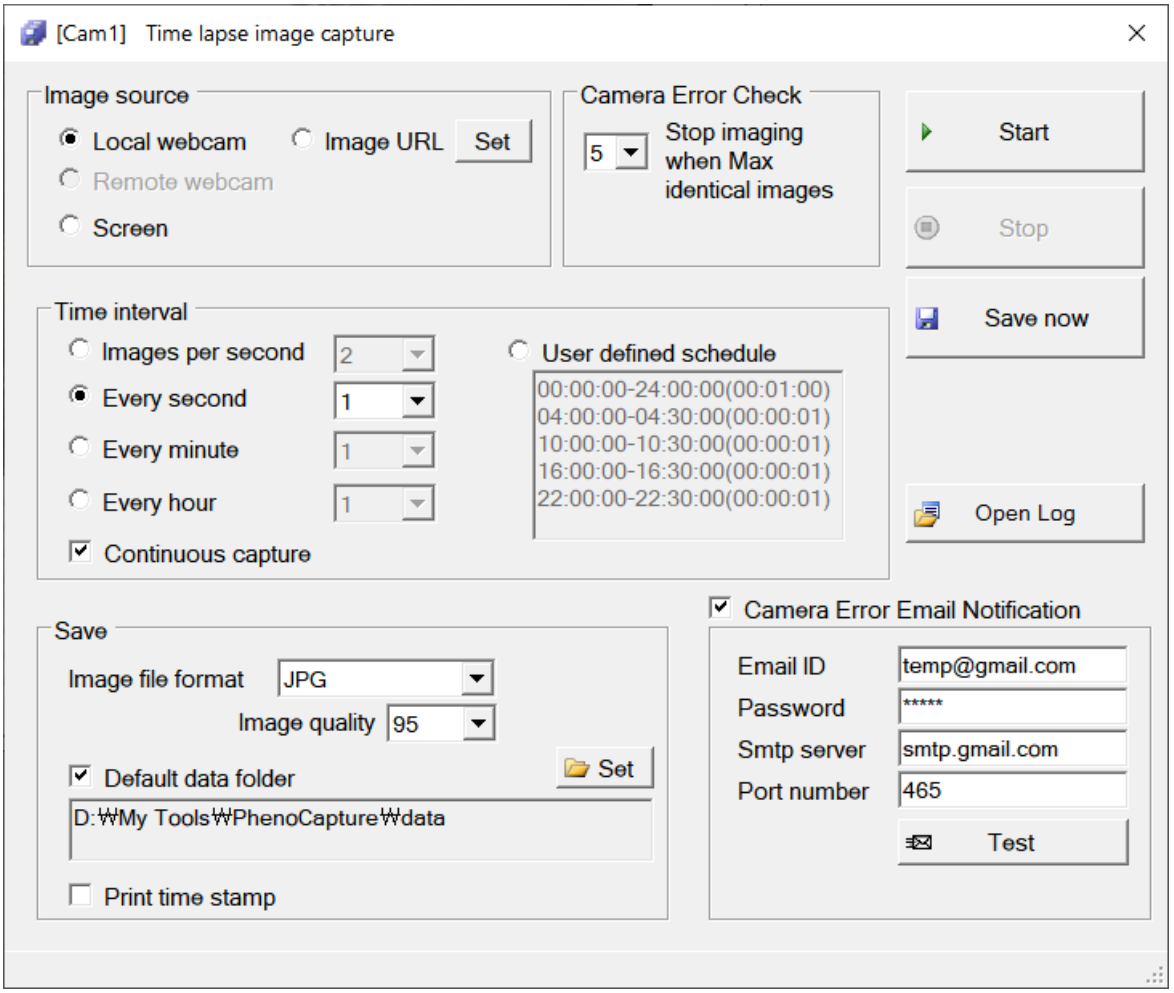
Next, the user has to enter image processing commands in the 'Step 2: Edit' tab. Click the 'New' button to set the Preset name. Then, select the command to be executed sequentially in the 'Unit module' list, then click the 'Add' button or double-click the left mouse button. To use the configured preset again, save it by pressing the ' Save Preset" button. When the user clicks the 'Step 3: Run' tab and then presses the 'Start' button, image analysis proceeds. In this example, '# Average color value' is included. After calculating the average color value from individual images, the result is saved in the clipboard.


Batch processing
Step 1: Config
Step 2: Edit
Step 3: Run
Preset
Click New button to create new preset!
Save Preset
Binary analysis
New
Rename
Delete
Unit module
Process
----- Image -----
Flip Vertical
Flip Horozontal
Rotational alignment by line
Rotation
Resize
Crop
Brightness and contrast
Box averaging 3x3
Box averaging 5x5
Box averaging 7x7
Box averaging 9x9
Box averaging 11x11
Box averaging 13x13
Box averaging 15x15
Gaussian filter 5x5
Gray scaling
Invert
Adaptive binarization
Average gray value
Add
Insert
Delete
Up
Down


Batch processing
Step 1: Config
Step 2: Edit
Step 3: Run
Average gray value
2011-09-29 (20-30-00).jpg loaded...
Gray scaling
Invert
Adaptive binarization
Average gray value
2011-09-29 (21-00-00).jpg loaded...
Gray scaling
Invert
Adaptive binarization
Average gray value
2011-09-29 (21-30-00).jpg loaded...
Gray scaling
Invert
Adaptive binarization
Start
Resume
Stop
Do not update
5/420

11.2. Time-lapse image capture

'Time-lapse capture capture' is available from the 'Tool' menu. The imaging source can be specified in the 'Image source' option.

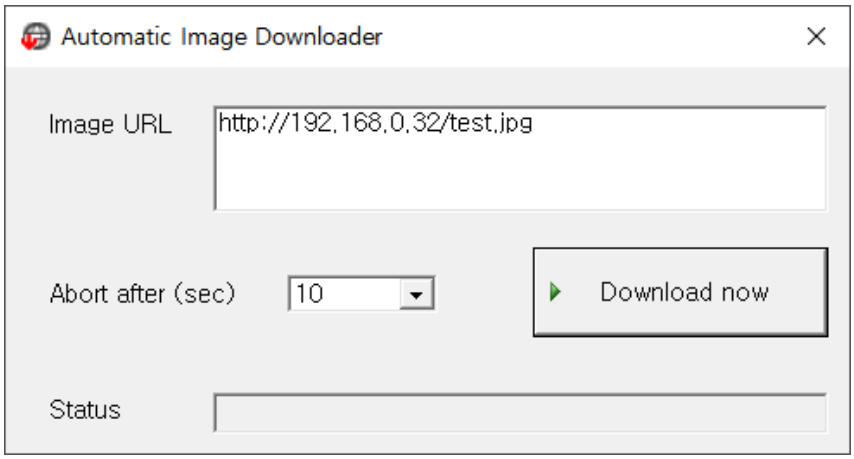


The user can select from the currently connected camera, Internet URL address, or current monitor screen. The 'Camera Error Check' option can set the termination condition when the camera is disconnected and the image is not captured normally. In the 'Time interval' option, the user can specify the time interval to capture, and check the 'User defined schedule' to program the imaging time in various ways. The time format of 'User defined schedule' is hh: mm: ss-hh: mm: ss (hh: mm: ss), indicating the start time-end time (imaging interval). When

multiple lines are entered, the lower the priority, the higher the priority. In the 'Save' option, the user can specify the format of the image file and the destination folder to be saved. If the user checks the 'Camera Error Email Notification' option, a warning email can be sent to a specified email address when camera errors occur. Time-lapse capture can be initiated by pressing the 'Start' button and finishing by pressing the 'Stop' button.

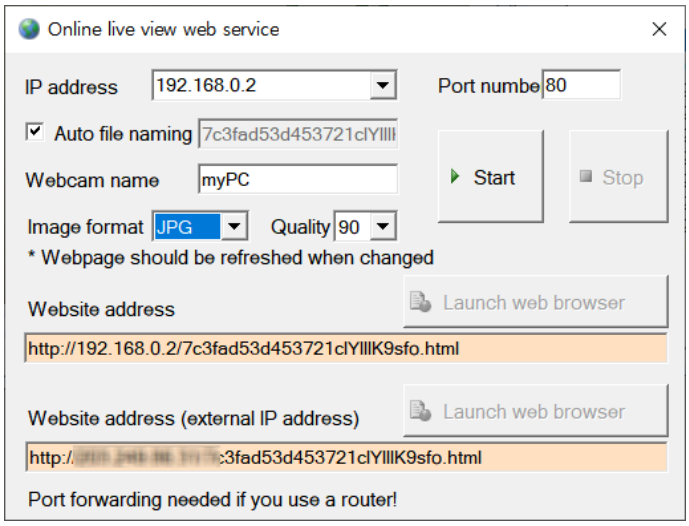
11.3. Automatic image downloader

The user can download images from a specific IP address or web address. This function can be linked with the time-lapse image capture function. When the user selects 'Image URL' as 'Image source' in the time-lapse capture function, images can be downloaded and saved at regular time intervals.

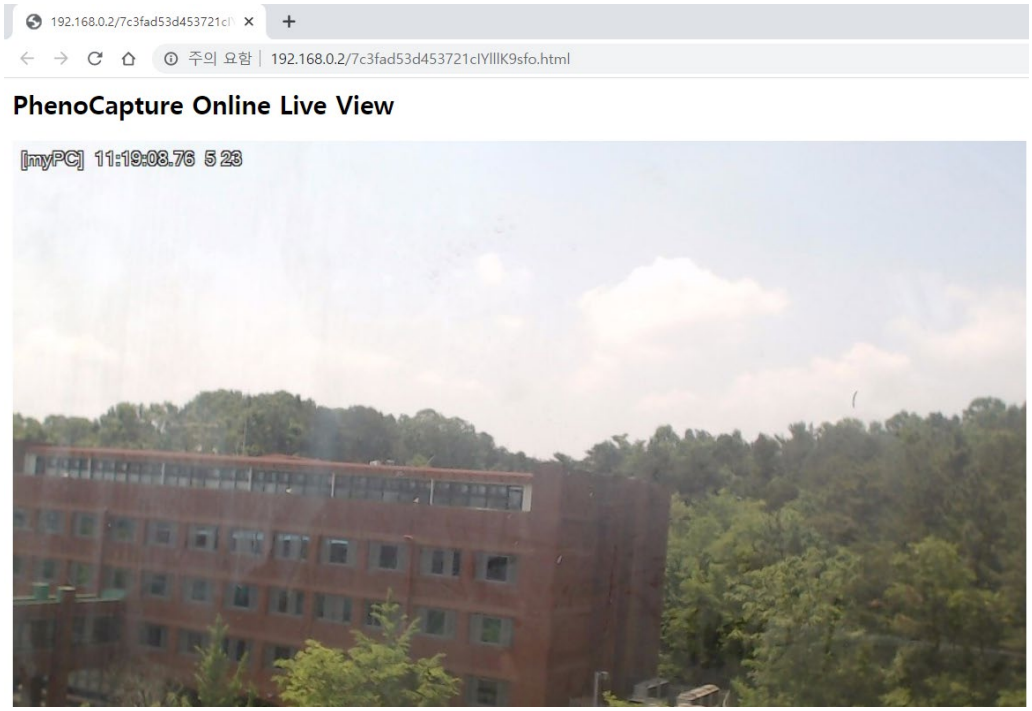


11.4. Online live view web service

- This function provides camera video streaming to view real-time images on the web browser. This is useful for viewing camera images connected to a remote PC through a mobile device. In order to view the webcam image on an external device, the user must set the router's 'port forwarding' to access it externally.

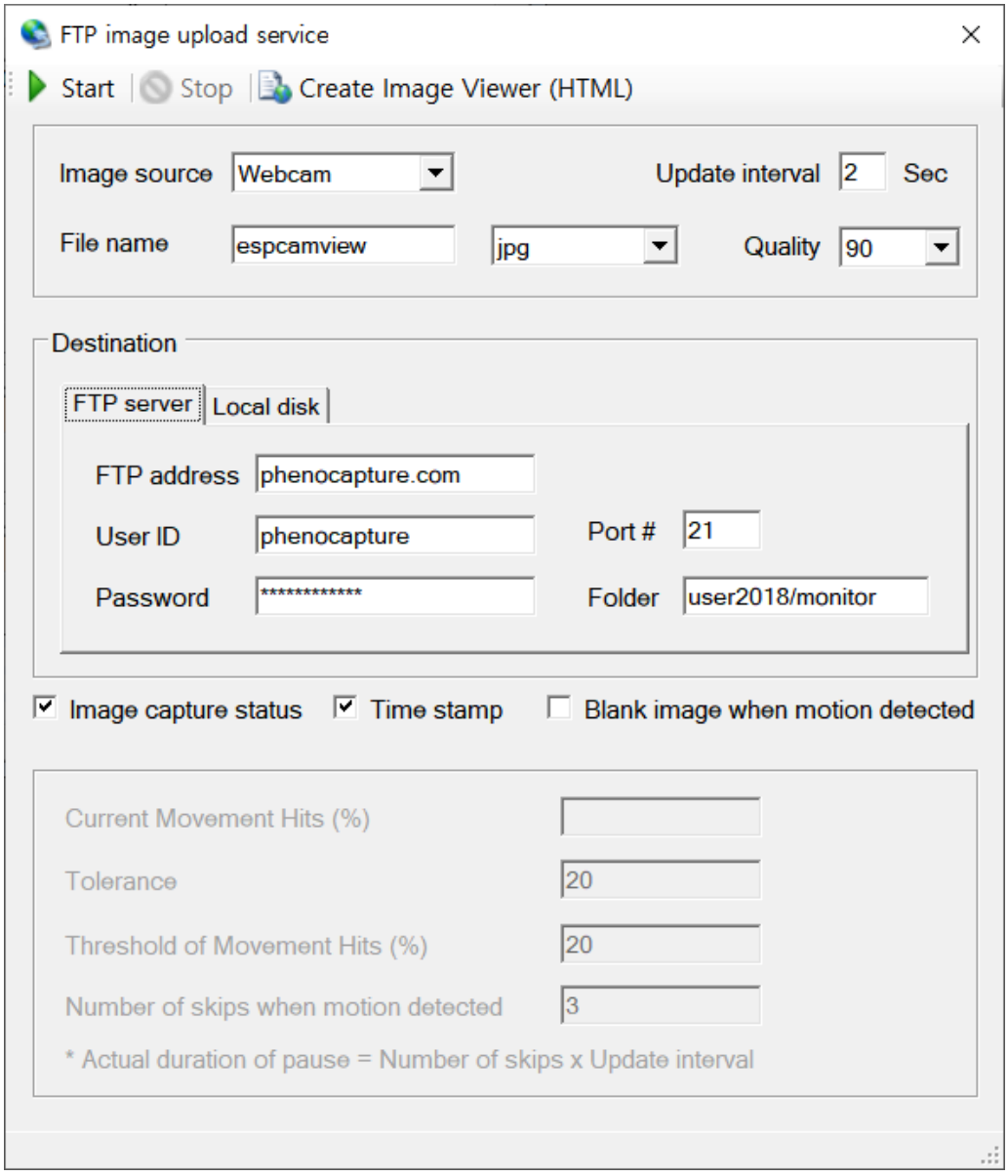


The following figure is a scene of checking the video by accessing the IP address with a web browser.



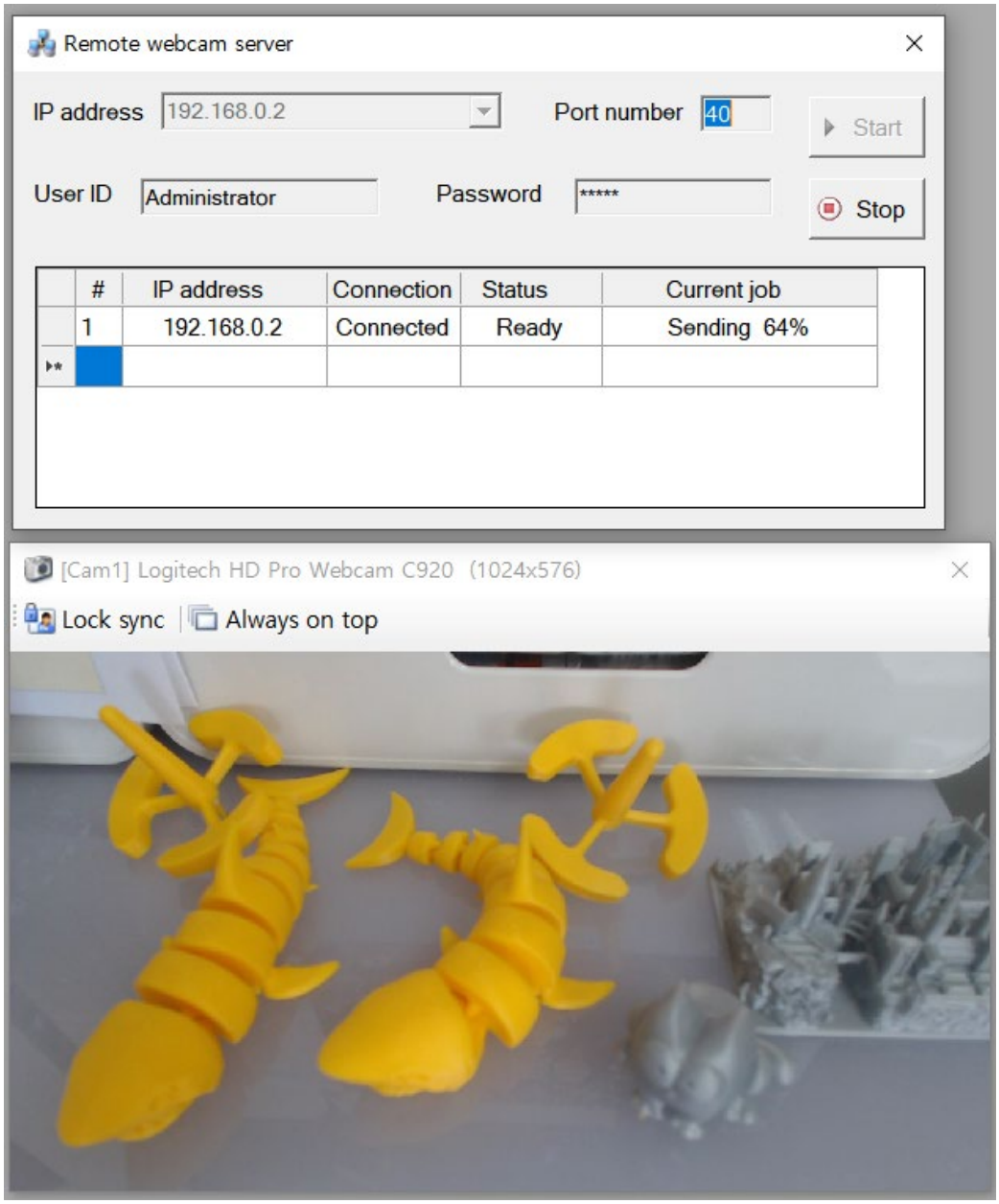
11.5. FTP image upload service

The user can upload images to the FTP server regularly. Both FTP and SFTP (secured FTP) modes are supported. If the 'Start' button is pressed while the camera is connected, the image upload starts. Click the 'Create Image Viewer (HTML)' button to create an HTML file to check the uploaded image on the FTP server. The user can upload this file to the FTP server and see the image being updated at regular time intervals. For privacy, if 'Blank image when motion detected' is checked, a blank image can be uploaded instead of the original camera image if an object appears.



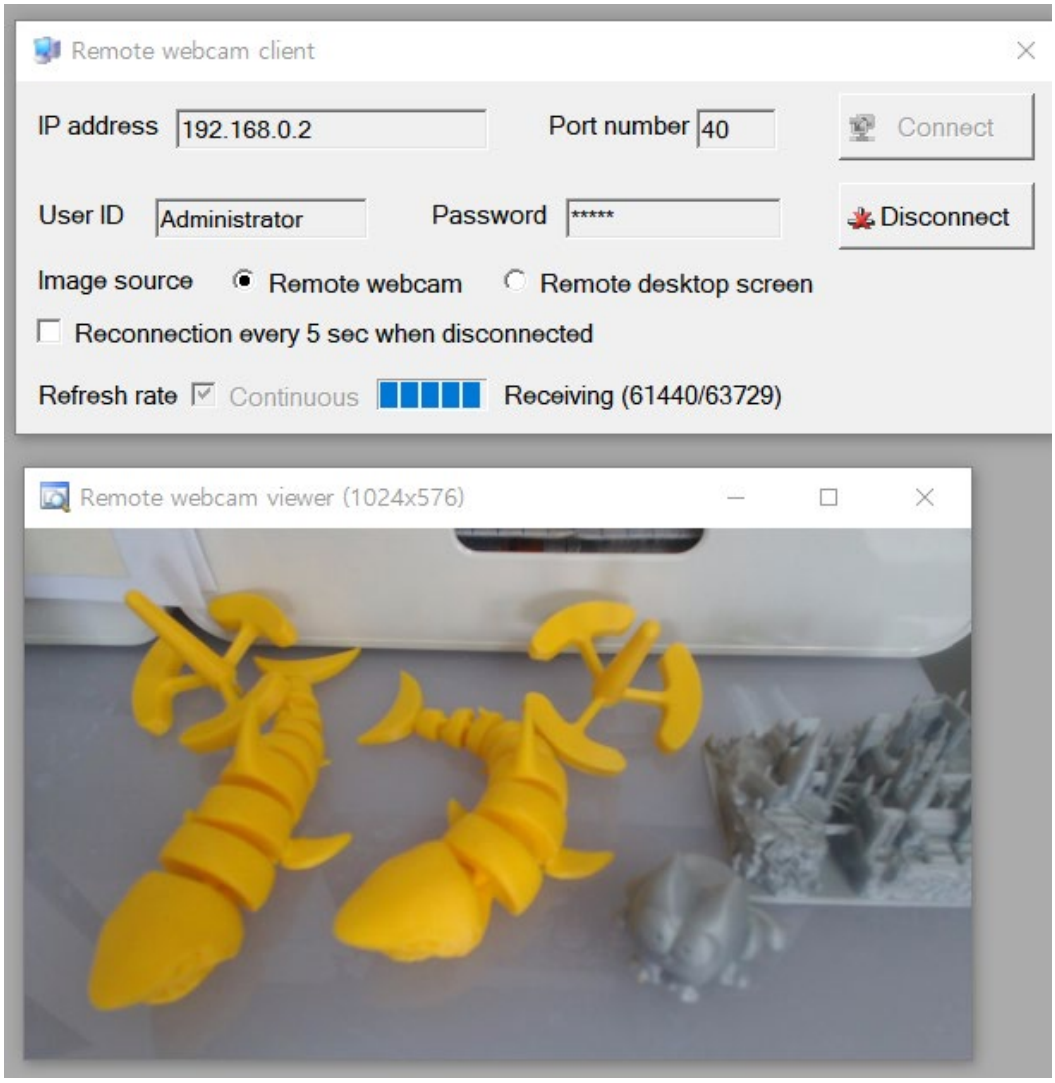
11.6. Remote webcam server

The user can build a webcam server. After making the PC to which the camera is connected as a remote webcam server, the user can download images by connecting to the server PC from another PC. Images can be simultaneously downloaded from multiple PCs connected to one webcam server. After setting any 'Port number', 'User ID', and 'Password' that can be accessed, press the 'Start' button to start the server operation.



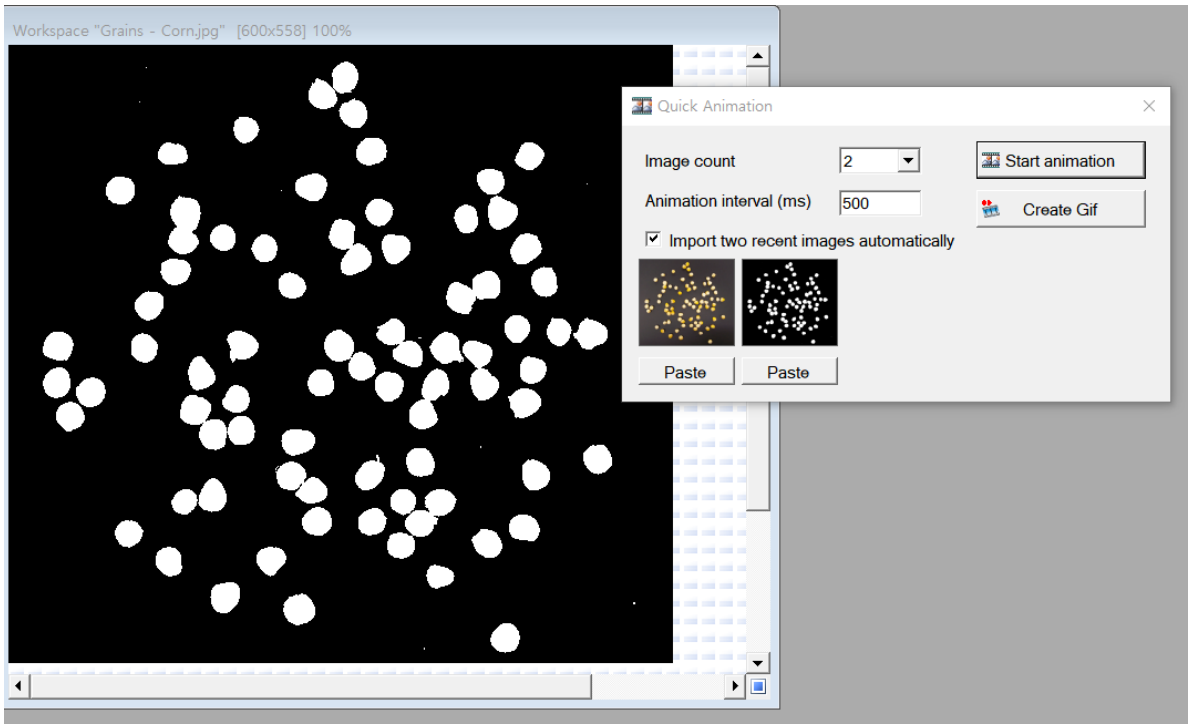
11.7. Remote webcam client

The user can connect to the webcam server and download the image. After setting the 'Port number', 'User ID', and 'Password' that can access the server, click the 'Connect' button to start downloading the image. This function can be linked with the time-lapse image capture function. When the user selects 'Remote webcam' as 'Image source' in the time-lapse capture function, images can be downloaded and saved at regular time intervals.



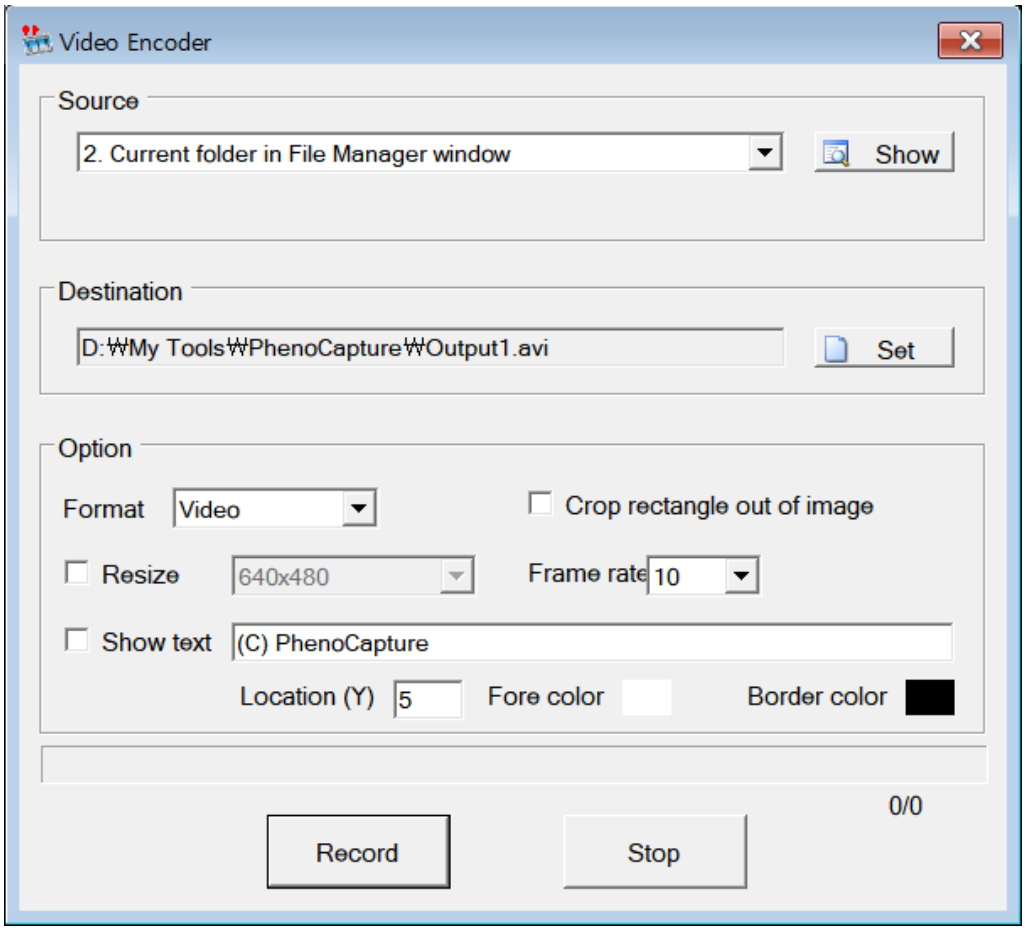
11.8. Quick animation

This function is to show animation from 2 ~ 5 images and create an animated GIF file. This is useful when the user needs to observe the difference between the two images. If the 'Import two recent images automatically' option is selected, the latest working images are automatically loaded.



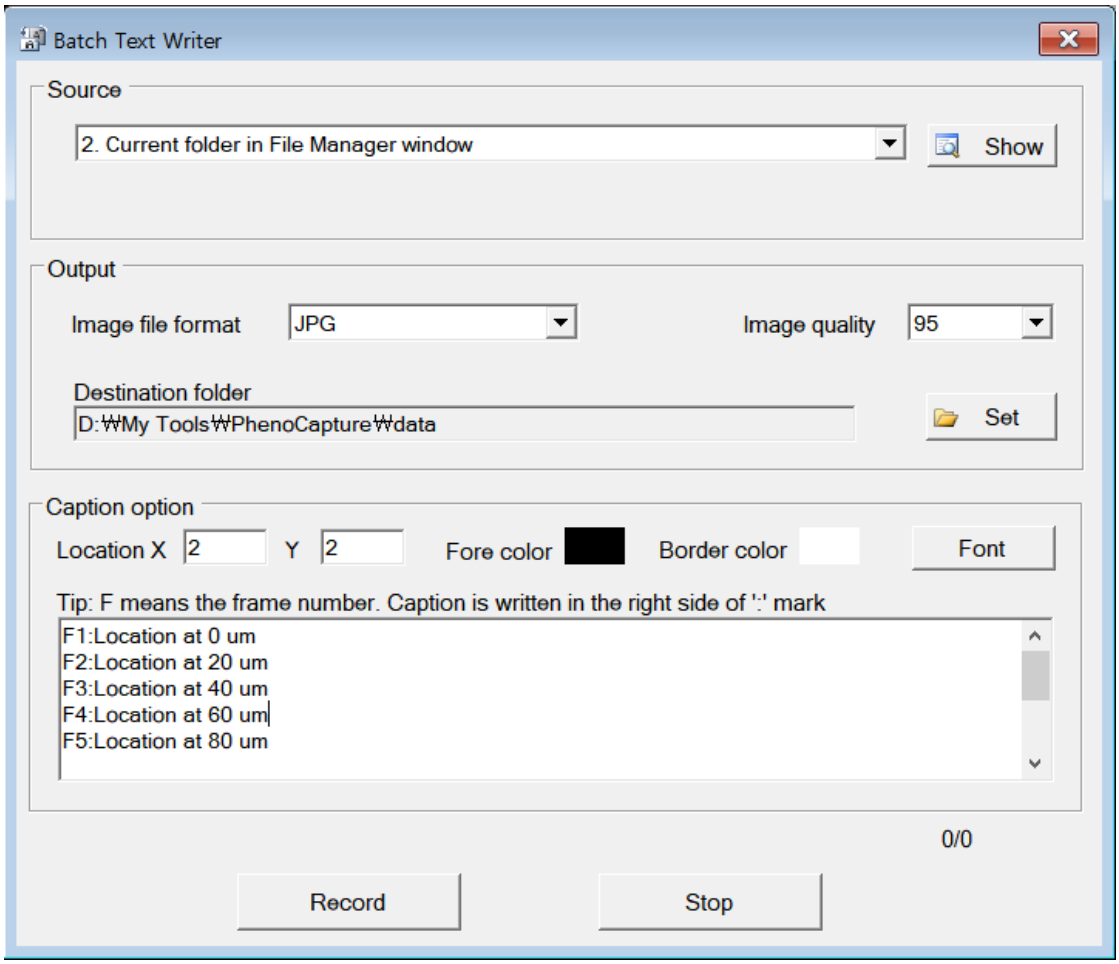
11.9. Create Video or Animated GIF file from images

The user can create a video or animated GIF file from multiple images. Depending on the type of compressed codec installed on the PC, the user can save as a variety of video files and as animated GIF files. When the 'Crop rectangle out of image' is checked, only a specific area of images can be saved as a video through the rectangle selection tool. When the 'Record' button is pressed, the video creation starts. When saving as a video file, a compression codec and a window for various settings appear first.



11.10. Batch text writer

The user can write text sequentially on multiple images. In the 'Source' option, specify the folder where multiple images are stored, and in the 'Output' panel, specify the image format, text font, and folder of the image file to be saved. Enter the coordinates and color of text output in the 'Caption option' panel. Text to be output for each image is entered in the text box below it. The format of the text to be input is F#: text, where # specifies the number of images to be displayed in the number.



11.11. Extract frames from Video file

The user can extract frame images from a video file. Specify the time to start and end the extraction in 'Range' and the time interval to extract in 'Interval'. When the 'Extract' is clicked, the currently viewed scene is saved as an image, and when the 'Extract all' button is pressed, the images are sequentially extracted from the time range set in 'Range' and saved as image files.