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Introduction to WinLab

WinLab is a powerful Image Processing tools able to satisfy the needs of both inexperienced and advanced users. Besides the opportunity of managing a number of different image formats, including the *JPEG* compression standard, WinLab also offers a wide choice of advanced processing tools.

WinLab supports any kind of image format up to 24 bpp full color images, 8 bpp grayscale, 256 colors

WinLab can perform: color correction/calibration, color format conversion (HSL, HSV, YUV, YIQ, CMYK, etc), on-line color palette changes (loading, saving), histogram equalization stretching specification, contrast/intensity change (many color spaces), resizing, rotation, zooming, color dithering (many algorithms), bit per pixel conversion, color channels split/merge (many color spaces), filtering (user defined masks, low/high pass, crispening, blurring, directional, autoregressive, edge preserving, etc), noise addition (gaussian, uniform), edge detection (many), edge thinning, segmentation, classification, image operations (add, sub, blend, etc), image masking, and many others.

WinLab fully supports floating selection inside images (rectangular, elliptical, segment/freehand, magic wand), each operation is transparently applied to the whole image or to the selection if any.

WinLab has supports tools bars for fast command access and floating selection operations.

The speed aspects have been carefully taken into account during the implementation of every WinLab module, from the access to image data to the more complex processing tools.

Many instruments have been introduced to improve the accessibility to the system functionalities even to less experienced users

The processing tools have been designed to have good performances in terms of speed/accurateness.

The interface of WinLab has been designed in order to be easy-to-use, configurable, ergonomic, compliant to windows standard.

The introduction of image folders gives the possibility to easily manage and access collections of images in different formats and in different places by an immediate and transparent interface.

WinLab has a built-in network support (any NETBIOS compatible layer) for folders, which enables to share images over a LAN in a transparent way, moreover you can send and receive an image or a folder through the use of the netproto.exe DDE server which is a window socket compliant application.

WinLab rely on the PhD TWAIN DDE server to fully support TWAIN compliant source handling, enabling image acquisition from any kind of device which is TWAIN compatible.

WinLab Menu

The top Menu of WinLab contains 6 entries:

<u>File</u>	Input/Output management (load, save, print commands)
<u>Edit</u>	Clipboard management (cut & paste commands)
<u>View</u>	Graphical interface configuration (tool bars setting)
<u>Image</u>	Image processing tools (manipulation, filtering, feature extraction)
<u>Options</u>	Interface and tools parameter settings
<u>Window</u>	Window management (tile, select, close operations)

File Menu

By selecting the commands contained in this menu it is possible to perform the following operations, related to image file creation, opening, saving, printing:

<u>New</u>	Creates a new image file or a new folder of given characteristics
<u>Open</u>	Opens an existing image file or folder
<u>Save</u>	Saves the currently selected image or folder with the same name
<u>Save As New</u>	Saves the currently selected image or folder with the a new name
<u>Remote Send To</u>	Allow to send the current image or folder to a remote host
<u>Acquire</u>	Acquire an image from a TWAIN compliant source (usually a scanner)
<u>Select Source</u>	Allow to select a TWAIN compliant source for acquiring
<u>Printer Setup</u>	Calls a procedure for setting up the default Printer driver
<u>Change Printer</u>	Changes the default printer driver
<u>Print Image</u>	Sends the current image to the printer
<u>Quit</u>	Exits WinLab

To get more information on a command, click on the desired topic

Edit Menu

By selecting the commands contained in this menu it is possible to perform several cut&paste operations on the current image or selection.

<u>Undo</u>	Cancels the last operation applied to an image
<u>Cut</u>	Deletes the current selection, copying it in the clipboard
<u>Erase</u>	Deletes the current selection without copying it in the clipboard
<u>Copy</u>	Copies the current selection in the clipboard without deleting it
<u>Shrink</u>	Creates a new image of the dimension of the current selection
<u>Paste</u>	Puts the content of the clipboard into a new selection or document
<u>Fill</u>	Fills the current selection with a predefined pattern
<u>Capture</u>	Accesses a sub-menu allowing to grab images from other windows and screen

To get more information on a command, click on the desired topic

View Menu

This menu contains some commands to configure the visual aspect of the WinLab graphical interface during a working session.

<u>Palette</u>	Shows/Hides the currently installed colour palette
<u>Selection Tools</u>	Shows/Hides the button-style selection tools
<u>Image Tools</u>	Shows/Hides the button-style image manipulation tools

To get more information on a command, click on the desired topic

Image Menu

This menu contains a lot of image processing tools, including geometrical manipulation (resizing, rotating, mirroring), zooming, color conversion, and image processing (filtering, contour extraction, segmentation, and so on).

<u>Info</u>	Displays some textual information on the current image
<u>Duplicate</u>	Creates a new image window exactly equal to the current
<u>Resize</u>	Changes the (x,y) dimension of an image (or selection)
<u>Rotate</u>	Performs a rotation on an image or a selection
<u>Flip (H/V)</u>	Mirrors (horizontal or vertical) the current image (or selection)
<u>Negative</u>	Calculates the negative of an image (or selection)
<u>Zoom (I/O)</u>	Zooms in or out the current image by a given factor
<u>Normal View</u>	Clears every previous zoom command
<u>Convert to</u>	Performs all color/bw conversions on the current image
<u>Change Depth</u>	Quantizes (over or under) the pixels of the current image
<u>Split RGB Channels As</u>	Create new images from the channels of the selected color space
<u>Combine RGB Channels From</u>	Creates a full RGB image from channels of the selected color space
<u>Filtering</u>	Accesses a sub-menu containing the image filtering algorithms
<u>Special</u>	Accesses a sub-menu containing other image processing algorithms
<u>Equalization</u>	Accesses a sub-menu to performs some image processing algorithms based on histogram
<u>Compute</u>	Accesses a sub-menu to performs mathematical operations involving two or more images (add, compose, ...)

To get more information on a command, click on the desired topic

Options Menu

Displays a dialog to allows the user to customise the default settings of WinLab, for what concerns image handling, input/output options, color palette management, memory usage, network interface file formats, etc..

<u>Use memory DIB</u>	Set/Reset memory storage of device independent bitmaps (waste memory if set)
Disable Undo Buffers	Set/Reset memory storage for undo buffers (use more memory if set)
<u>Adjust palette on WinLab</u>	Set/Reset palette changes adjustment among displayed images
<u>Adjust palette on external</u>	Set/Reset foreign applications palette changes adjustment
<u>Display Dithering</u>	Set the default dithering method for displaying true color images
<u>Display RGB Conversion</u>	Set the default color quantization scheme for displaying true color images
<u>Clipboard Format</u>	Set the format for clipboard storage of image data
<u>Toolbars</u>	Sub Menu for toolbars settings
Remote send/receive enabled	Enable to remotely send or receive documents trough the use of the network DDE server <u>netproto</u>
it is possible for certain file formats to set load/save parameters by choosing the desired format and pressing the Load or Save buttons, user configurable file formats are:	
<u>JPEG Image Format</u>	Set the parameters for JPEG I/O
<u>TIFF Image Format</u>	Set the parameters for TIFF I/O

It is possible to overlap a grid on images by selecting the Show Grid check box and choosing the grid pixel spacing

It is possible from this dialog to access dialogs for user defined filters to be added to the Image menu and to setup parameters for some Tool bars tools.

Important Notes:

WinLab supports threading operations, that is the user can performs other tasks on images being not processed. This feature can be switched off by unselecting the **Monitoring/Threading** checkbox, this will cause WinLab to not release CPU until the requested operation has been completed, also progress monitoring bar will be disabled, moreover will be no more possible to cancel the current operation using the ESC key. There is no real need to switch this options off.

WinLab supports multiple instance of itself running at the same time, if the options for threading operations is enabled, the different copy of WinLab can perform different operation at the same time in a cooperative multitasking fashion.

WinLab tries to use the minimum amount of memory required by the selected operation, so sometimes it may perform in-place operation on images (modification of the original data while processing, rather than a copy of them), if the Undo memory buffers is disabled, to interrupt an operation can result in a loss of the original unmodified data (this is also the case of low-memory then allocating the undo buffer)

To get more information on a command, click on the desired topic

Window Menu

The Window Menu contains the classical commands of a Windows MDI interface. Besides the first section of commands, an additional section shows all the opened windows (image files and folders), and allows to select the active window by directly clicking on the corresponding name.

<u>Tile</u> (horizontally or vertically)	Organises the non-iconized windows on the MDI child windows as tiles
<u>Cascade</u>	Organises the non-iconized windows on the MDI child windows as a cascade
<u>Arrange Icons</u>	Organises the iconized windows on the MDI child windows
<u>Close Active</u>	Closes the currently active window
<u>Close All</u>	Closes all the iconized and non-iconized windows

At the end of this menu there is a list of all the currently open documents, selecting such items will cause the selected document to become the active one

To get more information on a command, click on the desired topic


New

The command **New** (Menu **File**) can be used to create a new WinLab folder or a new image file of given characteristics. It displays a choice between:

Folder: an empty image folder is immediately created with the temporary name of "*noname.wfl*". If the folder is used and never saved after the creation, the user is prompted on quitting for a new filename.

Image: a dialog box is displayed, in which the required parameters for the creation of the new image can be defined. The values to be specified are the following:

<u>Color format</u>	RGB (true color image, 24 bit per pixel) Grayscale (256 levels of gray image, 8 bit per pixel) Colormap (colormapped image, 16 or 256 colors)
<u>Colors</u>	Number of colors (for colormapped images)
<u>Xdim</u>	horizontal dimension (in pels)
<u>Ydim</u>	vertical dimension (in pels)
<u>Colors</u>	Displays a dialog for the selection of the background color (for true colors images).

You can create a new document using the  button from the tool bar

Open

The command **Open** (Menu **File**) can be used to load an existing WinLab folder or image file. In both cases it displays a dialog box for the browsing of the file.

Folder: It is possible to select the disk drive, the directory and a filename. In the case of network connected working stations (with MS Windows for WorkGroups installed) a "**Net**" button is also present, allowing the browsing of a remote site.

The default extension is ".wfl" (**W**inLab **F**older) but it is not mandatory. The only available file format is the custom WinLab folder.


Image: It is possible to select the disk drive, the directory and one or more filenames. In the case of network connected working stations (with MS Windows for WorkGroups installed) a "**Net**" button is also present, allowing the browsing of a remote site.

By default, the standard extensions of all the available file formats are displayed (.tif, .gif, .jpg, and so on), so allowing a rapid browsing of the archive by mouse selection only. It is possible to highlight one or more consecutive (keeping pressed the *shift* key) or non-consecutive (keeping pressed the *Ctrl* key) files: when the **OK** button is clicked, all the images are opened in sequence.

if the preview checkbox is checked, a preview of the images will be shown on a thumb nail image, there are also checkbox to select only the preview of JPEG files and to select only grayscale preview for JPEG files.


Up to know the preview will require to read the whole image file for all format but the JPEG one, which is a loaded faster than the whole image would be.

It is possible to directly set load/save parameters for some file formats by pushing the Options button
To see a description of the available image formats and of the related read/write parameters click here [IMAGE FORMATS](#)

You can open a new document using the  button from the tool bar

Save

The command **Save** (Menu **File**) performs an instant saving of the currently selected image or folder, without prompting for a file name; in the case of generated images (e.g., images created with the **duplicate** command) the automatic generated filename is used.

You can save the current document using the  button from the tool bar

Save As New

The command **Save As New** (Menu **File**) can be used to save the currently selected WinLab folder or image into a file. In both cases it displays a dialog box for the introduction of the filename.

Folder: It is possible to select the disk drive, the directory and the filename. In the case of network connected working stations (with MS Windows for WorkGroups installed) a "**Net**" button is also present, allowing the saving on a remote site (if permitted). The name can be either selected among the listed files or typed: in both cases, if the file already exists the user is prompted for a confirmation before overwriting the folder.

The default extension is ".wfl" (**WinLab Folder**) but it is not mandatory. The only available file format is the custom WinLab folder.

Image: It is possible to select the disk drive, the directory and the filename. In the case of network connected working stations (with MS Windows for WorkGroups installed) a "**Net**" button is also present, allowing the the saving on a remote site (if permitted). The name can be either selected among the listed files or typed: in both cases, if the file already exists the user is prompted for a confirmation before overwriting the image.

The format in which to save the image must be selected in the listbox, and the correspondent standard extension(s) is visualized in the filename box.

To see a description of the available image formats and of the related read/write parameters click here [IMAGE FORMATS](#)

Printer Setup

The command **Printer Setup** (Menu **File**) activates the Windows standard dialog box for the set up of the current default printer. The options available in the dialog box change with the installed printer driver, but include in general: resolution, paper size and orientation, paper source and number of copies.


Change Printer

The command **Change Printer** (Menu **File**) activates the Windows standard dialog box for the choice and setting of the default and specific printer to which the images are sent. Changing the default printer affects all the Windows applications, while setting the specific printer has effect only for WinLab printouts. The **Options** button activates a number of printer-dependent settings sub-menu.

Print Image

The command **Print Image** (Menu **File**) sends the currently selected image to the default (or specific) printer. A dialog box is displayed, that allows to specify the following parameters:

<u>Maintain aspect</u>	Maintain the aspect ratio when checked
<u>Number of copies</u>	Allows to specify the number of equal pages to be printed
<u>Fit page</u>	If checked, resizes the picture in order to fit the selected page format
<u>Center Horizontal</u>	If checked, centers the printed picture horizontally on the page
<u>Center Vertical</u>	If checked, centers the printed picture vertically on the page
<u>Width</u>	Specify the image width on the paper
<u>Height</u>	Specify the image height on the paper

To print the active image you can use the button  from the tool bar.

Quit


The command **Quit** (Menu **File**) terminates the current session of WinLab. It is equivalent to double-click on the top-left button of the WinLab window.

If some image or folder has been create or modified and the changes was not saved, the user is prompted for each of them.

Undo

The **Undo** command (Menu **Edit**) allows the user to cancel the last operation made on an image. After the execution of the Undo command, the situation prior to the last action is completely restored: this can be useful to invalidate the results of a wrong operation or to test some different processing tools without damaging the image.

Currently, WinLab provides only a one-level Undo command; it is therefore impossible to cancel the effects of two consecutive operations, but separated undo buffers for each image are supported.


You can perform the undo operation on the current image using the  button from the tool bar

Cut

The **Cut** command (Menu **Edit**) erases the current selection, and puts the corresponding area of the picture in the clipboard for successive use (**Paste** command) using the current Clipboard Format as specified in the Options. The previous clipboard content is lost.

The same action can be performed by applying in cascade the commands **Copy** and **Erase**.

This command can be activated by the shortcut *Shift+Del*.

You can perform the cut command on the current image/selection using the  button from the tool bar

Erase


The **Erase** command (Menu **Edit**) erases the portion of the image contained in the current selection, without putting the corresponding area of the picture in the clipboard.

This command can be activated by the shortcut *Del*.

Copy

The **Copy** command (Menu **Edit**) copies the current selection in the clipboard for successive use (**Paste** command) using the current Clipboard Format as specified in the Options. The previous clipboard content is lost.

This command can be activated by the shortcutkey *Ctrl+Ins*.

You can perform the copy command on the current image/selection using the  button from the tool bar

Shrink to Selection

The **Shrink to Selection** command (Menu **Edit**) generates an image of lower/equal size, containing only the currently selected area. If the selection is not rectangular, the new image has a dimension equal to the smallest including rectangle.

Since this command does not generate a new image, the complete image is lost. To create a new window, use in cascade the commands **Copy** and **Paste** (with the option "**as new image**").

Paste

The **Paste** command (Menu **Edit**) copies the content of the clipboard in the currently selected image or in a new image, depending on the chosen option. Three possibilities are provided:


As New Image A new image is created containing the data stored in the clipboard

As New Selection The clipboard content is put as a new selection in the active image window, where can be positioned and pasted, the current selection if any

is deleted.

Inside Selection The clipboard content is stretched in order to fit the current selection in the active image window.

When pasting from clipboard into an image or selection, WinLab automatically handles the conversion of color format and bit per pixel to match that of the current image/selection.

You can perform the paste command using the  button from the tool bar the kind of paste operation can be selected by left clicking over that button tool.

An alternative way to paste a selection from one image into another is to use the button  from the tool bar, see also the Selection Window

Palette

The **Palette** command (Menu **View**) enables/disables the visualisation of the Palette Window. When enabled, a check symbol is set near the menu item.

Selection Tools

The Selection Tools command (Menu **View**) enables/disables the visualisation of the toolbar containing the instruments for the definition of image selections. When enabled, a check symbol is set near the menu item.


Image Tools

The **Image Tools** command (Menu **View**) enables/disables the visualisation of the toolbar containing the instruments for the geometrical manipulation of images and selections. When enabled, a check symbol is set near the menu item.

Information on Current Image


The **Info** command (Menu **Image**) gives some info on the currently selected image:

<u>Name</u>	Image name (name of the file in which it is stored or generated name)
<u>Format</u>	Image format (<i>BMP, TIF, ...</i>)
<u>Height</u>	Number of image rows (vertical dimension in pixels)
<u>Width</u>	Number of image columns (horizontal dimension in pixels)
<u>Depth</u>	Number of bits for each pixel (e.g., 256 levels of gray = 8 bpp depth)
<u>Xres/Yres</u>	Resolution at which the image was acquired (measured in <i>dots per inch</i>)
<u>Type</u>	Full color/black&white/colormapped image
<u>Modified</u>	Shows if an image needs or not to be saved

You can perform the info command using the  button from the tool bar

Duplicate

The **Duplicate** command (Menu **Image**) generates a new image exactly equal to the currently selected one.


You can perform the duplicate command using the  button from the tool bar

Resize

The **Resize** command (Menu **Image**) performs a resampling of the current image or the active selection. A dialog box is displayed, that shows the current dimension and resolution of the image (or selection) and gives the possibility to specify the desired values:

<u>Original Dimension</u>	Shows the initial horizontal and vertical size of the image to be resized
<u>Aspect Ratio</u>	Is the ratio between the X and Y size (horiz./vert.) of the original image
<u>Fixed</u>	If the box is checked the parameters are automatic adjusted to maintain unchanged the original aspect ratio (image resized but not deformed).
<u>Dot per Inch</u>	Allows to modify the setting of the acquisition resolution. It has not a direct effect on the image, but affects the printing parameters.
<u>New Dimensions</u>	Allows to specify the desired horizontal and vertical size of the image. If the Aspect Ratio is fixed (box checked) the two parameters are inter-dependent.

If the resize command is applied to a selection, the original size correspond to the X,Y dimensions of the bounding rectangle. After resizing the contour of the selection is resized by the same factor and remains active for successive operations. The resized selection maintains the position of the left-top corner of the bounding rectangle.


You can perform the resize command using the  button from the tool bar

Rotate

The **Rotate** command (Menu **Image**) performs a rotation of the current image or the active selection. A dialog box is displayed, asking for a rotation angle (in degrees): positive values produce clockwise rotations, negative values counter-clockwise rotations.

If the rotate command is applied to an *image*, the dimension of the resulting image is such as to contain all the rotated picture (in general larger); the points not belonging to the picture are set to the background color.

If the rotate command is applied to a *selection*, the image maintains the size unchanged. After the rotation, the contour of the selection is rotated by the same angle and remains active for successive operations. The rotation center is the centroid of the bounding rectangle.

You can perform the rotate command using the  button from the tool bar

Flip Horizontal - Flip Vertical

The **Flip Horizontal** and **Flip Vertical** commands (Menu **Image**) perform an horizontal or vertical mirroring of the image (or active selection). This operation does not introduce any variation in the size of the image or on the dimension of the bounding rectangle of the selection.

If the flip command is applied to a *selection*, the contour of the selection is equally mirrored and remains active for successive operations. The axis for the flip operation is the central axis of the bounding rectangle.


You can perform the flip horizontal or vertical commands using the  buttons from the tool bar

Negative

The **Negative** command (Menu **Image**) produces a photographic negative of the current image or selection. The value of each pixel is changed to its complementary, i.e.:

$$pixel(x,y) = max_value - pixel(x,y)$$

where `max_value` is computed on the basis of image characteristics (e.g., for a 8 bpp gray level image, the maximum intensity value is 255).


You can perform the negative commands using the  buttons from the tool bar

Zoom In/Out and Normal View

The **Zoom in** and **Zoom out** commands (Menu **Image**) allow the user to visualize and work on the currently selected image in an enlarged or reduced way. After choosing the zoom commands a sub-menu is visualized where the zoom factor can be specified (by entire numbers): a factor 1:N means that the image would be represented on screen at a dimension N times larger or shorter than the original.

The **Normal View** (Menu **Image**) command can be used to restore the normal size visualization of the image.

The Zoom In, Zoom Out and Normal View commands do not modify at all the content of the image to which they are applied.

You can perform the zoom commands only if a selection is defined using the  buttons from the tool bar

Convert to

The **Convert To** sub menu (Menu **Image**) allows to convert the color format of the current image:

There are the following menu entries:

Gray Scale	Converts the image to gray scale 256 levels (8 bpp)
Black and White	Converts the image to 2 levels black and white (1 bpp) using Floyd-Steinberg
Palette ...	Converts the image to a colormapped image (8 bpp)
RGB Full color	Converts the image to a full color RGB image (24 bpp)

The selection if any is equally converted

Change Depth

The Change Depth sub menu (Menu **Image**) allows to change the number of bit per pixel for the active image, this is useful for example for applying filters on a black and white image or to save an image in a file format which do not supports a given number of bit per pixel etc.

You can change the number of bit per pixel to 1,4,8,24, when converting to 1 bit per pixel a gray scale image WinLab perform a thresholding to obtain 2 levels.

N.B. The selection if any is deleted (use copy paste to preserve it or use the Selection Window)

Split RGB Channels As

The **Split RGB Channels** sub menu (Menu **Image**) allows to create new images from the channels of the selected color space for the current image (only for full color RGB images)

There are the following menu entries:

RGB	Create 3 new images name.R, name.G, name.B
YIQ	Create 3 new images name.Y (intensity), name.I, name.Q
HSL	Create 3 new images name.H(hue), name.S(saturation), name.L(luminance)
CMYK	Create 4 new images name.C (Cyan), name.M (Magenta), name.Y (Yellow), name.K (Black)
YUV	Create 3 new images name.Y (intensity), name.U, name.V

Combine RGB

The **Combine RGB Channels From** sub menu (Menu **Image**) allows to create a full RGB image from channels of the selected color space (only from gray scale images)

There are the following menu entries:

RGB	Create a new image name.RGB
YIQ	Create a new image name.YIQ
HSL	Create a new image name.HSL
CMYK	Create a new image name.CMY
YUV	Create a new image name.YUV

Each menu entry displays a dialog box allowing to specify image names (all allowed names are listed in the list boxes) to be used as sources for the color component, the order is the same of the corresponding color space (e.g. for RGB Source1 = R, Source2 = G, Source2 = B)

Filtering

The **Filtering** sub-menu (Menu **Image**) allow to apply different image filtering algorithms:

User Defined ...	displays a dialog to specify a user defined filter mask, you can save or load it from file and use then the User Defined filter entry in the <u>Options</u> Menu to add it to the Filter Menu as Custom Filter
Low Pass	apply a low pass filter
High Pass	apply a high pass filter
Band Pass	apply a band pass filter (not implemented yet)
Crispening 1	edge crispening heavily
Crispening 2	edge crispening
Directional X	enhance horizontal direction (vertical edges)
Directional Y	enhance vertical direction (horizontal edges)
Auto Regressive	The same as User Defined filter but performs a recursive filtering
Moving Average	sub menu to apply a moving average filter (blurring) of 3,5,7,9,11 mask size
Median ...	apply a median filter of a given mask size for a given number of times
Morphology (Min,Max)	apply a maximum or minimum filter of a given mask size
Edge Preserving Blurring &1 &2	Perform an edge preserving blurring using a given noise power for a given number of times

At the very end of this Menu there are the entries for the custom defined filters with their names as specified in the User Defined dialog

Special

The **Special** sub-menu (Menu **Image**) contains other image processing algorithms

Add &Noise ... add uniform or gaussian noise to the current image

Edge Detection sub menu to apply edge detection algorithms (create new images)

Sobel ... apply Sobel operator with a given threshold

Gradient Thresholding ... apply gradient thresholding with a given
threshold

Marr &Hildreth ... apply the Marr-Hildreth operator with a given
variance (directly connected with the mask size) and a given threshold.

Fast Edge Thinning performs edge thinning on a 2 colors image

Segmentation sub menu to apply segmentation algorithms (create new images)

K-Means ... performs a K-Means clustering with a given
number of cluster and a given number of iterations

Fill Segmentation performs a fill region growing algorithm
with a given threshold, allows to remove small regions and to find edges instead of label images.

Equalization

The **Equalization** sub-menu (Menu **Image**) performs some image processing algorithms based on histogram

Histogram Equalization

Equalization	performs an istogram equalization (try to get an uniform integral)
Uniform	apply an uniform histogram mapping
Exponential	apply an exponential histogram mapping
Rayleigh	apply an Rayleigh histogram mapping
Cube Root	apply an Cuberoot histogram mapping
Logarithm	apply an Logarithmic histogram mapping

Istogram Rescaling ... Perform an histogram stretching given two thresholds being the low and high pixels percentuage to cut out

Istogram Specification Not implemented yet

Color/Gray Correction Displays a dialog box allowing to do color or gray level calibration on the current image/selection

Compute

The **Compute** menu entry (Menu **Image**) displays a dialog which enables to perform mathematical operations involving two images or more images the operations are:

Add	$(Src1 + Src2)/Scale + Shift$	
Sub	$(Src1 - Src2)/Scale + Shift$	
Multiply	$(Src1 * Src2)/255$	
Difference	$Abs(Src1 - Src2)$	
Blend	$Src1 * Perc + Src2 * (1 - Perc)$	Perc=Scale/100
Composite	$Src1 * Perc + Src2 * (1 - Perc)$	Perc=Mask/255
Lighter	$Max(Src1, Src2)$	
Darker	$Min(Src1, Src2)$	
Extract	Not Implemented yet	

Sources must have the same dimensions and color formats (only 8 or 24 bpp allowed), a new image is created.

Use memory DIB

Use memory DIB Set/Reset memory storage of device independent bitmaps, note that if selected more memory is used to display images, try disabling this option if running out of memory

Adjust palette on WinLab Images

Adjust palette on WinLab Set/Reset palette changes adjustment among displayed images

WinLab automatically updates all images displayed if a palette change occurs, this can happen if the user activates a different image or folder having a palette (even if a full color image displayed on a palette based device) different to the previous one, disabling this option will cause WinLab to not update the screen (only the currently active document will display correctly).

Adjust Palette on External Images

Adjust palette on external Set/Reset foreign applications palette changes adjustment

WinLab automatically updates all images displayed if a palette change occurs disabling this option will cause WinLab to not update the screen when a different application realizes a new palette.

Display Dithering

Display Dithering Set the default dithering method for true color images

there are currently 3 possible choices

None:	Do not perform any dithering
Floyd-Steinberg	Use Floyd-Steiberg error diffusion (good results but slow)
Ordered	Use Ordered pattern dithering (poor results but faster)

WinLab ignores this selection when it detects a non palette based display driver, that is if the currently installed display driver support more than 32k colors, WinLab always displays full colors images without dithering.

Display RGB->Palette Conversion

Display RGB Conversion Set the default color quantization scheme for displaying full color RGB images

there are currently 4 possible choices

No Conversion	Do not perform color quantization
Quantize 256 color	Use a simple 3-3-2 bit allocation for RGB channels to produce a palette, the color palette is the same for each RGB image
Median Cut RGB	Use the median-cut algorithm to carry out a color palette for each image
Adaptive each image	Use an orthogonal balanced palette (same number of levels for channel), the color palette is the same for each RGB image

Using the Median Cut algorithm will cause a different palette for each full-color image to be used, hence a complete display redraw will occur when switching between full-color images.

WinLab ignores this selection when it detects a non palette based display driver, that is if the currently installed display driver support more than 32k colors, it always displays full colors images without color quantization.

Clipboard Format

Clipboard Format Set the format for clipboard storage of image data

WinLab currently supports 3 clipboard formats

Window device dependent Bitmap (BMP)
Window Device Independent Bitmap (DIB)
Aldus TIFF 5.0

The currently selected clipboard format will affect only writing operation into the clipboard, since the pasting from the clipboard will take any format WinLab can support.

The shape of the current selection is stored in a custom clipboard format, and is separated from the actual image data, so the latter could be used from another application.

Due to the Windows Bitmap formats limitation, not all image format (color format and bit per pixel) supported by WinLab can be stored in the clipboard if one of this format is selected, on the other side the TIFF format fully support all image color and depth format.

Toolbars

Toolbars

Set the visualization mode for the toolbars

There are 2 possible choice:

Floating Tool Bars
top of the

If selected the tool bars are displayed as floating window always on MDI child windows, otherwise they have a fixed position

Vertical Tool Bars
otherwise

If selected the tool bars are vertically oriented, horizontally

WinLab automatically place the tool bars when the Floating Tool Bars Options is disabled, taking into account the Main window sizes.

see also: [tool bars](#)

JPEG Image Format

JPEG Image Format dialog is for setting the parameters for JPEG co/decompression.

For the Load/Decompression parameters:

color type radio buttons set the color format when loading a jpeg image

number of colors editbox set the desired number of color when requesting a colormapped image

speed Vs quality radio buttons select wich dct routines to use: fast integer (less accurate) or slow integer (accurate)

color quantiz. checkbox will select one pass only color quantization (faster)

Dithering radio buttons select wich kind of color dithering to use

Rescaling factor will rescale down the image by a given factor (faster for preview load)

For the Save/Compression parameter:

The **Quality** scroll bar and edit set the requested quality (1-100) the higher the number the lower the compression factor.

The **Entropy Optimization** checkbox will select the use of a two pass huffman coding (compute huffman tables dinamically on the given image), slow down the compression if set.

The **Arithmetic Coding** radiobutton will select the alternate entrophy encoder for dct coeff (not available)

The **Huffman Coding** radiobutton selects the huffman entrophy encoder for dct coeff (default)

TIFF Image Format

The **TIFF Image Format** dialog is for setting the parameters for TIFF format image saving:

The **Contigüe** and **Separate** radiobuttons select the color samples arrangement (e.g. RGB or RRR...GGG....BBB)

The **Tile** checkbox selects the output of a tiled tiff file (not implemented yet)

The **Lsb Msb** and **Msb Lsb** radio buttons select the byte ordering (default is Msb Lsb for INTEL machines)

The **Compression** radio buttons select the compression schemes to be used (G3 and G4 not implemented yet)

The **LZW Predictor** check and edit set parameter and use of a DPCM predictor for LZW compression.

The **Group 3** check boxes select parameter for the Group 3 compression (not implemented yet)

Tile

Tile

Organizes the non-iconized MDI child windows as tiles (vertically or horizontally)

Cascade

Cascade

Organizes the non-iconized MDI child windows as a cascade

Arrange Icons

Arrange Icons Organizes the iconized MDI child windows

Close Active

Close Active Closes the currently active window

Close All

Close All

Closes all the iconized and non-iconized windows

File Formats

WinLab currently supports the following image formats:

Format Name	File Extensions	I/O Capabilities	Comments
Windows 3.0/3.1 Bitmap	.bmp,.dib	Read/Write	
Raw Data	any	Read/Write	
CompuServe Gif	.gif	Read/Write	
Hp Starbase	.img	Read/Write	
Aldus TIFF V5.0 library)	.tif	Read/Write	No Group G3 G4(TIFF
Targa bpp	.tga	Read/Write	Read: all. Write: 8,24
Amiga IFF (ILBM) HAM	.iff	Read/Write	Read: all. Write: no
JPEG (JFIF file format)	.jpg;.jpe;.jp;.j	Read/Write	Use IJG jpeg library
Paintbrush	.pcx	Read	
Encapsulated Postscript	.eps	Write	

You can set writing options for TIFF and JPEG format by using the [Options](#) dialog

WinLab currently supports the following custom document formats:

Format Name	File Extensions	I/O Capabilities	Used for
WinLab Folder V1.0	.wfl	Read/Write	Open/Save As
WinLab Filter V1.0 Options	.wft	Read/Write	User Defined and
WinLab Palette V1.0	.wcm	Read/Write	Palette Window

Selection Window



The Selection Window is a special child window that could be used to temporary store one or more selections dragged and dropped from any image. The selection window automatically place a copy of the dropped selection (remember that new memory is allocated for each copy) and displays it as a reduced version.

You can drag and drop one of the selection into the selection window into any other image, after dropping a selection out from the selection window the selection will be erased from it only if the dropping operation do not cause selection conversion or modification (e.g. color conversion to that of the selected image or dropping into a previous existing selection), in order to prevent the lost of the original selection.

Tool bars

WinLab currently support 3 kind of toolbars:

Selection Tools

Image Tools

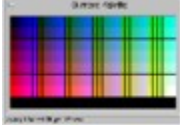
File and Edit Tools

Tool bars can be displayed or not depending on the setting of the View Menu , their orientation can be horizontal or vertical and can have a floating or fixed position depending on the settings of the ToolBars entry of the Options Menu

Palette Window

The Palette Window is a special kind of child window that displays the palette of the current active image if any.

The palette is displayed as a grid of rectangles filled with a color from the color palette:



The status bar of the window will display the current palette entries under the cursor as well as the color component (RGB,HSV,CMYK).

You can change the color space by selecting a menu entry by clicking the right mouse button while the cursor is over the palette window.

With the same menu you are entitled to save or load the palette from a WinLab palette file see [File Formats](#) for details.

By double clicking over a given color rectangle, you can display a dialogbox to choose a new color for that entry (N.B. the image color format will be changed to colormapped if the previous one was grayscale)

For full color RGB images the palette window will display a gamut of possible colors in the HSV color space



Selection Tools

The Selection Toolbar contains 12 buttons some of them corresponding to menu entries while others performs commands not accessible by other means.



From Left to right top to bottom the corresponding functions are:














-  When pressed enables to defines a rectangular selection into an image, position the cursor over the image and press the left mouse button, while pressing the button drag the cursor to select the rectangular area, if the Shift key is pressed when you can define a square selection.
-  When pressed enables to define a segmented and/or free hand selection, position the mouse over the starting point and press the left mouse button once for each vertex, a straight line will be drawn between vertex, keep pressed the button for free hand drawing, you can combine both segment and free hand in the same selection, when finished just double click on the left mouse button.
-  When pressed enables to drag and drop the current selection to another image or to the selection window just click over the given selection to drag it. The cursor will change this way if the window under it is can drop the selection otherwise the cursor will take the form
-  When pressed enables to defines an elliptical selection into an image, position the cursor over the image and press the left mouse button, while pressing the button drag the cursor to select the elliptical area, if the Shift key is pressed when you can define a circular selection.
-  When pressed enables to define a selection by means of a fill segmentation process starting from a given point, the algorithm is based on a threshold region growing. The settings for this tool can be changed by clicking the left mouse button over it
-  Deletes the current selection (you can use the undo button or menu entry to undelete it)
-  When pressed enables to drag the selection on a different position into the same image. The selection isn't actually copied back to the image.
-  When pressed enables to drag the shape of the selection on a different position into the same image. The selection is copied back to the image at the old position.
-  When pressed enables to drag the selection on a different position into the same image. The selection is copied back to the image at the new position.
-  When pressed enables to drag the selection on a different position into the same image. The selection is copied back to the image at the new position and the old position is erased.
-  When pressed zooms the image to fit the current selection into the current window sizes
-  When pressed zooms out the image to normal view
-  When pressed fills the current selection with a predefined pattern which could be taken from the current clipboard contents or from a pattern file. The settings for this tool can be changed by clicking the left mouse button over it

Image Tools

The Image Toolbar contains 7 buttons each one corresponding to a menu entry in the Image Menu



From Left to right top to bottom the corresponding functions are:

Image Info

Duplicate

Resize

Rotate

Flip X

Flip Y

NegativeColor/Gray correction

File and Edit Tools

The File and Edit Toolbar contains 8 buttons each one corresponding to a menu entry in the File and Edit Menus



From Left to right top to bottom the corresponding functions are:

New Image

Open Document

Save Document

Cut

Copy

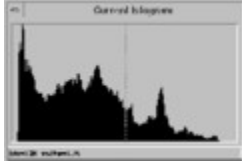
Paste As New Image Paste As New Selection or Paste Inside Selection (left click over it to set behaviour)

Undo

Print Image

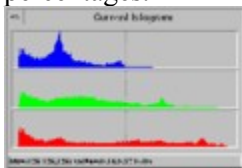
Histogram Window

The Histogram Window is a special child window that displays the Histogram of the active image/selection . For gray scale images the histogram window displays the graph of the gray levels occurrences normalized by the maximum value in the Histogram:



The status bar will displays the color index and the percentage of pixels having that gray value in the active image or selection, you can change the index by clicking the left mouse button and dragging the dotted vertical line inside the window.

For full color images 3 different graphs for each RGB channel will be displayed as well as indexes and percentages.



You can use the information from this window to choose parameters for Histogram Equalization Filters or for image analysis of local features extraction.

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Remote Send To

This command allow to transmit over the net a document (image or folder) through the use of any window socket compliant layer (e.g. Trumpet or WfW socket layer).

The command will displays a dialog to specify the address of the remote machine in internet dot style (e.g. 130.251.89.99 or janine.dibe.unige.it), clicking over the button "WinLab's running on" will broadcast a message over your physically connected network and fills the list box with all machine names currently running WinLab (only those having enabled file transfer see menu Options)

Netproto DDE Server

netproto.exe is a DDE server which uses the window socket specification to communicate with other instances of it running on a different machine.

It is a general purpose server which could be used to transmit files over the network if a socket compliant layer is provided. There are commercially available many TCP/IP layers and also some shareware ones (e.g. Trumpet window socket), it is also available a free TCP/IP protocol stack for Windows for Workgroup© from Microsoft.

Netproto can perform broadcast query over the net to find out other copy of itself running, and can identify if a given program (e.g. WinLab) is running on that machine.

Netproto is fully asynchronous so many transfer and receive can take place at the same time.

Netproto receive command by DDE interface and send notification messages to the applications registered with it when a file is received correctly.

If you are interested in using NetProto for your own application please send a request to the me at the address of PhD Engineering S.R.L.

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For the JPEG I/O many thanks to the great Independent Jpeg Group for their jpeg library
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Many thanks to all the people who have sent to me suggestion, comments and bug reports

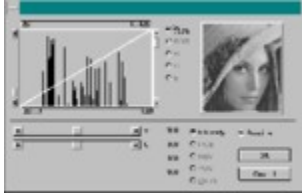
Acquire

Acquire an image from a TWAIN compliant source (usually a scanner), this is achieved by loading the PhD TWAIN DDE server called TWAINSRV.EXE which must be in the same directory of WinLab in order to be found and launched, otherwise it must be running at the time the menu item is selected (i.e. by placing it in the StartUp folder), You can configure some acquisition parameter from the system menu of the icon of TWAINSRV.EXE.

Select Source

Allow to select a TWAIN compliant source for acquiring, by asking the default source dialog box to be displayed, in order to work this command needs the presence of the PhD TWAIN DDE server (TWAINSRV.EXE) either in the same directory of WinLab or already running in memory.

Color/Gray Correction



The Color/Gray correction dialog box is designed to have a powerful control on color or gray level calibration of contrast and intensity on the current active image or selection, it is possible to change the contrast by means of a contrast stretching mapping function piecewise linear. Such a function is made up by 3 segment and the user can control the position of the 2 resulting node at segment boundaries. Four scroll bars control the position along the X axe (gray or RGB planes index) and the Y level (gray or RGB planes value), You can arrange the curve in order to obtain a contrast enhancement or reduction as well as intensity shift.

The level mapping behaviours are controlled by means of the radio buttons besides the histogram window:

- Gray** modify gray levels
- RGB** modify RGB levels simultaneously using the same function
- R,G,B** modify RGB levels using different function for each one

The slope of the curve directly control the contrast of the resulting image, to choose suitable thresholds the user can exploit information coming out from the histogram graph.

Along with gray or color planes level mapping, the dialog allow to change intensity for each channel, specifying the percentage of increase or decrease Vs the original one.


The user can select to change the intensity of different kind of color channels: **Intensity, RGB, HSV, YUV, CMYK**

The percentage ranges allowed are between 0 and 200 %, switching from one color space to another will update such settings according to the last one.

On the left-top of the dialog is displayed a preview of the result that will be obtained, such preview is updated at every settings change, this could be avoided by unchecking the **preview** checkbox.

N.B. contrast operation (level mapping) and intensity modification will be performed on the selected image/selection, sequentially (first level mapping and then intensity change on the result)

Fill

Fills the current selection with a predefined pattern, the pattern could be taken from the current clipboard selection or from a file, the settings for this command could be changed from the Options dialog or by left mouse click over the button  in the tool bar

Capture

This sub-menu allows to grab images from other windows and screen, the available menu items are:

- Desktop:** allow to grab the all screen (contents of the desktop window)
- Screen Rect:** allow to grab a screen rectangle (the rectangle dimension are displayed while dragging)
- Window Area:** allow to grab a whole window (including menus, frame etc)
- Window Client Area:** allow to grab a window content (not including menus, frame etc)

each of this command will hide the WinLab window in order to grab whatever you have chosen to grab, so in order to be able to grab a specific window or screen configuration, you should arrange the windows in a suitable Z-order (i.e. by using the ALT+TAB to switch between windows).

N.B. the only way to capture a WinLab window is to start another copy of WinLab and grab from it.

Autofilling selection tool


This tool is implemented by means of a threshold filling process starting from the selected point, the algorithm used is controlled by a threshold being the allowed pixel distance from the starting point (seed).

This tool has the following configurable parameters:

- Threshold: the allowed pixel distance used for the region growing from the starting point
- Distance criteria: the kind of distance used (linear or quadratic)
- Regularize region specify if a morphologic algorithm for region regularization must be used (slow down the process)
- Smooth region specify if a smoothing filter is to be applied to region boundaries

This tool could be tuned to obtain better performances depending on image classes by a suitable choice of the previous parameters, the use of a quadratic distance criteria usually leads to higher values of the threshold (e.g. 100-400), and the regions obtained are more sensible to noise and boundaries.

Defining a Pattern

defining a pattern is done by means of a dialog allowing to select the source for the pattern (clipboard or file), by left clicking over the  tool or by means of the Options dialog.

This dialog enables to select the source of the pattern by means of two radio buttons, and to test the visual aspect of the chosen pattern in a preview image.

The mirroring checkbox will generate patten filling made up by alternatively mirroring the selected pattern.

DDE support

WinLab can open documents through the use of DDE commands:

supported commands are:

"O(filename)" opens the file filename (any WinLab supported format)

"C)" closes the currently active window

WinLab DDE server name is **"WinLab"**, the only supported topic is **"WinLabDocument"**

i.e. to open a new file into WinLab from a Microsoft word macro:

```
Sub MAIN
Num = DDEInitiate("WinLab", "WinLabDocument")
DDEExecute Num, "O( pippo.tif )"
End Sub
```

