

Fotoxx Quick Guide v.9.0

File menu	File Management
Image Gallery	Show thumbnail images - files in the current directory (more).
Open Image File	File open dialog - open an image file to view or edit (more).
Open Recent File	Choose from a list of the most recent files opened.
Save to Same File	Save modified image to the same file (overwrite) (more).
Save to New File	Save modified image to a new file (more).
Print Image File	Arrange images and text in a layout for printing (more).
Trash Image File	Move an image file into the fotoxx trash bin (more).
Rename Image File	Rename image files with optional sequence numbers (more).
Quit fotoxx	Exit from fotoxx.
Area menu	Areas within images where edits can be confined (more).
Select Area -mouse	Outline an area for subsequent editing using the mouse (more).
Select Area -color	Select an area by color and range (more).
Show Area	Show outline of current area (more).
Hide Area	Remove outline, for better visibility of edit results (more).
Area Edge Calculation	Calculate pixel edge distances for blend width calculations (more).
Invert Area	Replace an area with everything outside the area (more).
Disable Area	Disable area, leaving it available for re-edit and re-use (more).
Delete Area	Remove the selected area (more).
Copy Area	Copy a selected area and save it in memory (more).
Paste Area	Paste the saved area into the same or a new image (more).
Edit menu	These functions modify image files (more).
Adjust White Balance	Remove false color-cast from an image (more).
Flatten Brightness	Flatten the brightness distribution to enhance detail (more).
Retouch Image	Edit brightness, color, saturation, balance (more).
Remove Red Eyes	Click on a red-eye to remove it (more).
Blur Image	Blur an image (smoothen skin) (more).
Sharpen Image	Sharpen a blurred image (more).
Reduce Noise	Reduce noise (speckles) in low-light images (more).

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Trim Image	Cut out a rectangular portion of an image (more).
Resize Image	Scale an image up or down (more).
Rotate Image	Rotate an image (level a tilted image or turn in 90° steps) (more).
Flip Image	Reverse an image horizontally or vertically (more).
Unbend Image	Fix perspective problems (more).
Warp Area	Distort image within an area by pulling with the mouse (more).
Warp Image	Distort entire image by pulling with the mouse (more).
Color Depth	Reduce color depth (posterize) (more).
Simulate Drawing	Transform a photo into a simulated pencil or chalk drawing (more).
Simulate Embossing	Transform a photo into a simulated metallic embossing (more).
Simulate Tiles	Transform a photo into tiles (make large pixels) (more).
Simulate Painting	Transform a photo into a simulated painting (more).
Edit Pixels	Edit pixels and paint lines or areas using the mouse (more).
Make HDR Image	HDR = high dynamic range (more).
Make HDF Image	HDF = high depth of field (more).
Panorama	Join overlapping images to make an ultra-wide image (more).
Tools menu	Utilities and setup functions.
Check Monitor	Display a color palette for tuning your monitor (more).
Index Tags and Thumbs	Re-index tags and thumbnails after file rearrangements (more).
Brightness Graph	Show brightness distribution graph of current image (more).
Clone fotoxx	Open a new window (e.g. to compare two images) (more).
Slide Show	Show images full screen (no menu or toolbar) (more).
Show RGB	Show RGB values at position of mouse click (more).
Lens Parameters	Edit parameters for your cameras and lenses (more).
Change Language	Change the GUI language (more).
Create Launcher	Create a desktop icon / launcher for fotoxx (more).
Convert RAW Files	Convert one or many RAW files to tiff (more).
Burn Images to CD/DVD	Select images and write them on a CD or DVD (more).
Tags menu	Manage tags (keywords) / star ratings / dates (more)

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Edit Tags	Add or change image date / stars rating / tags (keywords) (more).
Search Tags	Find images with desired tags / star ratings / dates (more).
View EXIF Data	View image EXIF data (date, exposure data, tags) (more).
Help menu	User guide, README, change log (more).
Toolbar buttons	
Gallery	Show thumbnail images - files in the current directory (more).
Open	File open dialog - open an image file to view or edit.
Prev	Go to previous image in the current directory.
Next	Go to the next image in the current directory.
Save	Save modified image to the same file (overwrite).
Save As	Save modified image to a new file (more).
Undo	Undo (reverse) the results of the previous edit function.
Redo	Redo the previous undo. Undo/redo depth is 50 edits.
Zoom+	Magnify the image. A left mouse click also magnifies.
Zoom-	Reduce the image. A right mouse click also reduces.
Trash	Move an image file into the fotoxx trash bin (more).
Quit	Exit from fotoxx.

Keyboard Shortcuts

Main Window	
left / right arrow keys	previous / next image
plus(+) / minus(-) keys	zoom bigger / smaller
Z key	zoom to 100% / fit to window
R / L keys	rotate 90° right / left (temporary)
G key	open image gallery window (thumbnails)
Delete key	move image to fotoxx trash
Escape key	Exit slide show mode or show RGB mode
Control + s	Save to original file (no questions asked)
Control + S	Save-as: dialog to choose a target file

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Control + q or Q	Quit fotoxx
Image Gallery window	
Home / End keys	move to first / last page of thumbnails
Page Up / Down keys	move to previous / next page of thumbnails
up / down arrow keys	move up / down by one row of thumbnails
left / right arrow keys	move to previous / next page of thumbnails
plus(+) / minus(-) keys	bigger / smaller thumbnail image size
Escape key	close image gallery window
Dialogs for User Input	
F1 function key	display user guide section for current function

Mouse Functions

left click	Zoom-in: magnify image 1.41x, 2 clicks for 2x, center at click position.
right click	Zoom-out: restore image to window size.
drag on image	Scroll image in opposite direction, like a normal scroll bar.

License and Warranty

Fotoxx is licensed under the GNU General Public License v3 (Free Software Foundation).

Fotoxx is not warranted for any purpose, but if you find a bug, I will try to fix it.

Origin and Contact

Fotoxx originates from the author's web site: <http://kornelix.squarespace.com/fotoxx>

Other web sites may offer it for download. Modifications may have been made.

If you have questions, suggestions, or a bug to report, contact kornelix@yahoo.de

Some additional technical notes can be found [here](#).

File Menu

Navigation

Use the Image Gallery menu (or Press the [gallery] toolbar button) to get an image gallery window (thumbnails) showing image files in the current image directory. Use this window to scroll around the directory and select files by clicking thumbnails. The buttons at the top allow scrolling forward or back by

rows or pages. Use the file and folder buttons to navigate elsewhere if wanted. Make the window bigger to show more thumbnails, or use the [bigger] and [smaller] buttons to change the thumbnail size and the number of visible thumbnails. Pressing the [gallery] button in the fotoxx main window will bring the gallery window forward with the current file's thumbnail in the upper left corner. Clicking on a thumbnail will bring the fotoxx main window forward with the selected image.

Open Image File

This function starts a standard file open dialog, allowing you to select an image file or navigate to another directory and select an image file. The selected file is opened in the fotoxx main window where you can view or edit the file using the menus and toolbar buttons. Drag and drop can also be used to open a file: drag the file from Nautilus (or another browser) to the fotoxx window or to the fotoxx desktop launcher, and fotoxx will open the file. If text is dragged from gedit (or another editor supporting drag sourcing), fotoxx will assume the text is a filespec and try to open it. Thus you can make a list of filespecs within a text file and use this list with fotoxx. Effectively, you can use Nautilus or text files to navigate a collection of images as an alternative to the fotoxx navigation system.

Save Image File

Menu: File > Save to Same File, or toolbar button [Save]: saves the current image file back to itself without confirmation. If the file is a JPEG file, the default quality (90) is used.

Menu: File > Save to New File, or toolbar button [Save-as]: opens a dialog to save the current image file to a selected file, which can be the original file, another file, or a new file. The file type (format) and JPEG compression quality can also be selected. An edited image file can be saved in three formats, JPEG, PNG, and TIFF. JPEG is normally the best option, since files are compressed to reduce space. You can choose a JPEG quality value in the range 1-100. Lower values give greater compression and less image quality. Values above 70 are generally hard to distinguish from 100 (highest quality, large file size). PNG files are compressed without any loss of quality and are usually larger than JPEG files of the highest quality. TIFF files are uncompressed and larger than JPEG or PNG. TIFF files may be saved with 24 or 48 bits per pixel. The 48 bit TIFF format (16 bits per color) only makes sense for files converted from a RAW format supporting more than 8 bits per color (camera RAW files are typically 12 bits per color). It is rare that the difference between 8 and >8 bits per color can be seen with the eye.

File sizes for a 10 megapixel image are roughly as follows (depends on amount of detail):

tiff-48	tiff-24	png	jpeg-100	jpeg-90	jpeg-80	jpeg-70	jpeg-50
58 MB	19 MB	14 MB	7 MB	2 MB	1 MB	0.6 MB	0.4 MB

Print Image File

The print menu starts the program printoxx (if installed) with the current image loaded into the printoxx layout window. Printoxx allows you to add images and text to the layout window, change their size, move

them around, and print or save the final layout. Printoxx is available at <http://kornelix.squarespace.com/printoxx>.

Trash Image File

There is no standard location for the trash folder in Linux, and in practice it varies. fotoxx puts discarded images into a desktop folder named "fotoxx-trash". You can delete it or move it to your distro-specific trash folder.

Rename Image File(s)

This function can help automate the process of renaming a series of files using a root name (e.g. an event or place name) and a sequence number. It is good for renaming a series of files from a digital camera. Open the first file in the series, input a new name, and press the [rename] button. The next file is then opened. You can use the same name again by pressing the [previous] button and then add a suffix or sequence number. If you are using sequence numbers, press the [+1] button after the [previous] button to get the next sequence number added to the name.

Area Menu

It is possible to modify part of an image while leaving the rest unchanged. Edit functions normally apply to the entire image. If a smaller image area has been selected, then the following edit functions will be carried out within the selected area: all brightness and color functions, warp area, sharpen, blur, reduce noise, and all art functions. The warp area function works only within a selected area, and the warp image function works only on the whole image. Other functions (trim, red-eye, rotate, resize, HDR, HDF, panorama, unbend) ignore a selected area. An area may be selected before starting an edit function, or while an edit function is active. The selected area is immediately active, prior edits are retained, and future edits (those listed above) will apply only to the area. If another edit function is started, the selected area remains active, so it is possible to carry out a series of edits on one area, or one edit function on a series of areas. You can leave the select area function with the [OK] button and resume it later. When the select area function is started and an area already exists (finished or not), use the [start] button to continue editing the current area, or the [delete] button to start over. If the existing area is not the same type (select by mouse or color) as the area to be edited, you will be asked to delete the old area or terminate the new edit (i.e. both types cannot be active at the same time).

Select Area -mouse

Start with the [start] button. If an area is already there, it will be shown. You can edit this area or delete it

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([delete] button) to start a new area. The mouse is used to outline the target area. Use the radio buttons to select either "freehand draw" or "follow edge".

Freehand draw: Drag the mouse (left button down) to draw a freehand (curvey) line, or left-click to connect a straight line from the last point drawn to the point clicked. Continue around the target area until it is surrounded with connected curves and lines. Right click to remove previous lines (mistakes) in order to re-draw them. A right click will remove the previous clicked or dragged line (up to 50 pixels). Right click repeatedly to remove more. A new clicked line will always connect to the end of the previous line. A new dragged line will connect to the previous line if it is started close to the end of that line. If it is started elsewhere, a disconnected line will be drawn. To draw in the opposite direction, start a new drag from far away and draw back to meet the previous line. If a clicked line connects to an undesired point (you don't want to connect to the last line drawn), right click to erase it and do a small drag to start a new sequence of lines from that point. A right-button drag can be used to erase small segments: right-drag closely along a line to erase it, then left-drag to re-draw the line. At the end, all lines must be connected with no gaps. Overlaps are OK. Gaps can be difficult to find and correct, so work at 100% image size or greater and be careful. A series of lines automatically connected will not leave gaps, but deviation from this order is very likely to create gaps. To reduce the possibility of gaps, use deliberate overlaps when manually connecting lines.

Follow edge: this modifies the behavior of click and drag: high-contrast pixels (likely edges) in the direction of mouse movement are searched and connected. This is effective for hard edges that are straight or gently curved. Fuzzy and ragged edges may not work well and hand dragging will be needed if high precision is necessary. The rules for connecting lines are the same as explained above.

The [suspend] button temporarily stops editing and releases the mouse to zoom or scroll the image to a new position. The button changes to [resume] and can then be used to resume editing. The [Hide] button removes the area outline (for better visibility of image edits). The button changes to [Show] and can then be used to show the outline. The [delete] button removes the area, allowing another area to be started. The select area dialog can be exited and re-started later. If the [start] button is pressed, the area can be revised. The slider [blend width] is explained below.

The [finish] button completes the selected area - the inside pixels are marked and any gaps in the outline are detected. An attempt is made to show where the gap is: you will see a line coming out of the area to meet the edge of an imaginary rectangle enclosing the area. You may be able to follow this line back to the gap, but if the area is convoluted finding the gap can be difficult. Each use of [finish] may produce a different picture that may lead you to the gap.

Select Area -color

Start with the [start] button. Click the left mouse button somewhere on the image to define a color to select.

An area of the image around the mouse position will be selected. The color range slider defines the range of colors to select. Low values (left) define a narrow range and high values (right) a broad range. Clicking the right mouse button removes the last selection, and may be repeated to undo more previous selections. Adjust the color range slider to increase or decrease the area selected with each left click. It is important to

understand the selection algorithm: all pixels contiguous with the mouse position and matching the color at the mouse position (within the specified color range) are selected. The search for matching pixels stops at pixels not matching the color or at pixels already selected by the current or a previous selection. You can think of non-matching pixels and already selected pixels as "barriers" that cannot be penetrated by the search for new pixels. The search spreads out from every matching pixel to adjacent pixels, until a barrier is met. The mouse may also be dragged with the left button pressed. The selection algorithm is repeated for every pixel touched during the drag: this pixel and matching contiguous pixels are added to the selection. All pixels selected during a drag are counted as one selection, and a right mouse click will remove all of them at once. Therefore, while working in drag mode, press the left button often to initiate a new drag, so that right-clicks remove only the last few seconds of work. You can drag along an edge with a narrow color range to define a barrier, and then increase the range to select a large area at once that will not cross the barrier. You will need some practice to get a feeling for this and be able to work efficiently. If an "island" is left out after a selection, you can likely eliminate it by clicking on it, or dragging through it. Zoom the image to 100% or more to better see edge details. Click the [finish] button to mark the area as complete. The selected area is now active and subsequent image edit functions will operate within the area. The buttons [Show/Hide], [Suspend/Resume] and [Delete] work as described above.

Show Area and Hide Area

The show function refreshes the current area outline. The hide function suppresses the outline, which can improve the visibility of image edits within the area.

Area Edge Calculation and Blend Width

Edits made within an area can be blended with the surrounding image over a distance called blend width. Blend width is also a sliding control in both select area dialogs. At the edge of the select area, the image is the original image, not affected by the edit within the area. At a distance of blend width into the area, the image is the edited image. For distances in-between, the pixels are a mix of original and edited pixels. This mix changes from 100/0 at the edge to 0/100 at a distance of blend width from the nearest edge, using a linear ramp (e.g. at 0.5 blend width the mix is 50/50). The leftmost position of the slider is zero blend width, which gives a hard edge to the area edit. Moving the slider to the right increases blend width and makes the edges of the edit more gradual and harder to distinguish from the original image. Blending only works if the edge calculation has been done, which supplies the distance to the nearest edge for each pixel in an area. This calculation can take a long time and is not always needed, so it is not done automatically. Whenever an area is re-edited or inverted, the edge calculation is discarded and must be repeated if blending is wanted. The blend width control is not active unless an edit function that can use it is also active. If the blend width control is used and the edge calculation has not been done, it is initiated automatically. It can also be killed with the [cancel] button in the popup dialog that appears.

Invert Area

This function inverts an existing area: the entire image is selected except for the existing area. Using the function two times returns the original selected area. Inverting a selected area invalidates the edge calculation

which must be repeated if edge blending is desired.

Disable Area

This function disables the current area and keeps the data so that it can be re-activated or re-edited. This allows you to alternate edits within a selected area and edits for the entire image.

Delete Area

This function permanently deletes both mouse- and color-selected areas.

Copy and Paste Area

Copy: The selected area is copied and saved in memory.

Paste: The saved area is pasted into the middle of the current image. It can be moved around by dragging with the mouse. Use the buttons [+10%] etc. to resize the pasted object. Use the edge blend slider to make a blended edge if desired. Press the [done] button in the popup dialog. The pasted area is now the equivalent of an area selected by color. You can edit within the area and use the [blend width] control in the Select Area-color dialog.

Image Edit Menus

General Editing Procedure

The image in the main window can be operated on with the edit menu functions. You can use these functions in any order, and the changes are accumulated for the current image and shown in the main window. The [undo] and [redo] buttons can be used to review the before/after results for the last 50 edits of the current image. These buttons do not work during an image edit function, but some of these functions have their own method to undo and redo changes during the edit. When finished with an image, use [save] to replace the original file or save to a new file.

Adjust White Balance

This function is an easy way to remove a false color-cast, e.g. the whole image has an overall blue or red tinge. After starting the function, click somewhere on the image that should have no color - a white or gray area. If that location has any color other than white or gray, it will be used as a measure of overall false color, and this amount of color will be removed from the whole image. You can click around on various areas and see the impact instantly. Press the [done] button when you are satisfied, or [cancel] if not.

Flatten Brightness

This is a fast and easy way to compensate for a common limitation in photos: there is not enough range in the brightness to show good detail in all areas. This function finds where there are too many pixels with nearly the same brightness and spreads them apart, compressing other areas to make room. Technically, the brightness distribution is made more uniform (flatter). Move the slider and watch the image, which may lag a moment. Some images will show good results, others may not be helped or even become worse.

Brightness/Color

This function is used to change brightness, color intensity, color saturation, and color balance (relative RGB levels). You can adjust all of these items as a function of the original image pixel brightness. To illustrate, you could increase color saturation in darker image areas and leave it unchanged in brighter image areas.

There are 7 response curves for the 7 image attributes of brightness, whiteness, color intensity, color saturation, and color balance (levels of red, green, and blue). The radio buttons select which curve is active and displayed. The curve represents a value (Y-axis) for each level of image brightness (X-axis). The middle Y-value is neutral (no change from the initial value). Higher and lower Y-values represent corresponding higher and lower settings for the 6 attributes. The initial curves are flat at the middle value.

The buttons [+++] etc. can be used to shift the whole curve in various ways. The curve can also be dragged up or down with the mouse. An anchor point (black dot) is added to the curve wherever it is pulled, and this becomes a constraint for subsequent pulls: the curve will continue to go through this point as other parts of the curve are pulled. Anchor points can be dragged, or deleted by right-clicking them.

The image changes in real-time as the curves are moved. Simply move the curves and observe the image until you are satisfied.

Changing brightness moves all RGB values by the same factor. Defog changes "whiteness", defined as the lowest RGB level in a pixel - this amount can be removed or added to each RGB color. Changing color intensity moves all RGB levels by the same factor within a pixel (no color shift), and the factor is greater for darker pixels. Changing color saturation changes the dominant RGB color(s) within each pixel and moves other colors in the opposite direction, so that overall brightness does not change.

Note about using defog: this can be used to reduce fog or haze. Initially, pull the center of the curve down to remove "whiteness" from the middle of the brightness spectrum, and push the middle of the brightness curve up to restore the brightness level, if needed. This is only a suggested way to start. It is likely that better results can be obtained by further manipulation of the defog, brightness, and saturation curves.

Remove Red Eye

This function reduces the red-eye effect from electronic flash photos. Two methods are provided. The first is faster but will not handle difficult cases (e.g. the eyelids are almost as red as the eye). The second method is more robust but also needs more time and care.

To use the first function, left-click on a red-eye one or more times until satisfied. If the darkened area is too small or off-center, do a right-click to undo the change and then left-click more precisely on the center of the red-eye. If a red-eye cannot be fixed correctly, right-click to undo the change and then use the second method.

The second method can better handle difficult cases where the red-eye is only slightly red and the color difference with the eyelids is too little for the automatic algorithm to distinguish. Place the cursor over the center of the red eye. Hold the left mouse button and drag the cursor down and to the right. A dotted ellipse will appear enclosing the red eye. Repeat if needed to get the red eye centered in the ellipse (roughly). Note that the shape of the ellipse depends on the direction of the drag, which can allow more precise enclosure of only the red-eye. Left-click inside the ellipse repeatedly while watching the red eye darken, and stop when it is dark enough. If you go too far, the eyelids may start to darken. Right-click to undo and repeat if necessary.

Blur image

This function can be used to blur or un-sharpen an image. Each pixel is mixed with neighboring pixels to reduce the differences, making edges fuzzy. Enter a value for blur radius and press [apply] to see the results. A small value mixes each pixel with its nearest neighbors and larger values mix more distant pixels. The contribution from each pixel decreases with distance, so the nearest pixels have the greatest contribution. This function is useful to smooth mottled skin tones. You can use "select area" to limit the blur to a face or part of a face.

Sharpen Image

This function sharpens a blurry image. Three methods are implemented: edge detection, unsharp mask, and Laplacian. Edge detection is a simple algorithm: find adjacent pixels with the largest brightness difference and increase the difference. This is repeated for several cycles, with the threshold for brightness difference decreased each cycle. Unsharp mask is a traditional method also found in Gimp and other tools. It is fast and effective (a technical description can be found via Google). The edge detection method gives sharper edges where the contrast is high and softer edges elsewhere, making it good for portraits (sharp eyes, smooth skin). For images that are partly sharp and partly blurred (e.g. depth of field or motion problem), the edge detection method will affect only the blurry areas, whereas unsharp mask may put "halos" around edges that are already sharp. The Laplacian method is very similar to unsharp mask, producing slightly better results in some cases and slightly worse in others. The radius value limits the distance over which pixels around an edge are changed. It should be small (1-2) for images that are slightly fuzzy and larger for poorer images. Threshold suppresses changes to low-contrast pixels: a higher values reduces the amplification of low-level irregularities.

For the edge detection method, enter the following parameters:

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cycles number of iterations
reduce brightness reduction threshold per cycle, 80 means 0.80
threshold brightness change low cutoff threshold

For the unsharp mask or Laplacian method, enter the following parameters:

radius distance pixels around an edge are changed
amount amount of correction, 100 = normal
threshold brightness change low cutoff threshold (unsharp mask only)

Press the button for the method selected and wait a few seconds to see the result. The default values are suggested starting points. Make changes and repeat the process until satisfied. You can go back and forth among the methods to compare which is best for a given image.

Reduce Noise

This function reduces the noise present in photos taken under poor lighting conditions, making uniform surfaces appear speckled. Choose one of the methods described below. Press the [reduce] button repeatedly while watching the image. If you go too far, sharpness and detail will be lost. The radius input determines the area around each pixel that is compared. A default radius is set when a method is selected, but other values may work better. For a large image, these algorithms may run a long time. To save time, select a small area and experiment with the different methods and radius settings until you make a decision, then clear the selected area and apply the chosen method to the whole image.

The following algorithms are applied to each RGB color independently.

- (1) Flatten outliers by color: the highest and lowest pixel values within a radius are moderated slightly.
- (2) Flatten outliers by color: pixels are compared to the mean and sigma of pixels within a radius. Those outside one sigma are moved back toward the mean by half the excess over one sigma.
- (3) Set median brightness by color: pixels are set to the median value of their neighbors within a radius.
- (4) Top hat: detect outliers by comparison with a band of pixels some distance away. The comparison distance is increased in steps from 1 pixel to the radius limit.

Trim Image

The HDR and panorama functions will leave some black margins around the edges where the images did not overlap. Use the trim function to remove these areas, or any other unwanted margins. An initial selection rectangle is drawn, encompassing about 60% of the image. Areas outside the rectangle will be cut off. Click or drag near any corner of the rectangle to move that corner. When done, press the [trim] button in the dialog box. The dialog box shows the current width/height ratio of the selection rectangle. If the box "lock ratio" is checked, then moving one corner of the rectangle will also move the opposite corner to keep the same ratio. You can also drag from the middle of the rectangle to shift the whole rectangle without changing its dimensions.

Resize Image

Sometimes called "rescale", this function allows setting a new image width and height in pixels, or as a percent of the original size. You can input the new width and height directly. Buttons are present for setting the new size to 3/4, 2/3, 1/2, 1/3, or 1/4 of the original size. Using one of these ratios will minimize loss of resolution. If the lock ratio box is checked, the original width / height ratio will be preserved, meaning that if one dimension is changed, the other dimension will be changed to match. After setting the new dimensions, use the [apply] button to perform the rescale. The window may look the same, but the image behind it is rescaled. The status bar shows the new dimensions. The file size is not updated until the modified image is saved.

Rotate Image

The rotate menu function starts a dialog to rotate the image clockwise (+) or counterclockwise (-) in steps of 0.1, 1, 10, or 90 degrees. For a tilted image, use the mouse to drag the right edge up or down until the image looks level. Use the 90 degree steps to convert an image taken in vertical format to horizontal. No resolution is lost with 90 degree rotation. For other angles, the loss of resolution varies up to about 1/2 pixel. The output image is increased to accommodate the rotated input image without size reduction - e.g. a 100 x 100 image rotated 45 degrees will be inside a new image box of 141 x 141 pixels, and the unused areas will be black. Use the [trim] button to remove these expanded margins.

Flip Image

Choose either horizontal or vertical flip from the dialog. The image is reversed vertically or horizontally. Repeating the flip restores the original image. Doing both a horizontal and vertical flip is the same as a 180 degree rotation.

Unbend Image

Panoramas of nearby subjects (typically buildings or interior rooms) may show straight lines that are curved, or buildings that are slanted. Bending of the images is necessary in the panorama process in order for the images to fit together. For remote subjects (esp. landscapes) this is not noticeable. The unbend function can be used to straighten curved lines and remove the slant from vertical lines. Vertical and horizontal dotted lines are drawn over the image, showing the unbend axes. Click or drag the mouse near the end of a line to move it. Input values for horizontal and vertical unbend and watch the effect on the image. Increase or decrease the values and repeat until satisfied. Move the axes to change the centers of unbending. See also "Warp Image" for another method of correcting perspective problems.

Warp Area

This function can be used to make distortions within an image. You can select an image area and drag the mouse to stretch this area with respect to the rest of the image. The image reacts as if made of rubber. The movement is maximum at the mouse pointer and declines to zero at the edges of the selected area. Many mouse drags of different lengths and directions can be combined to achieve the desired results. The [undo] button will remove the most recent stretch (up to the last 100). When finished, you can select another area and do some more warping, or select [done] to exit the function.

Warp Image

This function is useful to correct perspective problems (see also "Unbend"). Drag the image from any edge, using the mouse. The entire image will be pulled or pushed in the direction of the mouse, but areas near the mouse are moved more than more distant areas.

Color Depth

This function changes the normal 16 bits per RGB color (red, green, blue) to any value between 1 and 16 bits per color. At 8 bits per color, there are 16.8 million total color combinations. At 4 bits per color there are only 4096 total colors. Use 1-4 bits for an interesting "poster" effect.

Simulate Drawing

This function transforms a photo into a black and white high-contrast image or into a line drawing where only the edges of objects are shown as black lines on white background or white lines on black background. The sliding control "contrast" will deepen dark areas to black. The sliding control "threshold" will convert the image from gray-scale to black and white. The sliding control "outlines" will highlight high-contrast pixels (edges of objects) and suppress low-contrast pixels. This can be black on white or white on black, depending on the selection of the radio buttons "pencil" and "chalk". Manipulate both "threshold" and "outlines" to find the best balance.

Simulate Embossing

This function transforms a photo into a simulated relief or embossed image. The "radius" setting determines the feature size or level of detail. The "depth" setting determines how deep the features go into the surface.

Simulate Tiles

This function transforms a photo into an array of large monochrome tiles. You can control the tile size and the thickness of the space between tiles (caulk, grout).

Simulate Painting

This function transform a photo into something looking more like a painting. It reduces the number of colors, maps each contiguous pixel area having the same color, and then consolidates smaller areas into adjacent larger areas having the best color match. Four user settings control this process: "color depth" sets the number of colors to be used (bits per color). 1 = 8 colors, 2 = 64 colors ... 5 = 32768 colors; "target group area" sets a lower limit for areas that will have their own color: areas smaller than this number of pixels will be absorbed into an adjacent area with the nearest color match; "req. color match" sets the minimum color match required for a smaller area to be consolidated into an adjacent larger area: 0 = don't care (maximum consolidation), 100 = perfect match required (no consolidation); "borders" determines whether the colored areas will be delineated with a thin black border, like irregular tiles in a mosaic. After using this function, using the "emboss" function can add interesting texture to the image.

Edit Pixels

This function changes individual pixels. There are three modes of operation: pick, paint, and erase. Pick mode: click anywhere on the image to set the current color. Paint mode: click or drag anywhere on the image to paint with the current color. Erase mode: click or drag anywhere on the image to restore modified pixels to their original color. The button [color] allows you to pick a color using a color wheel, and it always shows the current color. The "brush radius" control sets how large an area of pixels will be changed with each mouse click or drag. The "transparency" controls determine how intensely the color is applied at the center and edges of the brush. Zero transparency applies the full color immediately whereas a high transparency (90-99) applies a little color and allows you to gradually change the color using many clicks or drags (analogous to spray painting from a distance). Erase also works this way: use zero transparency to immediately erase, and high transparency to erase gradually. The [suspend] button releases the mouse so you can use the mouse to scroll or zoom the image. The button changes to [resume]. The [undo_last] button removes the last edit (modifications from the last click or drag operation), and this can be repeated to remove many recent edits. The memory for undo operations is limited to 100 megabytes, which can be reached if you make many edits using a large brush (every change to every pixel is saved). It is useful to save the image after each satisfactory change to free this memory. The amount of memory available is displayed in the dialog, so you can see when the limit is approaching. NOTE: zoom the image to 100% or more when using this function. If the mouse steps are larger than the image pixels and a small brush is being used, some pixels may be skipped by the mouse and cannot be painted.

Make HDR Image (high dynamic range)

HDR combines (overlays) multiple images of the same subject with different exposure levels. The combined image can show improved visibility of detail in both the darker and brighter areas, in effect using pixels from the brighter images for the darker areas, and from the darker images for the brighter areas. Many digital cameras do exposure bracketing: take multiple shots in quick succession with different exposure levels. You can combine such images to make a better one. If the camera is adjusted manually between shots, take care

to keep it level and aim at the same point. Some misalignment of the two images can be tolerated. If things move between the two shots (people, windblown trees), fuzziness and ghosting cannot be avoided.

Two HDR functions are available. The first works with only two images but is faster and easier to use. Open the 1st image file with the [open] button, then select the HDR (2 Images) menu function. A file open dialog is started to select the 2nd image file. The two images are aligned and combined automatically. When done, the combined image is shown, along with a dialog for manual fine adjustment. The contribution from each image can be adjusted independently for different brightness levels in the combined image. The initial ramp causes the darkest areas to be taken mostly from the brighter image, and the brightest areas mostly from the darker image. Use the mouse to pull the curve and change the contributions from the two input images. This will also add an anchor point that will not move when other parts of the curve are moved. An anchor point can also be dragged. An anchor point can be deleted with a right-click.

The 2nd HDR function can combine up to 10 files. Open one of the image files with the [open] button, then select the HDR (2-10 Images) menu function. A file open dialog is started to select up to nine more image files, which must all have the same pixel dimensions. The images are aligned and combined automatically, which may need a minute or more. When done, the combined image is shown, along with a dialog for manual adjustments. The contributions from the input images are shown as a series of editable curves. The horizontal scale represents pixel brightness, from dark to bright white. Each curve represents an image which contributes to the pixels within the range of the curve. A brightness value falling within multiple curves is made from multiple images, with the ratios being the heights of the curves. The curves can be edited as described above. Select a curve using the radio buttons below the curves. The anchor points of the selected curve turn red. You can raise or lower the curve or shift it left or right by dragging the anchor points. The corresponding image contributions are changed accordingly, and you can see the results in quasi-real-time in the output image. The button [flash] can be used to briefly highlight the image areas that are influenced by the image and curve currently selected for editing. You will likely need practice before the concepts sink in and you become more effective at working the curves.

A faster and easier alternative may work as well: after the images are combined, ignore the curves and exit from HDR. Then use the functions Flatten and Brightness/Color to tune the image. A kind of "tone mapping" can also be done: use Select Area (mouse) to enclose any area in the image which needs more local contrast, and use the same two functions to improve that area.

Make HDF Image (high depth of field)

HDF combines (overlays) two photos of the same subject with different focus settings, near and far. The near-focus image has close objects sharply in focus and far objects blurred. The far-focus image has the opposite condition. The idea is to combine the images so that both near and far objects are sharp.

Making the two photos: choose a point for the center of the image. Aim the camera at a near object and depress the shutter button 1/2 way, to set the focus on this object. Hold the button at the 1/2 position, aim the camera at the chosen center, and snap the photo. Now choose a far object and do the same. The camera position should be nearly the same for both photos, which can be a challenge when the subject is very close. Camera movement can cause scaling and parallax problems (nearer objects shifted against farther objects), which may or may not be fixable within fotoxx.

Processing the photos: in fotoxx, open the first image file, choose the HDF menu function, and you will be asked to select the second image. The two images will now be aligned as well as possible. The output image

is a 50/50 mix of the aligned input images. A small amount of camera movement between the photos is compensated, but this is limited, and parallax shifts are not compensated at all. When the alignment is complete, a dialog opens. You can select either input image and "paint" with the mouse on any area of the output image. This converts the 50/50 mix to the selected input image for the area being painted. The radius of the paintbrush can be 1-200 pixels, so you can paint large areas quickly and control fine detail when needed. If you have overlapping near and far objects, time and patience will be needed to make all of them sharp. The examples in the [fotoxx gallery](#) took about 5-10 minutes each, but the object overlaps are also minor.

Panorama

This function stitches two images together to make a wide image or panorama. The images must overlap by 10% or more, so that the program can find where they coincide and put them together.

Open the left image file first. Select the panorama menu function. A file open dialog is started to select the right image file. The two images are initially joined with a small transparent overlap. A dialog pops up asking you to move the right image into rough alignment with the left image. Do this with the mouse, dragging the right image leftwards until it is within a few pixels of the best match with the left image. Rotate the right image if needed, by dragging the right edge up or down.

The images should be correctly curved and fit together well. If they do not fit, you need to set the lens parameters as described under "Lens Parameters". You can adjust these parameters within the dialog until the images fit reasonably well, and this may be good enough for most panorama jobs.

Press [proceed] when rough alignment is finished, and the program will do fine alignment and join the images. Internally, the images are shifted and rotated and the degree of match is evaluated. This is done with increasing image sizes until the best match is found within a fraction of a pixel. The process needs 10 seconds to 3 minutes, depending on CPU speed and image size. A 2.4 GHz Intel Core 2 processor with 10 megapixel images needs about 30 seconds.

When fine alignment is complete, the combined image is displayed. A dialog pops up for fine adjustment of brightness and color match. You may see a sharp border because the two images do not have the same brightness and color balance. The [auto] button can be used to perform an automatic color match, which is usually the best starting point. This button toggles the auto color match on and off. The other controls allow you to make additional changes to better match the two images. Changes are made to both images, in opposite directions. Change the values for brightness and color and press the [apply] button to see the results. The "blend width" input governs how the two images are blended together: the color balance is gradually shifted over this many pixels, to mask imbalances that cannot be fully corrected. The default is 1 pixel, which makes any brightness or color differences look obvious. When done, you can use unbend, image warp, rotate, trim, and other functions for final adjustments.

Panoramas of three or more images can be done as follows: After joining the first two images, Start the panorama function again to open and join a 3rd image. In this manner you can string together several images. New images are always joined on the right.

Vertical Panoramas

Rotate the images 90° to make them match as a left-right pair. After doing the panorama, rotate them back.

Panorama Limitations

Panoramas including nearby objects can be tricky: when the two photos are made, be careful to turn the camera on a vertical axis through the lens, with minimum lateral movement, otherwise the images may align poorly due to movement of foreground objects against the background (parallax). This is not an issue when the subject is 50+ meters away, since a small lateral movement has little impact on the image.

Tools Menu

Check Monitor

Eight color bands are written across the screen with brightness from zero (black) to 100%. You can use this to adjust the brightness and gamma of your monitor. The left end of each stripe should be as black as possible, but you should start to see some color within a few mm from the left edge. If the completely black portion is wider than this, adjust the monitor. There are 255 brightness steps from black to 100% (8 bits per color). The steps are too small to distinguish with the eye. This evaluation should be done in a darkened room (no external light falling on the monitor screen).

Index Tags and Thumbs

You need to do this after first installing fotoxx, or if you move or reorganize image files and directories. Nothing is lost when image files are moved around, but tag searching will not work (see the tags section below), and the image gallery (thumbnail) windows will be slow. The index function regenerates the tags index file and the thumbnail images that make the gallery windows fast. A dialog will ask for the topmost directory of your image files. That directory and any subdirectories containing images will be processed (if you have multiple directories not in the same hierarchy, make one directory with links to all the others). The time required depends on computer speed and average image size. My (fast) development computer does about 800 images / minute. Once the images have been indexed, searching them using tags is almost instantaneous. Starting with v.8.4, this function works incrementally (after it has run one more time). If only a few images have been added or moved (unknown to fotoxx), then only these images are processed. The indexing should complete in seconds instead of minutes. The index is built in memory and then written to disk (at `~/fotoxx/assigned_tags`). There is a limit of 100K images. If you want to force a complete re-indexing of all files, delete this index file first.

Brightness Graph

This function opens a small window that shows a brightness distribution graph of the current image in the main window. This graph updates immediately as edit functions change the brightness.

Clone fotoxx

Start a new instance of fotoxx in a new window, starting with the current image file. This is useful to compare images or to work with more than one image at a time.

Slide Show

The image window is enlarged to the whole desktop, and the menu and toolbar are removed. A dialog pops up to ask for the time duration to show each slide. You can also use the keyboard for navigation ([more](#)). Use the escape key to get out of slide show mode. If a tag search is done before a slide show, these images are shown.

Show RGB

This function changes the mouse mode. When a point on the image is left-mouse clicked, the RGB values are shown in the status bar at the bottom. The values have the format xxx.ddd, where xxx is the upper 8 bits of the color value, with range 0-255, and .ddd is the lower 8 bits, with range .000 to .999. The lower 8 bits are zero unless the image has been edited. Only the edit functions for color and brightness affect the lower 8 bits, and this data is preserved only if the image is saved in 48 bit tiff format. A right-mouse click restores the normal mouse mode (click to zoom), or the escape key can also be used.

Lens Parameters

This is a dialog for setting and saving the two lens parameters, lens_mm and lens_bow, which must be set for each camera/lens used for panoramas. These parameters govern how fotoxx "bends" the two panorama input images so that they can fit together accurately. Enter a name for the lens/camera and the two parameters. Up to four lens/cameras may be entered. Lens_mm is roughly the focal length of the lens (35mm film equivalent), and lens_bow is a factor for edge-curving distortion. How to set these parameters is described here, but you should read the section on making panoramas first, in order to better understand the following instructions.

Setting Lens Parameters Automatically

The [search] button in the panorama pre-alignment dialog initiates an automated search for optimum lens parameters. Use a suitable image pair: the subject is 50+ meters away, the images have a low horizon difference and little relative rotation, and there is plenty of high-contrast detail in the overlap area. Input your nominal lens focal length for lens_mm. Use zero for lens_bow. After doing a decent pre-align, press the [search] button and wait a while for the results. Do this a second time and observe the changes. If the values remain consistent, you can use them for your panoramas. The search function steps through a range of values

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for lens_mm, lens_bow, and the image alignment offsets for x, y, and theta. It searches for the lens values that give the best alignment results for the given images. The process needs a minute or more, but you only need to do this once to characterize a given camera lens. Be sure to save the results using the lens parameters menu.

Setting Lens Parameters Manually

Make a panorama image of a brick or tile wall with about 40% image overlap. Within the panorama pre-align process, adjust lens_mm and lens_bow until the overlapping bricks or tiles coincide. When making the two images, be sure to turn the camera on a vertical axis through the lens, minimizing lateral movement and rotation in other axes - otherwise the images may fit poorly and your factors may not be optimum.

Change Language

This function allows you to change the GUI to one of the available languages. If your language is not available and you know enough English, consider making a translation, which is not difficult ([more](#)).

Create Launcher

This function puts a fotoxx icon / launcher on the desktop and enters fotoxx in the menu system in the category "Graphics". Your system must be LSB compliant (Linux Standards Base).

Convert RAW Files

This function converts one or more RAW files to tiff-48 format, using the program "ufraw". A file chooser dialog is opened. Choose one or more RAW files (hold down the CTRL key to select multiple files). The files are converted one at a time and displayed in the main window. Depending on the number of files, this can take a long time (my 2.67 GHz processor does about 9 files per minute using a mix of raw file types).

Burn Images to CD/DVD

This function enables you to choose image files and burn them into a CD or DVD. When the function starts, a dialog is started and an image gallery window (thumbnails) is displayed. The dialog shows a list of images for burning which is initially empty. To select an image, click its thumbnail and it will be added to the list. You can navigate the image gallery window to other directories and choose images randomly. Click on a file in the list to show its thumbnail in the dialog and also set the current position for subsequent adds and deletes. The next image added will be inserted at this position. If the [delete] button is pressed, the current image will be deleted, and if the [insert] button is pressed, the last deleted image will be inserted at the current position. To move an image to a new position in the list: click the image file (its thumbnail will be shown), press [delete], click another image and press [insert] - the deleted image will be inserted before the selected image. The list can also be edited directly: you can use cut and paste to get the sequence you wish, but be careful to always cut and paste entire lines only. The [add_all] button will add all the files in the current image gallery. Thus you can use the Search Tags function to create an image gallery, add them all,

and then make adjustments if wanted. The [burn] button will send the list of files to Brasero to burn a CD or DVD.

Tags Menu

Tags - General Principles

Image files can have classification tags (categories, keywords) assigned to them. These can be used to search a large image library for those images having desired tags. Typical tags: the main subject of a photo, the associated event, the location, the person(s), etc. Tags reside inside the image (in the EXIF data) and are independent of its file name or directory location. You can use a directory hierarchy to make a physical organization of your images, e.g. directory names corresponding to year or location or other scheme. You can use file names for the main subject of the image. Such physical organizations are useful but optional: you can also put all your images in one giant directory and keep the numeric file names that come out of the camera. Regardless of the physical organization, "tags" can be used to create other organizations, e.g. label all the images of one person over all years, events, locations, etc. All images having a desired tag or tags can be found quickly and displayed in a pageable image gallery window (thumbnails), where you can further review the images and choose those for viewing, editing, or changing their tags. If you have used directory and file names in a meaningful way, you can keep using these, and you can also search for images using these names as well as tags.

Images may have a date which is pulled from the image EXIF data, if present, or manually set. Images may have a "star rating" for the importance of an image. Dates and star ratings can also be used as search criteria.

The package "exiftool" must be installed for tag editing. This program is used by fotoxx to read and write the EXIF data within image files.

There is a tag database used for searching, which makes it very fast (thousands of images per second are searched). The database is generated from the tags data inside the image EXIF data. Thus you can rearrange your image directories and files without losing anything - you must only regenerate the database, which is simple and fast. See the section Index Tags and Thumbs.

Limitations and Practical Tips

The following are the default limits for tags. These are compile time constants which can be easily increased if needed, although I believe they are large enough to exceed practical limits:

- o max. tag length: 30 characters per tag
- o max. tags for one image file: 300 characters
- o max. tags for all images: 1000 unique tags up to 20000 total characters
- o max. tags in a search: 200 characters

The practical limit for the overall number of tags is in the range 100-200. Exceeding this range is possible but will lead to some practical problems: The window showing available tags will be large and tags will become hard to find (although ordered alphabetically), and the point and click method of adding tags will become more cumbersome. Typing the tags manually will work, but this may lead to typos and other tag redundancies. This is a bigger problem when tags are initially being defined for a library with thousands of

images, and less of a problem afterwards when new images are added in small batches. Searching tags is also more cumbersome if the window of available tags is huge. If the tags are broadly defined and fewer in number, the search results will be larger, but using the search results (image gallery window) to find a smaller set of images is also quite fast. Physical file organization is also preserved in the gallery window (files located together in their directories will also appear together in the gallery window). All in all, my recommendation for the casual photographer is to use fewer and broader tag categories.

Edit Tags

Open an image file and then select the edit tags menu. Existing tags are shown in "current tags". Available tags are shown in the "assigned tags" window below. One of these tags can be added by pointing and clicking with the mouse. A tag can be deleted by pointing and clicking within the current tags. Tags recently added are shown in "recently added". This is a convenience to make adding tags to a new batch of images easier, assuming that many of the same tags will be used repeatedly. Point and click the same way. New tags that have never been used before (and do not appear in the list) can be added by typing them in and pressing [create tag]. The date of the image, if available, is shown as "image date". This may be entered if missing, or changed. You can enter a full date in the format `yyymmdd` or a shorter format `yyyy` or `yyyymm`. A missing month or day is logically equivalent to "01" for search purposes. The [use last] button fills-in the date from the last date entered or shown. This is to allow easy dating of a series of images. You may enter an optional "stars" rating in the stars field. Use numeric values, e.g. 5 for a 5-star rating. The dialog remains open if you navigate to a new image, and the current tags are filled-in from that image.

Search Tags

Use the search tags menu to find images having desired tags. Available tags are shown and can be chosen with point and click. Use the radio buttons to select "match all tags" or "match any tag". Press the [search] button to perform the search. Matching images are displayed in a pageable image gallery window (thumbnails). Choose images to view or edit by clicking the thumbnails. The set of matching images will remain in effect for image navigation (the buttons [prev], [next], [next page], etc.) until you use the [file] or [folder] buttons to establish a new image gallery set, which will be all images in the same directory as the chosen file.

A date range may be optionally entered, to further restrict the search to images within the date range. The format is `yyymmdd`. Images are selected which have a date on or after the first date, if present, and on or before the second date, if present. Missing `mm` or `dd` default to 01.

A pair of star ratings may be optionally entered to restrict the results to images having a star rating within the given range. A missing low value implies zero, and a missing high value means unlimited.

Directory and file names may also be searched, with simple wildcard matching. Example: in the input field labeled `/path*/file*`, enter `*egypt*cairo*` to select all files with "egypt" and "cairo" in the directory or file names. The matching rule is simple: `*` matches any sequence of characters anywhere in the full `/pathname/filename`. Example: the file `/home/jack/aaa/bbb/xxx.jpg` would match `*aaa*` and `*xxx*` and `*aaa*xxx*` but would not match `aaa*` or `*xxx` or `*aaa/xxx*`. You can enter multiple file search strings separated by blanks, and files matching any of the strings will be selected. Name matching is not sensitive to case: both `*aaa*` and `*AAA*` would match the previous example. Note: only the files that have been indexed

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(menu: tools > index tags and thumbs) are searched. This is NOT a general file search function that covers the entire file system.

To find all images with no tags, search with all-blank tags, stars, dates, and file names.

View EXIF Data

If the package exiftool is installed, the View EXIF menu will display EXIF data in the current image file, if available. EXIF data contains the date and time of a photo, shutter speed, focal length, pixel dimensions, etc. Most cameras store this data inside the image. If the image is edited and then saved, the EXIF data is updated and stored with the new image. **NOTE THAT THE EXIFTOOL PACKAGE IS REQUIRED IF YOU WANT TO RETAIN EXIF DATA WHEN AN IMAGE IS MODIFIED AND SAVED.**

Help Menu

About

This displays a short message about the fotoxx version number, license, home page, and credits.

User Guide

The user guide (this document) is displayed (created using the WYSIWYG HTML editor SeaMonkey).

README

Displays the README file distributed with fotoxx, which may contain new information about installation or dependencies. When you install a new release of fotoxx, you should look at README and the Change Log to check if there is anything special you need to be aware of.

Change Log

Displays the change log file distributed with fotoxx, containing details about functional changes, additions, or bug fixes for the current and previous releases.

Translate

Displays a short text file which explains how to make a new translation or change an existing one. This involves editing a text file that contains English text messages with corresponding translations ([more](#)).

Home Page

Shows the fotoxx home page from the Internet. Look here for program updates.

Technical Notes

Translations

See the menu `Help > Translations` or the text file `TRANSLATIONS` for guidance on how to modify an existing translation or make a new one. This is a fairly simple process: edit a text file with English text strings followed by their corresponding translations. See one of the existing translations as an example: `/usr/local/share/fotoxx/locales/fr` (the French translation file). A new translation for language code `xx` would be saved at `/usr/local/share/fotoxx/locales/xx`. After making such a file, you can test it by starting fotoxx on the command line: `$ fotoxx -l xx`.

Hardware and Software Requirements

Fotoxx works best on a fast computer (2+ GHz) with at least one gigabyte of memory. Multiple CPU cores are utilized for compute intensive functions (e.g. sharpen, rotate, warp). Smaller computers (notebooks, netbooks) will work, but will be quite slow for some functions. Screens smaller than 1200x800 will feel confining for some functions. The typical notebook screen with poor brightness and color should not be used to adjust color and contrast.

Fotoxx uses the following software:

<code>libfreeimage</code>	read and write jpeg, tiff, and other image file formats
<code>xdg-utils</code>	open text or html files with user's assigned application
<code>exiftool</code>	read and write EXIF data, including user-defined image tags
<code>ufraw</code>	import raw image files from a digital camera
<code>brasero</code>	burn a CD or DVD with selected images
<code>g++</code>	GNU C++ compiler (to compile fotoxx from source)
<code>libgtk2.0-dev</code>	GTK/GDK/Pixbuf development files (to compile from source)
<code>libfreeimage-dev</code>	(to compile from source)
<code>printtox</code>	fotoxx sister application for making or printing a collage of images

See the `README` file for instructions on compiling fotoxx from source.

Command Line Options

The following command line options can be used in launchers to simplify startup:

```
fotoxx ../imagefile.jpg    # initial image directory or file to open
fotoxx -l lc                # language code to use for GUI (de, fr ...)
fotoxx -v                  # output version and build date and exit
```

Status Bar Information

The status bar contains information relevant to the current activity:

```
navigation: 1234x987x24 0.45MB 56% edits: 3
HDR/pano:   align: 2345 offsets: +12.3 -23.4 +0.0023 +1.2 -2.3 +4.5 -5.6 match: 0.91234
```

```
1234x987x24  image width x height x depth (bits per pixel)
0.45MB       image file size (updated when a modified image is saved)
56%         zoom status, image % size
```

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edits: 3 3 prior versions are saved in the undo stack
2345 HDR or panorama alignment cycles done (progress indicator)
+12.3 etc. alignment offsets: x, y, theta, 4 corner warp values
0.91234 image match (creeps up as alignment improves, reset each stage)

Alignment Algorithm

5000 high-contrast or "edge" pixels are selected to control alignment in HDR, HDF, and Panorama. The actual pixels used are shown in red during the alignment process, which is also entertaining. For Panorama and HDF, one image is systematically warped various small amounts and the fit with the other image is tested. This is done because two photos made with slightly different horizons or rotations will not fit perfectly with simple translation and rotation.

Alpha Channels

Images having alpha channels (transparency information) can be processed, but the alpha channel is lost when the processed file is saved.

Image Deterioration From Repeated Editing

If you save an edited image file and then use this file later to perform additional edits, pixel resolution may be lost. It is better if you do all edits when the image files are first processed, to minimize image deterioration (or go back to the originals if you still have them). The following edit functions reduce resolution about 1/2 pixel, and this error can accumulate from repeated edits: rotate (other than 90 degrees), HDR, panorama, unbend, warp. Resize to a smaller size will of course reduce resolution, but using the fraction 1/2, 1/3, or 1/4 gives the best results. The following functions do not reduce resolution: flatten, brightness/color, red eye, sharpen, reduce noise, trim, all art functions.

Source Code

The C++ source code is heavily commented in the hope that others can understand and use the code for their own projects. If you have a technical question about how something works, or a better idea to pass along, you can write to me at kornelix@yahoo.de.

Questions and Problems

If you have a question or run into a problem, you can write to me at kornelix@yahoo.de. If you send any images that work poorly, I can use these to try to improve fotoxx. If there is a traceback dump on the screen, or error messages in the log file `/home/<user>/fotoxx/fotoxx.log` please send these also.

Technical Reference Book

I recommend the book "Introduction to Image Processing and Analysis" by Russ and Russ, CRC Press. It is clear and concise. The following algorithms were adapted from this book: flatten brightness distribution, sharpen (unsharp mask, Laplacian), noise reduction (median smoothing, top hat), simulated embossing.

Acknowledgements

I am grateful for the programs `libfreeimage`, `ufraw`, `exiftool`, and `brasero`, which have helped fotoxx evolve much faster than otherwise possible. Of course this also applies to GTK, GDK, the `pixbuf` library, the GNU

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tools and libraries, and the entire Linux ecosystem. Many generous persons have donated their time for translations and testing (see [Help / About](#)). Many of the ideas in fotoxx have come from users.