NAME

convert - converts an input file using one image format to an output file with the same or differing image format.

SYNOPSIS

convert [*options ...*] *file* [*file...*] *file*

DESCRIPTION

convert converts an input file using one image format to an output file with the same or differing image format.

convert recognizes the following image formats:

Tag	**Description**
AVS	AVS X image file.
BIE+	Joint Bi-level Image experts Group file interchange format.
BMP+	Microsoft Windows bitmap image file.
BMP24+	Microsoft Windows 24-bit bitmap image file.
CGM	Computer Graphics Metafile.
CMYK	Raw cyan, magenta, yellow, and black bytes.
DCX+	ZSoft IBM PC multi-page Paintbrush file.
DIB	Microsoft Windows bitmap image file.
EPS	Adobe Encapsulated PostScript file.
EPS2	Adobe Level II Encapsulated PostScript file.
EPSF	Adobe Encapsulated PostScript file.
EPSI	Adobe Encapsulated PostScript Interchange format.
FAX+	Group 3.
FIG	TransFig image format.
FITS	Flexible Image Transport System.
FPX	FlashPix Format.
GIF+	CompuServe graphics interchange format; 8-bit color.
GIF87+	CompuServe graphics interchange format; 8-bit color (version 87a).
GRAY	Raw gray bytes.
GRADATION	gradual passing from one shade to another. Specify the desired shading as the filename (e.g. gradation:red-blue).
GRANITE	granite texture.
HDF+	Hierarchical Data Format.
HTML	Hypertext Markup Language with a client-side image map.
HISTOGRAM	

JBIG+ Joint Bi-level Image experts Group file interchange format.

JPEG Joint Photographic Experts Group JFIF format; compressed 24-bit color.

ICO Microsoft icon.

LABEL
text image.

MAP Red, green, and blue colormap bytes followed by the image colormap indexes.

MIFF+ Magick image file format. **MNG** Multiple-image Network Graphics.

MONO
Bi-level bitmap in least-significant-byte (LSB) first order.

MPEG+
Motion Picture Experts Group file interchange format.

MTV+ MTV Raytracing image format.

NETSCPAPE
Netscape 216 color cube.

NULL NULL image.

PBM+ Portable bitmap format (black and white).

PCD Photo CD. The maximum resolution written is 512x768 pixels.

PCL Page Control Language.

PCX ZSoft IBM PC Paintbrush file.

PDF+ Portable Document Format.

PGM+ Portable graymap format (gray scale).

PICT Apple Macintosh QuickDraw/PICT file.

PLASMA
plasma fractal image. Specify the base color as the filename (e.g. plasma:gray). Use **fractal** to initialize to a random value (e.g. plasma:fractal).

PNG Portable Network Graphics.

PNM+ Portable anymap.

PPM+ Portable pixmap format (color).

PS+ Adobe PostScript file.

PS2+ Adobe Level II PostScript file.

P7 Xv's visual schnauzer format.

RAD Radiance image format.

RGB Raw red, green, and blue bytes.

RGBA Raw red, green, blue and matte bytes.

RLA Alias/Wavefront image file; read only

RLE Utah Run length encoded image file; read only.

SGI+ Irix RGB image file.

SHTML
Hypertext Markup Language with a client-side image map.

SUN+ SUN Rasterfile.

TEXT raw text file; read only.

TGA+ Truevision Targa image file.

TIFF+ Tagged Image File Format.

TIFF24+
24-bit Tagged Image File Format.

TILE tile image with a texture.

UIL X-Motif UIL table.

UYVY 16bit/pixel interleaved YUV (e.g. used by AccomWSD).

VICAR
read only.

VID Visual Image Directory.

VIFF+ Khoros Visualization image file.

X select image from X server screen.

XC constant image of X server color. Specify the desired color as the filename (e.g. xc:yellow).

XBM X11 bitmap file.

XPM X Windows system pixmap file (color).

XWD X Windows system window dump file (color).

YUV+ CCIR 601 4:1:1 file.

Note, a format delineated with **+** means that if more than one image is specified, it is combined into a single multi-image file. Use **+adjoin** if you want a single image produced for each frame.

Raw images are expected to have one byte per pixel unless **ImageMagick** is compiled in 16-bit mode. Here, the raw data is expected to be stored two bytes per pixel in most-significant-byte-first order.

EXAMPLES

To convert a *MIFF* image of a cockatoo to a SUN raster image, use:

```
convert cockatoo.miff sun:cockatoo.ras
```

To convert a multi-page *Postscript* document to individual FAX pages, use:

```
convert -monochrome document.ps fax:page
```

To convert a TIFF image to a *Postscript* A4 page with the image in the lower left-hand corner, use:

```
convert -page A4+0+0 image.tiff document.ps
```

To convert a raw **GRAY** image with a 128 byte header to a portable graymap, use:

```
convert -size 768x512+128 gray:raw image.pgm
```

To convert a Photo CD image to a TIFF image, use:

```
convert -size 1536x1024 img0009.pcd image.tiff
convert img0009.pcd[4] image.tiff
```

To create a visual image directory of all your JPEG images, use:

convert 'vid:*.jpg' directory.miff

To annotate an image with blue text using font 12x24 at position (100,100), use:

convert -font helvetica -pen blue -draw "text 100,100 Cockatoo" bird.jpg bird.miff

To tile a 640x480 image with a JPEG texture with bumps use:

convert -size 640x480 tile:bumps.jpg tiled.png

To surround an icon with an ornamental border to use with **Mosaic(1)**, use:

convert -mattecolor #ccc -frame 6x6 bird.jpg icon.png

To create a GIF animation image from a DNA molecule sequence, use:

convert -delay 20 dna.* dna.gif

OPTIONS

-adjoin join images into a single multi-image file.

By default, all images of an image sequence are stored in the same file. However, some formats (e.g. JPEG) do not support more than one image and are saved to separate files. Use **+adjoin** to force this behavior.

-average
averages a set of images.

-blur *factor*
blurs an image. Specify *factor* as the percent enhancement (0.0 - 99.9%).

-border *<width>x<height>*
surround the image with a border of color. See **X(1)** for details about the geometry specification.

The color of the border is specified with the **-bordercolor** command line option.

-box *color*
set the color of the annotation bounding box. See **-draw** or for further details.

See **X(1)** for details about the color specification.

-charcoal *factor*
simulate a charcoal drawing.

-colorize *value*
colorize the image with the pen color.

Specify the amount of colorization as a percentage. You can apply separate colorization values to the red, green, and blue channels of the image with a colorization value list delineated with slashes (e.g. 0/0/50).

-colors *value*
preferred number of colors in the image.

The actual number of colors in the image may be less than your request, but never more. Note, this is a color reduction option. Images with less unique colors than specified with this option will have any duplicate or unused colors removed. Refer to **quantize(9)** for more details.

Note, options **-dither**, **-colorspace**, and **-treedepth** affect the color reduction algorithm.

-colorspace *value*

the type of colorspace: **GRAY**, **OHTA**, **RGB**, **Transparent**, **XYZ**, **YCbCr**, **YIQ**, **YPbPr**, **YUV**, or **CMYK**.

Color reduction, by default, takes place in the RGB color space. Empirical evidence suggests that distances in color spaces such as YUV or YIQ correspond to perceptual color differences more closely than do distances in RGB space. These color spaces may give better results when color reducing an image. Refer to **quantize(9)** for more details.

The **Transparent** color space behaves uniquely in that it preserves the matte channel of the image if it exists.

The **-colors** or **-monochrome** option is required for this option to take effect.

-comment *string*

annotate an image with a comment.

By default, each image is commented with its file name. Use this option to assign a specific comment to the image. Optionally you can include the image filename, type, width, height, or scene number by embedding special format characters. Embed **%f** for filename, **%d** for directory, **%e** for filename extention, **%t** for top of filename, **%m** for magick, **%w** for width, **%h** for height, **%s** for scene number, **%b** for file size, or **\n** for newline. For example,

```
-comment "%m:%f %wx%h"
```

produces an image comment of **MIFF:bird.miff 512x480** for an image titled **bird.miff** and whose width is 512 and height is 480.

If the first character of *string* is @, the image comment is read from a file titled by the remaining characters in the string.

-compress *type*

the type of image compression: *None*, *JPEG*, *LZW*, *RunlengthEncoded*, or *Zip*.

Specify **+compress** to store the binary image in an uncompressed format. The default is the compression type of the specified image file.

-contrast

enhance or reduce the image contrast.

This option enhances the intensity differences between the lighter and darker elements of the image. Use **-contrast** to enhance the image or **+contrast** to reduce the image contrast.

-crop *<width>{%}x<height>{%}{+-}<x offset>{+-}<y offset>*

preferred size and location of the cropped image. See **X(1)** for details about the geometry specification.

To specify a percentage width or height instead, append **%**. For example to crop the image by ten percent on all sides of the image, use **-crop 10%**.

Use cropping to crop a particular area of an image. Use **-crop 0x0** to remove edges that are the background color. Omit the x and y offset to generate one or more subimages of a uniform size.

-cycle *amount*
displace image colormap by amount.

Amount defines the number of positions each colormap entry is shifted.

-delay *<1/100ths of a second>*
display the next image after pausing.

This option is useful for regulating the animation of a sequence of GIF images within Netscape. *1/100ths of a second* must expire before the redisplay of the image sequence. The default is no delay between each showing of the image sequence. The maximum delay is 65535.

-density *<width>x<height>*
vertical and horizontal resolution in pixels of the image.

This option specifies an image density when decoding a Postscript or Portable Document page. The default is 72 pixels per inch in the horizontal and vertical direction. This option is used in concert with **-page**.

-despeckle
reduce the speckles within an image.

-display *host:display[.screen]*
specifies the X server to contact; see **X(1)**.

-dispose *method*
GIF disposal method.

Here are the valid methods:

0 No disposal specified.
1 Do not dispose.
2 Restore to background color.
3 Restore to previous.

-dither apply Floyd/Steinberg error diffusion to the image.

The basic strategy of dithering is to trade intensity resolution for spatial resolution by averaging the intensities of several neighboring pixels. Images which suffer from severe contouring when reducing colors can be improved with this option.

The **-colors** option is required for dithering to take effect.

-draw *string*
annotate an image with one or more graphic primitives.

Use this option to annotate an image with one or more graphic primitives. The primitives include

point
line
rectangle
fillRectangle
circle
fillCircle
polygon
fillPolygon

color
matte
text
image

Point, **line**, **color**, **matte**, **text**, and **image** each require a single coordinate. **Line** requires a start and end coordinate, while **rectangle** expects an upper left and lower right coordinate. **Circle** has a center coordinate and a coordinate on the outer edge. Finally, **polygon** requires three or more coordinates defining its boundaries. Coordinates are integers separated by an optional comma. For example, to define a circle centered at 100,100 that extends to 150,150 use:

-draw 'circle 100,100 150,150'

Use **color** to change the color of a pixel. Follow the pixel coordinate with a method:

point
replace
floodfill
reset

Consider the target pixel as that specified by your coordinate. The **point** method recolors the target pixel. The **replace** method recolors any pixel that matches the color of the target pixel. **Floodfill** recolors any pixel that matches the color of the target pixel and is a neighbor. Finally, **reset** recolors all pixels.

Use **matte** to the change the pixel matte value to transparent. Follow the pixel coordinate with a method (see the **color** primitive for a description of methods). The **point** method changes the matte value of the target pixel. The **replace** method changes the matte value of any pixel that matches the color of the target pixel. **Floodfill** changes the matte value of any pixel that matches the color of the target pixel and is a neighbor. Finally **reset** changes the matte value of all pixels.

Use **text** to annotate an image with text. Follow the text coordinates with a string. If the string has embedded spaces, enclose it in double quotes. Optionally you can include the image filename, type, width, height, or scene number by embedding special format characters. Embed **%f** for filename, **%d** for directory, **%e** for filename extention, **%t** for top of filename, **%m** for magick, **%w** for width, **%h** for height, **%s** for scene number, **%b** for file size, or **\n** for newline. For example,

-draw 'text 100,100 "%m:%f %wx%h"'

annotates the image with **MIFF:bird.miff 512x480** for an image titled **bird.miff** and whose width is 512 and height is 480.

Use **image** to composite an image with another image. Follow the image coordinates with the filename of an image.

If the first character of *string* is @, the text is read from a file titled by the remaining characters in the string.

You can set the primitive color, font color, and font bounding box color with **-pen**, **-font**, and **-box** respectively. Options are processed in command line order so be sure to use **-pen** *before* the **-draw** option.

-edge *factor*
detect edges with an image. Specify *factor* as the percent enhancement (0.0 - 99.9%).

-emboss
emboss the image.

-enhance
apply a digital filter to enhance a noisy image.

-equalize
perform histogram equalization to the image.

-flip create a "mirror image" by reflecting the image scanlines in the vertical direction.

-flop create a "mirror image" by reflecting the image scanlines in the horizontal direction.

-font *name*
use this font when annotating the image with text.

If the font is a fully qualified X server font name, the font is obtained from an X server (e.g. -*-helvetica-medium-r-*-*-12-*-*-*-*-*-iso8859-*). To use a TrueType font, precede the TrueType filename with a @ (e.g. @times.ttf). Otherwise, specify a Postscript font (e.g. helvetica).

-frame *<width>x<height>+<outer bevel width>+<inner bevel width>*
surround the image with an ornamental border. See **X(1)** for details about the geometry specification.

The color of the border is specified with the **-mattecolor** command line option.

-gamma *value*
level of gamma correction.

The same color image displayed on two different workstations may look different due to differences in the display monitor. Use gamma correction to adjust for this color difference. Reasonable values extend from 0.8 to 2.3.

You can apply separate gamma values to the red, green, and blue channels of the image with a gamma value list delineated with slashes (e.g. 1.7/2.3/1.2).

Use **+gamma** to set the image gamma level without actually adjusting the image pixels. This option is useful if the image is of a known gamma but not set as an image attribute (e.g. PNG images).

-geometry *<width>{%}x<height>{%}{+-}<x offset>{+-}<y offset>{!}{<}{>}*
preferred size or location of the image when encoding.

By default, the width and height are maximum values. That is, the image is expanded or contracted to fit the width and height value while maintaining the aspect ratio of the image. Append an exclamation point to the geometry to force the image size to exactly the size you specify. For example, if you specify **640x480!** the image width is set to 640 pixels and height to 480. If only one factor is specified, both the width and height assume the value.

To specify a percentage width or height instead, append **%**. The image size is multiplied by the width and height percentages to obtain the final image dimensions. To increase the size of an image, use a value greater than 100 (e.g. 125%). To decrease an image's size, use a percentage less than 100.

Use **>** to change the dimensions of the image *only* if its size exceeds the geometry specification. **<** resizes the image *only* if its dimensions is less than the geometry specification. For example, if you specify **640x480>** and the image size is 512x512, the image size does not change. However, if the image is 1024x1024, it is resized to 640x480.

There are 72 pixels per inch in Postscript coordinates.

-implode *factor*
implode image pixels about the center. Specify *factor* as the percent implosion (0 - 99.9%) or explosion (-99.9 - 0%).

-interlace *type*
the type of interlacing scheme: **None**, **Line**, **Plane**, or **Partition**. The default is **None**.

This option is used to specify the type of interlacing scheme for raw image formats such as **RGB** or **YUV**. **No** means do not interlace (RGBRGBRGBRGBRGBRGB...), **Line** uses scanline interlacing (RRR...GGG...BBB...RRR...GGG...BBB...), and **Plane** uses plane interlacing (RRRRRR...GGGGGG...BBBBBB...). **Partition** is like plane except the different planes are saved to individual files (e.g. image.R, image.G, and image.B).

Use **Line**, or **Plane** to create an interlaced GIF or progressive JPEG image.

-label *name*
assign a label to an image.

Use this option to assign a specific label to the image. Optionally you can include the image filename, type, width, height, or scene number in the label by embedding special format characters. Embed **%f** for filename, **%d** for directory, **%e** for filename extention, **%t** for top of filename, **%m** for magick, **%w** for width, **%h** for height, **%s** for scene number, **%b** for file size in kilobytes, or **\n** for newline. For example,

```
-label "%m:%f %wx%h"
```

produces an image label of **MIFF:bird.miff 512x480** for an image titled **bird.miff** and whose width is 512 and height is 480.

If the first character of *string* is @, the image label is read from a file titled by the remaining characters in the string.

When converting to Postscript, use this option to specify a header string to print above the image. Specify the label font with **-font**.

-layer *type*
the type of layer: **Red**, **Green**, **Blue**, or **Matte**.

Use this option to extract a particular *layer* from the image. **Matte**, for example, is useful for extracting the opacity values from an image.

-linewidth *value*
set the width of a line. See **-draw** for further details.

-loop *iterations*
add Netscape loop extension to your GIF animation.

A value other than zero forces the animation to repeat itself up to *iterations* times.

-map *filename*
choose a particular set of colors from this image.

By default, color reduction chooses an optimal set of colors that best represent the original image. Alternatively, you can choose a particular set of colors from an image file with this option. Use **+map** to reduce all images provided on the command line to a single optimal set of colors that best represent all the images.

-matte store matte channel if the image has one.

-modulate *value*
vary the brightness, saturation, and hue of an image.

Specify the percent change in brightness, the color saturation, and the color hue separated by commas. For example, to increase the color brightness by 20% and decrease the color saturation by 10% and leave the hue unchanged, use: **-modulate 20/-10**.

-monochrome
transform the image to black and white.

-negate apply color inversion to image.

The red, green, and blue intensities of an image are negated. Use **+negate** to only negate the grayscale pixels of the image.

-noise add or reduce the noise in an image.

The principal function of noise peak elimination filter is to smooth the objects within an image without losing edge information and without creating undesired structures. The central idea of the algorithm is to replace a pixel with its next neighbor in value within a 3 x 3 window, if this pixel has been found to be noise. A pixel is defined as noise if and only if this pixel is a maximum or minimum within the 3 x 3 window.

Use **+noise** followed by a noise type to add noise to an image. Choose from these noise types:

uniform
gaussian
multiplicative
impulse
laplacian
poisson

-normalize
transform image to span the full range of color values.

This is a contrast enhancement technique.

-opaque *color*
change this color to the pen color within the image. See **-pen** for more details.

-page *<width>{%}x<height>{%}{+-}<x offset>{+-}<y offset>{!}{<}{>}*
preferred size and location of an image canvas.

Use this option to specify the dimensions of the Postscript page in dots per inch or a TEXT page in pixels. The choices for a Postscript page are:

Letter	612x 792
Tabloid	792x1224
Ledger	1224x 792
Legal	612x1008
Statement	396x 612
Executive	540x 720
A3	842x1190
A4	595x 842
A5	420x 595
B4	729x1032

B5	516x 729
Folio	612x 936
Quarto	610x 780
10x14	720x1008

For convenience you can specify the page size by media (e.g. A4, Ledger, etc.). Otherwise, **-page** behaves much like **-geometry** (e.g. -page letter+43+43>).

To position a GIF image, use -page *{+-}<x offset>{+-}<y offset>* (e.g. -page +100+200). For a Postscript page, the image is sized as in **-geometry** and positioned relative to the lower left hand corner of the page by *{+-}<x offset>{+-}<y offset>*. The default is to center the image within the page. If the image size exceeds the Postscript page, it is reduced to fit the page.

The default page dimensions for a TEXT image is 612x792.

This option is used in concert with **-density**.

-paint *radius*

simulate an oil painting.

Each pixel is replaced by the most frequent color in a circular neighborhood whose width is specified with *radius*.

-pen *color*

set the color of the font or opaque color. See **-draw** for further details.

See **X(1)** for details about the color specification.

-pointsize *value*

pointsize of the Postscript font.

-quality *value*

JPEG/MIFF/PNG compression level.

For the JPEG image format, quality is 0 (worst) to 100 (best). The default quality is 75.

Quality for the MIFF and PNG image format sets the amount of image compression (quality / 10) and filter-type (quality % 10). Compression quality values range from 0 (worst) to 100 (best). If filter-type is 4 or less, the specified filter-type is used for all scanlines:

0: none
1: sub
2: up
3: average
4: Paeth

If filter-type is 5, adaptive filtering is used when quality is greater than 50 and the image does not have a color map, otherwise no filtering is used.

If filter-type is 6 or more, adaptive filtering with *minimum-sum-of-absolute-values* is used.

The default is quality is 75. Which means nearly the best compression with adaptive filtering.

For further information, see the PNG specification (RFC 2083), <http://www.w3.org/pub/WWW/TR>.

-raise *<width>x<height>*
lighten or darken image edges to create a 3-D effect. See **X(1)** for details about the geometry specification.

Use **-raise** to create a raised effect, otherwise use **+raise**.

-region *<width>x<height>{+-}<x offset>{+-}<y offset>*
apply options to a portion of the image.

By default, any command line options are applied to the entire image. Use **-region** to restrict operations to a particular area of the image.

-roll *{+-}<x offset>{+-}<y offset>*
roll an image vertically or horizontally. See **X(1)** for details about the geometry specification.

A negative *x offset* rolls the image left-to-right. A negative *y offset* rolls the image top-to-bottom.

-rotate *degrees{<}{>}*
apply Paeth image rotation to the image.

Use **>** to rotate the image *only* if its width exceeds the height. **<** rotates the image *only* if its width is less than the height. For example, if you specify **-90>** and the image size is 480x640, the image is not rotated by the specified angle. However, if the image is 640x480, it is rotated by -90 degrees.

Empty triangles left over from rotating the image are filled with the color defined as **bordercolor** (class **borderColor**). See **X(1)** for details.

-sample *geometry*
scale image with pixel sampling.

-scene *value*
image scene number.

-seed *value*
pseudo-random number generator seed value.

-segment *<cluster threshold>x<smoothing threshold>*
segment an image by analyzing the histograms of the color components and identifying units that are homogeneous with the fuzzy c-means technique.

Specify *cluster threshold* as the number of pixels in each cluster must exceed the the cluster threshold to be considered valid. *Smoothing threshold* eliminates noise in the second derivative of the histogram. As the value is increased, you can expect a smoother second derivative. The default is 1.5. See **IMAGE SEGMENTATION** for details.

-shade *<azimuth>x<elevation>*
shade the image using a distant light source.

Specify *azimuth* and *elevation* as the position of the light source. Use **+shade** to return the shading results as a grayscale image.

-sharpen *factor*
sharpen an image. Specify *factor* as the percent enhancement (0.0 - 99.9%).

-shear *<x degrees>x<y degrees>*
shear the image along the X or Y axis by a positive or negative shear angle.

Shearing slides one edge of an image along the X or Y axis, creating a parallelogram. An X direction shear slides an edge along the X axis, while a Y direction shear slides an edge along the Y axis. The amount of the shear is controlled by a shear angle. For X direction shears, *x degrees* is measured relative to the Y axis, and similarly, for Y direction shears *y degrees* is measured relative to the X axis.

Empty triangles left over from shearing the image are filled with the color defined as **bordercolor** (class **borderColor**). See **X(1)** for details.

-size *<width>{%}x<height>{%}+<offset>*

width and height of the image.

Use this option to specify the width and height of raw images whose dimensions are unknown such as **GRAY**, **RGB**, or **CMYK**. In addition to width and height, use **-size** to skip any header information in the image or tell the number of colors in a **MAP** image file, (e.g. -size 640x512+256).

For Photo CD images, choose from these sizes:

192x128
384x256
768x512
1536x1024
3072x2048

Finally, use this option to choose a particular resolution layer of a JBIG or JPEG image (e.g. -size 1024x768).

-solarize *factor*

negate all pixels above the threshold level. Specify *factor* as the percent threshold of the intensity (0 - 99.9%).

This option produces a **solarization** effect seen when exposing a photographic film to light during the development process.

-spread *amount*

displace image pixels by a random amount.

Amount defines the size of the neighborhood around each pixel to choose a candidate pixel to swap.

-swirl *degrees*

swirl image pixels about the center.

Degrees defines the tightness of the swirl.

-texture *filename*

name of texture to tile onto the image background.

-threshold *value*

threshold the image.

Create a bi-level image such that any pixel intensity that is equal or exceeds the threshold is reassigned the maximum intensity otherwise the minimum intensity.

-transparency *color*

make this color transparent within the image.

-treedepth *value*

Normally, this integer value is zero or one. A zero or one tells **convert** to choose a optimal tree depth for the color reduction algorithm.

An optimal depth generally allows the best representation of the source image with the fastest computational speed and the least amount of memory. However, the default depth is inappropriate for some images. To assure the best representation, try values between 2 and 8 for this parameter. Refer to **quantize(9)** for more details.

The **-colors** option is required for this option to take effect.

-undercolor *<undercolor factor>x<black-generation factor>*
control undercolor removal and black generation on CMYK images.

This option enables you to perform undercolor removal and black generation on CMYK images--images to be printed on a four-color printing system. You can control how much cyan, magenta, and yellow to remove from your image and how much black to add to it. The standard undercolor removal is **1.0x1.0**. You'll frequently get better results, though, if the percentage of black you add to your image is slightly higher than the percentage of C, M, and Y you remove from it. For example you might try **0.5x0.7**.

-verbose
print detailed information about the image.

This information is printed: image scene number; image name; converted image name; image size; the image class (*DirectClass* or *PseudoClass*); the total number of unique colors; and the number of seconds to read and transform the image.

-view *string*
FlashPix viewing parameters.

-wave *<amplitude>x<wavelength>*
alter an image along a sine wave.

Specify *amplitude* and *wavelength* to effect the characteristics of the wave.

Options are processed in command line order. Any option you specify on the command line remains in effect until it is explicitly changed by specifying the option again with a different effect. Some options only effect the decoding of images and others only the encoding.

By default, the image format is determined by its magic number. To specify a particular image format, precede the filename with an image format name and a colon (i.e. ps:image) or specify the image type as the filename suffix (i.e. image.ps). See **DESCRIPTION** for a list of valid formats.

When you specify **X** as your image type, the filename has special meaning. It specifies an X window by id, name, or **root**. If no filename is specified, the window is selected by clicking the mouse in the desired window.

Specify *input_file* as - for standard input, *output_file* as - for standard output. If *input_file* has the extension **.Z** or **.gz**, the file is uncompressed with **uncompress** or **gunzip** respectively. If *output_file* has the extension **.Z** or **.gz**, the file size is compressed using with **compress** or **gzip** respectively. Finally, precede the image file name with **|** to pipe to or from a system command.

Use an optional index enclosed in brackets after a file name to specify a desired subimage of a multi-resolution image format like Photo CD (e.g. img0001.pcd[4]) or a range for MPEG images (e.g. video.mpg[50-75]). A subimage specification can be disjoint (e.g. image.tiff[2,7,4]). For raw images, specify a subimage with a geometry (e.g. -size 640x512 image.rgb[320x256+50+50]).

Single images are written with the filename you specify. However, multi-part images (e.g. a multi-page Postscript document with **+adjoin** specified) are written with the filename followed by a period (**.**) and the scene number. You can change this behavior by embedding a **printf** format specification in the file name. For example,

image%02d.miff

converts files image00.miff, image01.miff, etc.

The % character is always interpreted in output filenames. To get a % character in the filename, use %%.

IMAGE SEGMENTATION

Use **-segment** to segment an image by analyzing the histograms of the color components and identifying units that are homogeneous with the fuzzy c-means technique. The scale-space filter analyzes the histograms of the three color components of the image and identifies a set of classes. The extents of each class is used to coarsely segment the image with thresholding. The color associated with each class is determined by the mean color of all pixels within the extents of a particular class. Finally, any unclassified pixels are assigned to the closest class with the fuzzy c-means technique.

The fuzzy c-Means algorithm can be summarized as follows:

o Build a histogram, one for each color component of the image.

o For each histogram, successively apply the scale-space filter and build an interval tree of zero crossings in the second derivative at each scale. Analyze this scale-space ‘‘fingerprint’’ to determine which peaks or valleys in the histogram are most predominant.

o The fingerprint defines intervals on the axis of the histogram. Each interval contains either a minima or a maxima in the original signal. If each color component lies within the maxima interval, that pixel is considered ‘‘classified’’ and is assigned an unique class number.

o Any pixel that fails to be classified in the above thresholding pass is classified using the fuzzy c-Means technique. It is assigned to one of the classes discovered in the histogram analysis phase.

The fuzzy c-Means technique attempts to cluster a pixel by finding the local minima of the generalized within group sum of squared error objective function. A pixel is assigned to the closest class of which the fuzzy membership has a maximum value.

For additional information see

Young Won Lim, Sang Uk Lee, "On The Color Image Segmentation Algorithm Based on the Thresholding and the Fuzzy c-Means Techniques", Pattern Recognition, Volume 23, Number 9, pages 935-952, 1990.

ENVIRONMENT

DISPLAY

To get the default host, display number, and screen.

SEE ALSO

display(1), animate(1), import(1), montage(1), mogrify(1), combine(1), xtp(1)

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