NAME

display - display an image on any workstation running X

SYNOPSIS

display [*options* **...]** *file* [[*options* ...] *file* ...]

DESCRIPTION

Display is a machine architecture independent image processing and display program. It can display an image on any workstation screen running an X server. **Display** can read and write many of the more popular image formats (e.g. JPEG, TIFF, PNM, Photo CD, etc.). With **display**, you can perform these functions on an image:

o load an image from a file
o display the next image
o display the former image
o display a sequence of images as a slide show
o write the image to a file
o print the image to a Postscript printer
o delete the image file
o create a Visual Image Directory
o select the image to display by its thumbnail rather than name
o copy a region of the image
o paste a region to the image
o undo last image transformation
o half the image size
o double the image size
o resize the image
o restore the image to its original size
o refresh the image
o crop the image
o cut the image
o flop image in the horizontal direction
o flip image in the vertical direction
o rotate the image 90 degrees clockwise
o rotate the image 90 degrees counter-clockwise
o rotate the image
o shear the image
o trim the image edges
o invert the colors of the image
o vary the color brightness
o vary the color saturation
o vary the image hue
o gamma correct the image
o sharpen the image contrast
o dull the image contrast
o perform histogram equalization on the image
o perform histogram normalization on the image
o negate the image colors
o convert the image to grayscale
o set the maximum number of unique colors in the image
o reduce the speckles within an image
o eliminate peak noise from an image
o detect edges within the image
o emboss an image
o segment the image by color

o simulate an oil painting
o simulate a charcoal drawing
o annotate the image with text
o draw on the image
o edit an image pixel color
o edit the image matte information
o composite an image with another
o add a border to the image
o surround image with an ornamental border
o add an image comment
o apply image processing techniques to a region of interest
o display information about the image
o show a histogram of the image
o display image to background of a window
o set user preferences
o display information about this program
o discard all images and exit program
o change the level of magnification
o display images specified by a World Wide Web (WWW) uniform resource locator (URL)

EXAMPLES

To scale an image of a cockatoo to exactly 640 pixels in width and 480 pixels in height and position the window at location (200,200), use:

```
display -geometry 640x480+200+200! cockatoo.miff
```

To display an image of a cockatoo without a border centered on a backdrop, use:

```
display +borderwidth -backdrop cockatoo.miff
```

To tile a slate texture onto the root window, use:

```
display -size 1280x1024 -window root slate.png
```

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

```
display 'vid:*.jpg'
```

To display a MAP image that is 640 pixels in width and 480 pixels in height with 256 colors, use:

```
display -size 640x480+256 cockatoo.map
```

To display an image of a cockatoo specified with a World Wide Web (WWW) uniform resource locator (URL), use

```
display ftp://wizards.dupont.com/images/cockatoo.jpg
```

OPTIONS

-backdrop

display the image centered on a backdrop.

This backdrop covers the entire workstation screen and is useful for hiding other X window activity while viewing the image. The color of the backdrop is specified as the background color. Refer to **X RESOURCES** for details.

-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 obtained from the X server and is defined as **bordercolor** (class **borderColor**). See **X(1)** for details.

-colormap *type*
the type of colormap: **Shared** or **Private**.

This option only applies when the default X server visual is *PseudoColor* or *GrayScale*. Refer to **-visual** for more details. By default, a shared colormap is allocated. The image shares colors with other X clients. Some image colors could be approximated, therefore your image may look very different than intended. Choose **Private** and the image colors appear exactly as they are defined. However, other clients may go *technicolor* when the image colormap is installed.

-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*.

Use this option with **-write** to specify the the type of image compression. See **miff(5)** for details.

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 apply image processing options to, or display, 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.

The equivalent X resource for this option is **cropGeometry** (class **CropGeometry**). See **X RESOURCES** for details.

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

This option is useful when viewing several images in sequence. *1/100ths of a second* must expire before the next image is displayed. The default is to display the image and wait until you choose to display the next image or terminate the program.

-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 the same as the resolution of your X server (see **xdpyinfo(1)**). 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** or **-monochrome** option is required for this option to take effect.

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

-enhance
apply a digital filter to enhance a noisy 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.

-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 (i.e. 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 and location of the image window. See **X(1)** for details about the geometry specification. By default, the window size is the image size and the location is chosen by you when it is mapped.

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.

When displaying an image on an X server, *<x offset>* and *<y offset>* is relative to the root window.

The equivalent X resource for this option is **geometry** (class **Geometry**). See **X RESOURCES** for details.

-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.

-immutable
displayed image cannot be modified",

-label *string*
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**.

-map *type*
display image using this Standard Colormap type.

Choose from these Standard Colormap types:

best
default
gray
red
green
blue

The X server must support the Standard Colormap you choose, otherwise an error occurs. Use **list** as the type and **display(1)** searches the list of colormap types in top-to-bottom order until one is located. See **xstdcmap(1)** for one way of creating Standard Colormaps.

-matte store matte channel if the image has one.

-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.

-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**.

-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**.

-remote *string*
execute a command in an remote display process.

The only command recognized at this time is the name of an image file to load.

-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**).

-sample *geometry*
scale image with pixel sampling. See **-geometry** for details about the geometry specification.

-scene *value*
image scene number.

Use this option to specify an image sequence with a single filename. See the discussion of *file* below for details.

-segment *value*
eliminate clusters that are insignificant.

The number of pixels in each cluster must exceed the the cluster threshold to be considered valid.

See **IMAGE SEGMENTATION for details.**

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

-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).

-texture *filename*
name of texture to tile onto the image background.

-title *string*
assign a title to the displayed image.

Use this option to assign a specific title to the image. This is assigned to the image window and is typically displayed in the window title bar. 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, or **%b** for file size in kilobytes. For example,

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

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

-treedepth *value*
Normally, this integer value is zero or one. A zero or one tells **display** 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** or **-monochrome** option is required for this option to take effect.

-update *seconds*
detect when image file is modified and redisplay.

Suppose that while you are displaying an image the file that is currently displayed is over-written. **display** will automatically detect that the input file has been changed and update the displayed image accordingly.

-verbose
print detailed information about the image.

This information is printed: image scene number; 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. Refer to **miff(5)** for a description of the image class.

If **-colors** is also specified, the total unique colors in the image and color reduction error values are printed. Refer to **quantize(9)** for a description of these values.

-visual *type*
display image using this visual type.

Choose from these visual classes:

StaticGray
GrayScale
StaticColor
PseudoColor
TrueColor
DirectColor
default
visual id

The X server must support the visual you choose, otherwise an error occurs. If a visual is not specified, the visual class that can display the most simultaneous colors on the default X server screen is chosen.

-window *id*
set the background pixmap of this window to the image.

id can be a window id or name. Specify **root** to select X's root window as the target window.

By default the image is tiled onto the background of the target window. If **-backdrop** or **-geometry** are specified, the image is surrounded by the background color. Refer to **X RESOURCES** for details.

The image will not display on the root window if the image has more unique colors than the target window colormap allows. Use **-colors** to reduce the number of colors. **-window_group** *id* exit program when this window id is destroyed.

id can be a window id or name.

-write *filename*
write image to a file.

If *file* already exists, you will be prompted as to whether it should be overwritten.

By default, the image is written in the format that it was read in as. To specify a particular image format, prefix *file* with the image type and a colon (i.e. ps:image) or specify the image type as the filename suffix (i.e. image.ps). See **convert(1)** for a list of valid image formats. Specify *file* as - for standard output. If *file* has the extension **.Z** or **.gz**, the file size is compressed using with **compress** or **gzip** respectively. Precede the image file name | to pipe to a system command. If *file* already exists, you will be prompted as to whether it should be overwritten.

Use **-compress** to specify the type of image compression.

The equivalent X resource for this option is **writeFilename** (class **WriteFilename**). See **X RESOURCES** for details.

In addition to those listed above, you can specify these standard X resources as command line options: **-background**, **-bordercolor**, **-borderwidth**, **-font**, **-foreground**, **-iconGeometry**, **-iconic**, **-mattecolor**, **-name**, or **-title**. See **X RESOURCES** for details.

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. For example to display two images, the first with 32 colors, and the second with only 16 colors, use:

```
display -colors 32 cockatoo.miff -colors 16 macaw.miff
```

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 **convert(1)** for a list of valid image 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 *file* as - for standard input. If *file* has the extension **.Z** or **.gz**, the file is uncompressed with **uncompress** or **gunzip** respectively. Precede the image file name **|** to pipe 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 read with the filename you specify. Alternatively, you can display an image sequence with a single filename. Define the range of the image sequence with *-scene*. Each image in the range is read 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,

```
-scene 0-9 image%02d.miff
```

displays files image00.miff, image01.miff, through image09.miff.

BUTTONS

The effects of each button press is described below. Three buttons are required. If you have a two button mouse, button 1 and 3 are returned. Press ALT and button 3 to simulate button 2.

1 Press this button to map or unmap the Command widget. See the next section for more information about the Command widget.

2 Press and drag to define a region of the image to magnify.

3 Press and drag to choose from a select set of **display(1)** commands. This button behaves differently if the image being displayed is a visual image directory. Here, choose a particular tile of the directory and press this button and drag to select a command from a pop-up menu. Choose from these menu items:

Open
Next
Former
Delete
Update

If you choose **Open**, the image represented by the tile is displayed. To return to the visual image directory, choose **Next** from the Command widget (refer to COMMAND WIDGET). **Next** and **Former** moves to the next or former image respectively. Choose **Delete** to delete a particular image tile. Finally, choose **Update** to synchronize all the image tiles with their respective images. See **montage(1)** and **miff(5)** for more details.

COMMAND WIDGET

The Command widget lists a number of sub-menus and commands. They are

- File
  - Open...
  - Next
  - Former
  - Select...
  - Save...
  - Print...
  - Delete...
  - Canvas...
  - Visual Directory...
  - Quit
- Edit
  - Undo
  - Redo
  - Cut
  - Copy
  - Paste
- View
  - Half Size
  - Original Size
  - Double Size
  - Resize...
  - Apply
  - Refresh
  - Restore
- Transform
  - Crop
  - Chop
  - Flop
  - Flip
  - Rotate Right
  - Rotate Left
  - Rotate...
  - Shear...
  - Roll...
  - Trim Edges
- Enhance
  - Hue...
  - Saturation...
  - Brightness...
  - Gamma...
  - Spiff...
  - Dull
  - Equalize
  - Normalize
  - Negate

- Grayscale
- Map...
- Quantize...

Effects
- Despeckle
- Emboss
- Reduce Noise
- Add Noise
- Sharpen...
- Blur...
- Threshold...
- Edge Detect...
- Spread...
- Shade...
- Raise...
- Segment...

F/X
- Solarize...
- Swirl...
- Implode...
- Wave...
- Oil Painting...
- Charcoal Drawing...

Image Edit
- Annotate...
- Draw...
- Color...
- Matte...
- Composite...
- Add Border...
- Add Frame...
- Comment...
- Launch...
- Region of Interest...

Miscellany
- Image Info
- Zoom Image
- Show Preview...
- Show Histogram
- Show Matte
- Background...
- Slide Show
- Preferences...

Help
- Help
- Browse Documentation
- About Display

Menu items with a indented triangle have a sub-menu. They are represented above as the indented items. To access a sub-menu item, move the pointer to the appropriate menu and press button 1 and drag. When you find the desired sub-menu item, release the button and the command is executed. Move the pointer away from the sub-menu if you decide not to execute a particular command.

KEYBOARD ACCELERATORS

Accelerators are one or two key presses that effect a particular command. The keyboard accelerators that **display(1)** understands is:

Ctl+O Press to load an image from a file.

Refer to **IMAGE LOADING** for more details.

space Press to display the next image.

If the image is a multi-paged document such as a Postscript document, you can skip ahead several pages by preceeding this command with a number. For example to display the fourth page beyond the current page, press **4space**.

backspace
Press to display the former image.

If the image is a multi-paged document such as a Postscript document, you can skip behind several pages by preceeding this command with a number. For example to display the fourth page preceeding the current page, press **4n**.

Ctl+S Press to save the image to a file.

Ctl+P Press to print the image to a Postscript printer.

Ctl+D Press to delete an image file.

Ctl+N Press to create a blank canvas.

Ctl+Q Press to discard all images and exit program.

Ctl+Z Press to undo last image transformation.

Ctl+R Press to redo last image transformation.

Ctl+X Press to cut a region of the image.

Refer to **IMAGE CUTTING** for more details.

Ctl+C Press to copy a region of the image.

Refer to **IMAGE COPYING** for more details.

Ctl+V Press to paste a region to the image.

Refer to **IMAGE PASTING** for more details.

< Press to half the image size.

- Press to return to the original image size.

> Press to double the image size.

% Press to resize the image to a width and height you specify.

Cmd-A Press to make any image transformations permanent.

By default, any image size transformations are applied to the original image to create the image displayed on the X server. However, the transformations are not permanent (i.e. the original image does not change size only the X image does). For example, if you press **>** the X image will appear to double in size, but the original image will in fact remain the same size. To force the original image to double in size, press **>** followed by **A**.

@ Press to refresh the image window.

C Press to crop the image.

Refer to **IMAGE CROPPING** for more details.

[Press to chop the image.

Refer to **IMAGE CHOPPING** for more details.

H Press to flop image in the horizontal direction.

V Press to flip image in the vertical direction.

/ Press to rotate the image 90 degrees clockwise.

Press to rotate the image 90 degrees counter-clockwise.

***** Press to rotate the image the number of degrees you specify.

Refer to **IMAGE ROTATION** for more details.

s Press to shear the image the number of degrees you specify.

r Press to roll the image.

t Press to trim the image edges.

Shft-H Press to vary the color hue.

Shft-S Press to vary the color saturation.

Shft-L Press to vary the image brightness.

Shft-G Press to gamma correct the image.

Shft-C Press to spiff up the image contrast.

Shft-Z Press to dull the image contrast.

= Press to perform histogram equalization on the image.

Shft-N Press to perform histogram normalization on the image.

˜ Press to negate the colors of the image.

. Press to convert the image colors to gray.

Press to set the maximum number of unique colors in the image.

F2 Press to reduce the speckles in an image.

F3 Press to emboss an image.

F4 Press to eliminate peak noise from an image.

F5 Press to add noise to an image.

F6 Press to sharpen an image.

F7 Press to blur image an image.

F8 Press to threshold the image.

F9 Press to detect edges within an image.

F10 Press to displace pixels by a random amount.

F11 Press to shade the image using a distant light source.

F12 Press to lighten or darken image edges to create a 3-D effect.

F13 Press to segment the image by color.

Meta-S Press to swirl image pixels about the center.

Meta-I Press to implode image pixels about the center.

Meta-W
Press to alter an image along a sine wave.

Meta-P Press to simulate an oil painting.

Meta-C Press to simulate a charcoal drawing.

Alt-A Press to annotate the image with text.

Refer to **IMAGE ANNOTATION** for more details.

Alt-D Press to draw a line on the image.

Refer to **IMAGE DRAWING** for more details.

Alt-P Press to edit an image pixel color.

Refer to **COLOR EDITING** for more details.

Alt-M Press to edit the image matte information.

Refer to **MATTE EDITING** for more details.

Alt-V Press to composite the image with another.

Refer to **IMAGE COMPOSITING** for more details.

Alt-B Press to add a border to the image.

Alt-F Press to add a ornamental frame to the image.

Shft-! Press to add an image comment.

Ctl-A Press to apply an image processing technique to a region of interest.

Refer to **REGION OF INTEREST** for more details.

Shft-? Press to display information about the image.

Shft-+ Press to map the zoom image window.

Shft-P Press to preview an image enhancement, effect, or f/x.

F1 Press to display helpful information about **display(1)**.

Find Press to browse documentation about **ImageMagick**.

1-9 Press to change the level of magnification.

Use the arrow keys to move the image one pixel up, down, left, or right within the magnify window. Be sure to first map the magnify window by pressing button 2.

Press **ALT** and one of the arrow keys to trim off one pixel from any side of the image.

X RESOURCES

Display options can appear on the command line or in your X resource file. Options on the command line supersede values specified in your X resource file. See **X(1)** for more information on X resources.

Most **display** options have a corresponding X resource. In addition, **display** uses the following X resources:

background (*class* Background)
Specifies the preferred color to use for the image window background. The default is #ccc.

borderColor (*class* BorderColor)
Specifies the preferred color to use for the image window border. The default is #ccc.

borderWidth (*class* BorderWidth)
Specifies the width in pixels of the image window border. The default is 2.

browseCommand (*class* browseCommand)
Specifies the name of the preferred browser when displaying ImageMagick documentation. The default is **netscape %s**.

confirmExit (*class* ConfirmExit)
Display pops up a dialog box to confirm exiting the program when exiting the program. Set this resource to *False* to exit without a confirmation.

displayGamma (*class* DisplayGamma)
Specifies the gamma of your X server.

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

The default is *2.2*.

displayWarnings (*class* DisplayWarnings)
Display pops up a dialog box whenever a warning message occurs. Set this resource to *False* to ignore warning messages.

editorCommand (*class* editorCommand)
Specifies the name of the preferred editor when editing image comments. The default is *xterm -title "Edit Image Comment" -e vi %s*.

font (*class* FontList)
Specifies the name of the preferred font to use in normal formatted text. The default is 14 point *Helvetica*.

font[1-9] (*class* Font[1-9])
Specifies the name of the preferred font to use when annotating the image window with text. The default fonts are *fixed*, *variable*, *5x8*, *6x10*, *7x13bold*, *8x13bold*, *9x15bold*, *10x20*, and *12x24*. Refer to **IMAGE ANNOTATION** for more details.

foreground (*class* Foreground)
Specifies the preferred color to use for text within the image window. The default is black.

gammaCorrect (*class* gammaCorrect)
This resource, if true, will lighten or darken an image of known gamma to match the gamma of the display (see resource *displayGamma*). The default is True.

geometry (*class* Geometry)
Specifies the preferred size and position of the image window. It is not necessarily obeyed by all window managers.

iconGeometry (*class* IconGeometry)
Specifies the preferred size and position of the application when iconified. It is not necessarily obeyed by all window managers.

iconic (*class* Iconic)
This resource indicates that you would prefer that the application's windows initially not be visible as if the windows had be immediately iconified by you. Window managers may choose not to honor the application's request.

magnify (*class* Magnify)
specifies an integral factor by which the image should be enlarged. The default is 3.

This value only affects the magnification window which is invoked with button number 3 after the image is displayed. Refer to **BUTTONS** for more details.

matteColor (*class* MatteColor)
Specify the color of windows. It is used for the backgrounds of windows, menus, and notices. A 3D effect is achieved by using highlight and shadow colors derived from this color. Default value: #ccc.

name (*class* Name)
This resource specifies the name under which resources for the application should be found. This resource is useful in shell aliases to distinguish between invocations of an application, without resorting to creating links to alter the executable file name. The default is the application name.

pen[1-9] (*class* Pen[1-9])
Specifies the color of the preferred font to use when annotating the image window with text. The default colors are *black*, *blue*, *green*, *cyan*, *gray*, *red*, *magenta*, *yellow*, and *white*. Refer to **IMAGE ANNOTATION** for more details.

printCommand (*class* PrintCommand)
This command is executed whenever **Print** is issued (see **BUTTONS**. In general, it is the command to print Postscript to your printer. Default value: **lpr -r %s**.

sharedMemory (*class* SharedMemory)
This resource specifies whether display should attempt use shared memory for pixmaps. ImageMagick must be compiled with shared memory support, and the display must support the MIT-SHM extension. Otherwise, this resource is ignored. The default is True.

textFont (*class* textFont)
Specifies the name of the preferred font to use in fixed (typewriter style) formatted text. The default is 14 point *Courier*.

title (*class* Title)
This resource specifies the title to be used for the image window. This information is sometimes used by a window manager to provide a header identifying the window. The default is the image file name.

undoCache (*class* UndoCache)
Specifies, in mega-bytes, the amount of memory in the undo edit cache. Each time you modify the image it is saved in the undo edit cache as long as memory is available. You can subsequently *undo* one or more of these transformations. The default is 16 mega-bytes.

usePixmap (*class* UsePixmap)
Images are maintained as a XImage by default. Set this resource to True to utilize a server Pixmap instead. This option is useful if your image exceeds the dimensions of your server screen and you intend to pan the image. Panning is much faster with Pixmaps than with a XImage. Pixmaps are considered a precious resource, use them with discretion.

To set the geometry of the *Magnify* or *Pan* or window, use the *geometry* resource. For example, to set the Pan window geometry to 256x256, use:

```
display.pan.geometry: 256x256
```

IMAGE LOADING

To select an image to display, choose **Open** of the **File** sub-menu from the Command widget. A file browser is displayed. To choose a particular image file, move the pointer to the filename and press any button. The filename is copied to the text window. Next, press **Open** or press the RETURN key. Alternatively, you can type the image file name directly into the text window. To descend directories, choose a directory name and press the button twice quickly. A scrollbar allows a large list of filenames to be moved through the viewing area if it exceeds the size of the list area.

You can trim the list of file names by using shell globbing characters. For example, type ***.jpg** to list only files that end with **.jpg**.

To select your image from the X server screen instead of from a file, Choose **Grab** of the **Open** widget.

VISUAL IMAGE DIRECTORY

To create a Visual Image Directory, choose **Visual Directory** of the **File** sub-menu from the Command widget. A file browser is displayed. To create a Visual Image Directory from all the images in the current directory, press **Directory** or press the RETURN key. Alternatively, you can select a set of image names by using shell globbing characters. For example, type ***.jpg** to include only files that end with **.jpg**. To descend directories, choose a directory name and press the button twice quickly. A scrollbar allows a large list of filenames to be moved through the viewing area if it exceeds the size of the list area.

After you select a set of files, they are turned into thumbnails and tiled onto a single image. Now move the pointer to a particular thumbnail and press button 3 and drag. Finally, select **Open**. The image represented by the thumbnail is displayed at its full size. Choose **Next** from the **File** sub-menu of the Command widget to return to the Visual Image Directory.

IMAGE CUTTING

Note that cut information for *image window* is not retained for colormapped X server visuals (e.g. *StaticColor*, *StaticColor*, *GrayScale*, *PseudoColor*). Correct cutting behavior may require a *TrueColor* or *DirectColor* visual or a *Standard Colormap*.

To begin, press choose **Cut** of the **Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **F3** in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *cut* mode. In *cut* mode, the Command widget has these options:

Help
Dismiss

To define a cut region, press button 1 and drag. The cut region is defined by a highlighted rectangle that expands or contracts as it follows the pointer. Once you are satisfied with the cut region, release the button. You are now in *rectify* mode. In *rectify* mode, the Command widget has these options:

Cut
Help
Dismiss

You can make adjustments by moving the pointer to one of the cut rectangle corners, pressing a button, and dragging. Finally, press **Cut** to commit your copy region. To exit without cutting the image, press **Dismiss**.

IMAGE COPYING

To begin, press choose **Copy** of the **Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **F4** in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *copy* mode. In *copy* mode, the Command widget has these options:

Help
Dismiss

To define a copy region, press button 1 and drag. The copy region is defined by a highlighted rectangle that expands or contracts as it follows the pointer. Once you are satisfied with the copy region, release the button. You are now in *rectify* mode. In *rectify* mode, the Command widget has these options:

Copy
Help
Dismiss

You can make adjustments by moving the pointer to one of the copy rectangle corners, pressing a button, and dragging. Finally, press **Copy** to commit your copy region. To exit without copying the image, press **Dismiss**.

IMAGE PASTING

To begin, press choose **Paste** of the **Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **F5** in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *Paste* mode. To exit immediately, press **Dismiss**. In *Paste* mode, the Command widget has these options:

Operators
  Over
  In
  Out
  Atop
  Xor
  Plus
  Minus
  Add
  Subtract
  Difference
  Bumpmap
  Replace
  ReplaceRed
  ReplaceGreen
  ReplaceBlue
  ReplaceMatte
Help
Dismiss

Choose a composite operation from the **Operators** sub-menu of the Command widget. How each operator behaves is described below. *image window* is the image currently displayed on your X server and *image* is the image obtained with the File Browser widget.

Over The result is the union of the two image shapes, with *image* obscuring *image window* in the region of overlap.

In The result is simply *image* cut by the shape of *image window*. None of the image data of *image window* is in the result.

Out The resulting image is *image* with the shape of *image window* cut out.

Atop The result is the same shape as image *image window*, with *image* obscuring *image window* where the image shapes overlap. Note this differs from **over** because the portion of *image* outside *image window*'s shape does not appear in the result.

Xor The result is the image data from both *image* and *image window* that is outside the overlap region.

The overlap region is blank.

Plus The result is just the sum of the image data. Output values are cropped to 255 (no overflow). This operation is independent of the matte channels.

Minus The result of *image* − *image window*, with underflow cropped to zero. The matte channel is ignored (set to 255, full coverage).

Add The result of *image* + *image window*, with overflow wrapping around (*mod* 256).

Subtract
The result of *image* - *image window*, with underflow wrapping around (*mod* 256). The **add** and **subtract** operators can be used to perform reversible transformations.

Difference
The result of abs(*image* − *image window*). This is useful for comparing two very similar images.

Bumpmap
The result of *image window* shaded by *image*.

Replace
The resulting image is *image window* replaced with *image*. Here the matte information is ignored.

ReplaceRed
The resulting image is the red layer of *image window* replaced with the red layer of *image*. The remaining layers remain untouched.

ReplaceGreen
The resulting image is the green layer of *image window* replaced with the green layer of *image*. The remaining layers remain untouched.

ReplaceBlue
The resulting image is the blue layer of *image window* replaced with the blue layer of *image*. The remaining layers remain untouched.

ReplaceMatte
The resulting image is the matte layer of *image window* replaced with the matte layer of *image*. The remaining layers remain untouched.

The image compositor requires a matte, or alpha channel in the image for some operations. This extra channel usually defines a mask which represents a sort of a cookie-cutter for the image. This is the case when matte is 255 (full coverage) for pixels inside the shape, zero outside, and between zero and 255 on the boundary. If *image* does not have a matte channel, it is initialized with 0 for any pixel matching in color to pixel location (0,0), otherwise 255. See **MATTE EDITING** for a method of defining a matte channel.

Note that matte information for *image window* is not retained for colormapped X server visuals (e.g. *StaticColor*, *StaticColor*, *GrayScale*, *PseudoColor*). Correct compositing behavior may require a *TrueColor* or *DirectColor* visual or a *Standard Colormap*.

Choosing a composite operator is optional. The default operator is *replace*. However, you must choose a location to composite your image and press button 1. Press and hold the button before releasing and an outline of the image will appear to help you identify your location.

The actual colors of the pasted image is saved. However, the color that appears in *image window* may be different. For example, on a monochrome screen *image window* will appear black or white even though your pasted image may have many colors. If the image is saved to a file it is written with the correct colors. To assure the correct colors are saved in the final image, any *PseudoClass* image is promoted to *DirectClass* (see **miff(5)**). To force a *PseudoClass* image to remain *PseudoClass*, use **-colors**.

IMAGE CROPPING

To begin, press choose **Crop** of the **Transform** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **[** in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *crop* mode. In *crop* mode, the Command widget has these options:

Help
Dismiss

To define a cropping region, press button 1 and drag. The cropping region is defined by a highlighted rectangle that expands or contracts as it follows the pointer. Once you are satisfied with the cropping region, release the button. You are now in *rectify* mode. In *rectify* mode, the Command widget has these options:

Crop
Help
Dismiss

You can make adjustments by moving the pointer to one of the cropping rectangle corners, pressing a button, and dragging. Finally, press **Crop** to commit your cropping region. To exit without cropping the image, press **Dismiss**.

IMAGE CHOPPING

An image is chopped interactively. There is no command line argument to chop an image. To begin, choose **Chop** of the **Transform** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **]** in the image window (see **KEYBOARD ACCELERATORS**).

You are now in *Chop* mode. To exit immediately, press **Dismiss**. In *Chop* mode, the Command widget has these options:

Direction
  horizontal
  vertical
Help
Dismiss

If the you choose the **horizontal** direction (this is the default), the area of the image between the two horizontal endpoints of the chop line is removed. Otherwise, the area of the image between the two vertical endpoints of the chop line is removed.

Select a location within the image window to begin your chop, press and hold any button. Next, move the pointer to another location in the image. As you move a line will connect the initial location and the pointer. When you release the button, the area within the image to chop is determined by which direction you choose from the Command widget.

To cancel the image chopping, move the pointer back to the starting point of the line and release the button.

IMAGE ROTATION

Press the **/** key to rotate the image 90 degrees or **** to rotate -90 degrees (see **KEYBOARD ACCELERATORS**). To interactively choose the degree of rotation, choose **Rotate...** of the **Pixel Transform** submenu from the Command Widget (see **COMMAND WIDGET**). Alternatively, press * in the image window (see **KEYBOARD ACCELERATORS**).

A small horizontal line is drawn next to the pointer. You are now in *rotate* mode. To exit immediately, press **Dismiss**. In *rotate* mode, the Command widget has these options:

Pixel Color
  black
  blue
  cyan
  green
  gray
  red
  magenta
  yellow
  white
  Browser...
Direction
  horizontal
  vertical
Crop
  false
  true
Sharpen
  false
  true
Help
Dismiss

Choose a background color from the **Pixel Color** sub-menu. Additional background colors can be specified with the color browser. You can change the menu colors by setting the X resources **pen1** through **pen9**. Refer to **X RESOURCES** for more details.

If you choose the color browser and press **Grab**, you can select the background color by moving the pointer to the desired color on the screen and press any button. The transparent color updates the image matte channel and is useful for image compositing.

Choose a point in the image window and press this button and hold. Next, move the pointer to another location in the image. As you move a line connects the initial location and the pointer. When you release the button, the degree of image rotation is determined by the slope of the line you just drew. The slope is relative to the direction you choose from the **Direction** sub-menu of the Command widget.

To cancel the image rotation, move the pointer back to the starting point of the line and release the button.

IMAGE ANNOTATION

An image is annotated interactively. There is no command line argument to annotate an image. To begin, choose *Annotate* of the **Image Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press *a* in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *annotate* mode. To exit immediately, press **Dismiss**. In *annotate* mode, the Command widget has these options:

Font Name
  fixed
  variable
  5x8
  6x10
  7x13bold

8x13bold
9x15bold
10x20
12x24
Browser...
Font Color
black
blue
cyan
green
gray
red
magenta
yellow
white
transparent
Browser...
Box Color
black
blue
cyan
green
gray
red
magenta
yellow
white
transparent
Browser...
Rotate Text
-90
-45
-30
0
30
45
90
180
Dialog...
Help
Dismiss

Choose a font name from the **Font Name** sub-menu. Additional font names can be specified with the font browser. You can change the menu names by setting the X resources **font1** through **font9**. Refer to **X RESOURCES** for more details.

Choose a font color from the **Font Color** sub-menu. Additional font colors can be specified with the color browser. You can change the menu colors by setting the X resources **pen1** through **pen9**. Refer to **X RESOURCES** for more details.

If you select the color browser and press **Grab**, you can choose the font color by moving the pointer to the desired color on the screen and press any button.

If you choose to rotate the text, choose Rotate Text from the menu and select an angle. Typically you will only want to rotate one line of text at a time. Depending on the angle you choose, subsequent lines may end up overwriting each other.

Choosing a font and its color is optional. The default font is *fixed* and the default color is *black*. However, you must choose a location to begin entering text and press button 1. An underscore character will appear at the location of the pointer. The cursor changes to a pencil to indicate you are in *text* mode. To exit immediately, press **Dismiss**.

In *text* mode, any key presses will display the character at the location of the underscore and advance the underscore cursor. Enter your text and once completed press **Dismiss** to finish your image annotation. To correct errors press **BACK SPACE**. To delete an entire line of text, press **DELETE**. Any text that exceeds the boundaries of the image window is automatically continued onto the next line.

The actual color you request for the font is saved in the image. However, the color that appears in your image window may be different. For example, on a monochrome screen the text will appear black or white even if you choose the color red as the font color. However, the image saved to a file with **-write** is written with red lettering. To assure the correct color text in the final image, any *PseudoClass* image is promoted to *DirectClass* (see **miff(5)**). To force a *PseudoClass* image to remain *PseudoClass*, use **-colors**.

IMAGE COMPOSITING

An image composite is created interactively. There is no command line argument to composite an image. To begin, choose **Composite** of the **Image Edit** from the Command widget (see **COMMAND WIDGET**). Alternatively, press *x* in the image window (see **KEYBOARD ACCELERATORS**).

First a popup window is displayed requesting you to enter an image name. Press **Composite**, **Grab** or type a file name. Press **Cancel** if you choose not to create a composite image. When you choose **Grab**, move the pointer to the desired window and press any button.

If the **Composite** image does not have any matte information, you are informed and the file browser is displayed again. Enter the name of a mask image. The image is typically grayscale and the same size as the composite image. If the image is not grayscale, it is converted to grayscale and the resulting intensities are used as matte information.

A small window appears showing the location of the cursor in the image window. You are now in *composite* mode. To exit immediately, press **Dismiss**. In *composite* mode, the Command widget has these options:

- Operators
  - over
  - in
  - out
  - atop
  - xor
  - plus
  - minus
  - add
  - subtract
  - difference
  - bumpmap
  - replace
- Blend
- Displace
- Help
- Dismiss

Choose a composite operation from the **Operators** sub-menu of the Command widget. How each operator behaves is described below. *image window* is the image currently displayed on your X server and *image* is the image obtained with the File Browser widget.

over The result is the union of the two image shapes, with *image* obscuring *image window* in the region of overlap.

in The result is simply *image* cut by the shape of *image window*. None of the image data of *image window* is in the result.

out The resulting image is *image* with the shape of *image window* cut out.

atop The result is the same shape as image *image window*, with *image* obscuring *image window* where the image shapes overlap. Note this differs from **over** because the portion of *image* outside *image window*'s shape does not appear in the result.

xor The result is the image data from both *image* and *image window* that is outside the overlap region. The overlap region is blank.

plus The result is just the sum of the image data. Output values are cropped to 255 (no overflow). This operation is independent of the matte channels.

minus The result of *image* – *image window*, with underflow cropped to zero. The matte channel is ignored (set to 255, full coverage).

add The result of *image* + *image window*, with overflow wrapping around (*mod* 256).

subtract
The result of *image* - *image window*, with underflow wrapping around (*mod* 256). The **add** and **subtract** operators can be used to perform reversible transformations.

difference
The result of abs(*image* – *image window*). This is useful for comparing two very similar images.

bumpmap
The result of *image window* shaded by *image*.

replace The resulting image is *image window* replaced with *image*. Here the matte information is ignored.

The image compositor requires a matte, or alpha channel in the image for some operations. This extra channel usually defines a mask which represents a sort of a cookie-cutter for the image. This is the case when matte is 255 (full coverage) for pixels inside the shape, zero outside, and between zero and 255 on the boundary. If *image* does not have a matte channel, it is initialized with 0 for any pixel matching in color to pixel location (0,0), otherwise 255. See **MATTE EDITING** for a method of defining a matte channel.

If you choose **blend**, the composite operator becomes **over**. The *image* matte channel percent transparency is initialized to *factor*. The *image window* is initialized to *(100-factor)*. Where factor is the value you specify in the Dialog widget.

Displace shifts the image pixels as defined by a displacement map. With this option, *image* is used as a displacement map. Black, within the displacement map, is a maximum positive displacement. White is a maximum negative displacement and middle gray is neutral. The displacement is scaled to determine the pixel shift. By default, the displacement applies in both the horizontal and vertical directions. However, if you specify a *mask*, *image* is the horizontal X displacement and *mask* the vertical Y displacement.

Note that matte information for *image window* is not retained for colormapped X server visuals (e.g. *StaticColor*, *StaticColor*, *GrayScale*, *PseudoColor*). Correct compositing behavior may require a *TrueColor* or *DirectColor* visual or a *Standard Colormap*.

Choosing a composite operator is optional. The default operator is *replace*. However, you must choose a location to composite your image and press button 1. Press and hold the button before releasing and an outline of the image will appear to help you identify your location.

The actual colors of the composite image is saved. However, the color that appears in *image window* may be different. For example, on a monochrome screen *image window* will appear black or white even though your composited image may have many colors. If the image is saved to a file it is written with the correct colors. To assure the correct colors are saved in the final image, any *PseudoClass* image is promoted to *DirectClass* (see **miff(5)**). To force a *PseudoClass* image to remain *PseudoClass*, use **-colors**.

COLOR EDITING

Changing the the color of a set of pixels is performed interactively. There is no command line argument to edit a pixel. To begin, choose **Color** from the **Image Edit** submenu of the Command widget (see **COMMAND WIDGET**). Alternatively, press *c* in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *color edit* mode. To exit immediately, press **Dismiss**. In *color edit* mode, the Command widget has these options:

- Pixel Color
  - black
  - blue
  - cyan
  - green
  - gray
  - red
  - magenta
  - yellow
  - white
  - Browser...
- Method
  - point
  - replace
  - floodfill
  - reset
- Delta
  - 0
  - 1
  - 2
  - 4
  - 8
  - 16
  - 32
  - Browser...
- Undo
- Help
- Dismiss

Choose a pixel color from the **Pixel Color** sub-menu. Additional pixel colors can be specified with the color browser. You can change the menu colors by setting the X resources **pen1** through **pen9**. Refer to **X RESOURCES** for more details.

Next, choose a color editing method from the **Method** sub-menu of the Command widget. The **point** method recolors any pixel selected with the pointer unless the button is released. The **replace** method recolors any pixel that matches the color of the pixel you select with a button press. **Floodfill** recolors any pixel that matches the color of the pixel you select with a button press and is a neighbor. Finally **reset** changes the entire image to the designated color.

Now press button 1 to select a pixel within the image window to change its color. Additional pixels may be recolored as prescribed by the method you choose. You can recolor additional pixels by increasing the Delta value. The Delta value is first added then subtracted from the red, green, and blue of the target color. Any pixels within the range is also recolored.

If the Magnify widget is mapped, it can be helpful in positioning your pointer within the image (refer to button 2). Alternatively you can select a pixel to recolor from within the Magnify widget. Move the pointer to the Magnify widget and position the pixel with the cursor control keys. Finally, press a button to recolor the selected pixel (or pixels).

The actual color you request for the pixels is saved in the image. However, the color that appears in your image window may be different. For example, on a monochrome screen the pixel will appear black or white even if you choose the color red as the pixel color. However, the image saved to a file with **-write** is written with red pixels. To assure the correct color text in the final image, any *PseudoClass* image is promoted to *DirectClass* (see **miff(5)**). To force a *PseudoClass* image to remain *PseudoClass*, use **-colors**.

MATTE EDITING

Matte information within an image is useful for some operations such as image compositing (See **IMAGE COMPOSITING**). This extra channel usually defines a mask which represents a sort of a cookie-cutter for the image. This is the case when matte is 255 (full coverage) for pixels inside the shape, zero outside, and between zero and 255 on the boundary.

Setting the matte information in an image is done interactively. There is no command line argument to edit a pixel. To begin, and choose *Matte* of the **Image Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press *m* in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *matte edit* mode. To exit immediately, press **Dismiss**. In *matte edit* mode, the Command widget has these options:

- Method
  - point
  - replace
  - floodfill
  - reset
- Delta
  - 0
  - 1
  - 2
  - 4
  - 8
  - 16
  - 32
  - Browser...
- Matte
- Undo
- Help
- Dismiss

Choose a matte editing method from the **Method** sub-menu of the Command widget. The **point** method changes the matte value of the any pixel selected with the pointer until the button is released. The **replace** method changes the matte value of any pixel that matches the color of the pixel you select with a button press. **Floodfill** changes the matte value of any pixel that matches the color of the pixel you select with a button press and is a neighbor. Finally **reset** changes the entire image to the designated matte value.

Choose **Matte Value** and a dialog appears requesting a matte value. Enter a value between 0 and 255. This value is assigned as the matte value of the selected pixel or pixels.

Now, press any button to select a pixel within the image window to change its matte value. You can change the matte value of additional pixels by increasing the Delta value. The Delta value is first added then subtracted from the red, green, and blue of the target color. Any pixels within the range also have their matte value updated.

If the Magnify widget is mapped, it can be helpful in positioning your pointer within the image (refer to button 2). Alternatively you can select a pixel to change the matte value from within the Magnify widget. Move the pointer to the Magnify widget and position the pixel with the cursor control keys. Finally, press a button to change the matte value of the selected pixel (or pixels).

Matte information is only valid in a *DirectClass* image. Therefore, any *PseudoClass* image is promoted to *DirectClass* (see **miff(5)**). Note that matte information for *PseudoClass* is not retained for colormapped X server visuals (e.g. *StaticColor*, *StaticColor*, *GrayScale*, *PseudoColor*) unless you immediately save your image to a file (refer to **Write**). Correct matte editing behavior may require a *TrueColor* or *DirectColor* visual or a *Standard Colormap*.

IMAGE DRAWING

An image is drawn upon interactively. There is no command line argument to draw on an image. To begin, choose *Draw* of the **Image Edit** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press *d* in the image window (see **KEYBOARD ACCELERATORS**).

The cursor changes to a crosshair to indicate you are in *draw* mode. To exit immediately, press **Dismiss**. In *draw* mode, the Command widget has these options:

- Primitive
  - point
  - line
  - rectangle
  - fill rectangle
  - ellipse
  - fill ellipse
  - polygon
  - fill polygon
- Color
  - black
  - blue
  - cyan
  - green
  - gray
  - red
  - magenta
  - yellow
  - white
  - transparent
  - Browser...

Stipple",
Brick",
Diagonal",
Scales",
Vertical",
Wavy",
Translucent",
Opaque",
Open...",
Width
1
2
4
8
16
Dialog...
Undo
Help
Dismiss

Choose a drawing primitive from the **Primitive** sub-menu.

Next, choose a color from the **Color** sub-menu. Additional colors can be specified with the color browser. You can change the menu colors by setting the X resources **pen1** through **pen9**. Refer to **X RESOURCES** for more details.

If you choose the color browser and press **Grab**, you can select the primitive color by moving the pointer to the desired color on the screen and press any button. The transparent color updates the image matte channel and is useful for image compositing.,

Choose a stipple, if appropriate, from the Stipple sub-menu. Additional stipples can be specified with the file browser. Stipples obtained from the file browser must be on disk in the X11 bitmap format.

Choose a line width from the **Width** sub-menu. To choose a specific width select the Dialog widget.

Choose a point in the image window and press button 1 and hold. Next, move the pointer to another location in the image. As you move, a line connects the initial location and the pointer. When you release the button, the image is updated with the primitive you just drew. For polygons, the image is updated when you press and release the button without moving the pointer.

To cancel image drawing, move the pointer back to the starting point of the line and release the button.

REGION OF INTEREST

To begin, press choose **Region of Interest** of the **Transform** sub-menu from the Command widget (see **COMMAND WIDGET**). Alternatively, press **R** in the image window (see **KEYBOARD ACCELERATORS**).

A small window appears showing the location of the cursor in the image window. You are now in *region of interest* mode. In *region of interest* mode, the Command widget has these options:

Help
Dismiss

To define a region of interest, press button 1 and drag. The region of interest is defined by a highlighted rectangle that expands or contracts as it follows the pointer. Once you are satisfied with the region of interest, release the button. You are now in *apply* mode. In *apply* mode the Command widget has these options:

- File
  - Save...
  - Print...
- Edit
  - Undo
  - Redo
- Transform
  - Flip
  - Flop
  - Rotate Right
  - Rotate Left
- Enhance
  - Hue...
  - Saturation...
  - Brightness...
  - Gamma...
  - Spiff
  - Dull
  - Equalize
  - Normalize
  - Negate
  - Grayscale
  - Quantize...
- Effects
  - Despeckle
  - Emboss
  - Reduce Noise
  - Add Noise
  - Sharpen...
  - Blur...
  - Threshold...
  - Edge Detect...
  - Spread...
  - Shade...
  - Raise...
  - Segment...
- F/X
  - Swirl...
  - Implode...
  - Wave...
  - Oil Painting...
  - Charcoal Drawing...
- Miscellany
  - Image Info
  - Zoom Image
  - Show Preview...
  - Show Histogram
  - Show Matte
- Help

Dismiss

You can make adjustments to the region of interest by moving the pointer to one of the rectangle corners, pressing a button, and dragging. Finally, choose an image processing technique from the Command widget. You can choose more than one image processing technique to apply to an area. Alternatively, you can move the region of interest before applying another image processing technique. To exit, press **Dismiss**.

IMAGE PANNING

When an image exceeds the width or height of the X server screen, **display** maps a small panning icon. The rectangle within the panning icon shows the area that is currently displayed in the the image window. To *pan* about the image, press any button and drag the pointer within the panning icon. The pan rectangle moves with the pointer and the image window is updated to reflect the location of the rectangle within the panning icon. When you have selected the area of the image you wish to view, release the button.

Use the arrow keys to pan the image one pixel up, down, left, or right within the image window.

The panning icon is withdrawn if the image becomes smaller than the dimensions of the X server screen.

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.

USER PREFERENCES

Preferences affect the default behavior of **display(1)**. The preferences are either true or false and are stored in your home directory as **.displayrc**:

display image centered on a backdrop

This backdrop covers the entire workstation screen and is useful for hiding other X window activity while viewing the image. The color of the backdrop is specified as the background color.

Refer to **X RESOURCES** for details.

confirm on program exit
Ask for a confirmation before exiting the **display(1)** program.

correct image for display gamma
If the image has a known gamma, the gamma is corrected to match that of the X server (see the X resource **displayGamma**).

apply Floyd/Steinberg error diffusion to 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 perference.

use a shared colormap for colormapped X visuals
This option only applies when the default X server visual is *PseudoColor* or *GrayScale*. Refer to **-visual** for more details. By default, a shared colormap is allocated. The image shares colors with other X clients. Some image colors could be approximated, therefore your image may look very different than intended. Choose **Private** and the image colors appear exactly as they are defined. However, other clients may go *technicolor* when the image colormap is installed.

display images as an X server pixmap
Images are maintained as a XImage by default. Set this resource to True to utilize a server Pixmap instead. This option is useful if your image exceeds the dimensions of your server screen and you intend to pan the image. Panning is much faster with Pixmaps than with a XImage. Pixmaps are considered a precious resource, use them with discretion.

ENVIRONMENT

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

SEE ALSO

animate(1), import(1), montage(1), mogrify(1), mosaic(1), convert(1), combine(1), xtp(1)

COPYRIGHT

ACKNOWLEDGEMENTS

The MIT X Consortium for making network transparent graphics a reality.

Peder Langlo, Hewlett Packard, Norway, made hundreds of suggestions and bug reports. Without Peder,

ImageMagick would not be nearly as useful as it is today.

Rod Bogart and John W. Peterson, University of Utah. Image compositing is loosely based on *rlecomp* of the Utah Raster Toolkit.

Michael Halle, Spatial Imaging Group at MIT, for the initial implementation of Alan Paeth's image rotation algorithm.

David Pensak, E. I. du Pont de Nemours and Company, for providing a computing environment that made this program possible.

Paul Raveling, USC Information Sciences Institute. The spatial subdivision color reduction algorithm is based on his *Img* software.

AUTHORS

John Cristy, E.I. du Pont de Nemours and Company Incorporated