Chapter 1
Welcome to ImageMagick

ImageMagick™ is an X11 package for displaying and interactively manipulating one or more images. Using ImageMagick you can display any image on any workstation screen running an X server. ImageMagick can read and write over fifty of the more poplar image formats including JPEG, TIFF, PNM, GIF, PhotoCD, and PostScript). ImageMagick lets you interactively resize, rotate, sharpen, color reduce, or add special effects to an image and save your completed work in the same or a different image format.

Tip! Written in C, ImageMagick interfaces with the X library so you don't need a proprietary toolkit to compile it.

In addition to the image display program, you can use ImageMagick's command line programs to perform the following functions:

- convert an image from one format to another
- resize, rotate, sharpen, color reduce, and add special effects to an image
- create a framed thumbnail of an image
- create a transparent image for use on the World Wide Web
- create a GIF animation sequence from a group of images
- combine several images to create a composite image

- segment an image based on its color histogram
- describe image format and characteristics
- retrieve, list, or print files from a remote network site

Tip! Visit the ImageMagick Studio web site at www.wizards.dupont.com to try out any of these functions.

How this guide is organized

Chapter 3
ImageMagick Tools

ImageMagick provides a number of tools that help you manipulate the images you work with.

display

Display is a platform-independent image processing and display program. It can display an image on any workstation running an X server and the image can be displayed as a background image in any window.

Display first determines the hardware capabilities of your workstation. If the number of unique colors in an image is fewer than or equal to the number of colors the workstation can support, the image is displayed in an X window. Otherwise the number of colors in the image is first reduced to match the color resolution of the workstation.

This means that a continuous-tone 24 bits/pixel image can display on a 8-bit pseudo-color device or a monochrome device. In most instances the reduced color image closely resembles the original. Alternatively, a monochrome or pseudo-color image sequence can display on a continuous-tone 24 bits/pixels device.

import

Import reads an image from any visible window on an X server and creates an image file. You can capture a single window, the entire screen, or any rectangular portion of the screen. You can use the display utility for redisplay, printing, editing, formatting, archiving, image processing, etc. of the captured image.

The target window can be specified by id, name, or may be selected by clicking the mouse in the desired window. If you press a button and then drag, a rectangle will form which expands and contracts as the mouse moves. To save the portion of the screen defined by the rectangle, just release the button. The keyboard bell is rung once at the beginning of the screen capture and twice when it completes.

animate

Animate displays a sequence of images on any workstation display running an X server. Animate first determines the hardware capabilities of the workstation. If the number of unique colors in an image is less than or equal to the number the workstation can support, the image is displayed in an X window. Otherwise the number of colors in the image is first reduced to match the color resolution of the workstation before it is displayed.

This means that a continuous-tone 24 bits/pixel image can display on a 8 bit pseudo-color device or monochrome device. In most instances the reduced color image closely resembles the original. Alternatively, a monochrome or pseudo-color image sequence can display on a continuous-tone 24 bits/pixels device.

montage

Montage creates a composite by combining several separate images. The images are tiled on the composite image with the name of the image optionally appearing just below the individual tile.

convert

Convert converts an input file using one image format to an output file with a differing image format. By default, the image format is determined by it's 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). Specify file as - for standard input or output. If file has the extension .Z, the file is decoded with uncompress.

mogrify

Mogrify transforms an image or a sequence of images. These transforms include image scaling, image rotation, color reduction, and others. The transmogrified image overwrites the original image.

identify

Identify describes the format and characteristics of one or more image files. It will also report if an image is incomplete or corrupt. The information displayed includes the scene number, the file name, the width and height of the image, whether the image is colormapped or not, the number of colors in the image, the number of bytes in the image, the format of the image (JPEG, PNM, etc.), and finally the number of seconds it took to read and process the image.

combine

Combine combines images to create new images.

xtp

Xtp is a utility for retrieving, listing, or printing files from a remote network site, or sending files to a remote network site. Xtp performs most of the same functions as the ftp program, but does not require any interactive commands. You simply specify the file transfer task on the command line and xtp performs the task automatically.

Chapter 4
Animate

Overview

Animate displays a sequence of images on any workstation running an X server. Animate first determines the hardware capabilities of the workstation. If the number of unique colors in an image is fewer than or equal to the number the workstation can support, the image is displayed in an X window. Otherwise the number of colors in the image is first reduced to match the color resolution of the workstation.

For example, a continuous-tone 24 bits/pixel image can display on an 8-bit pseudo-color device or a monochrome device. In most cases the reduced color image closely resembles the original. Alternatively, a monochrome or pseudo-color image sequence can display on a continuous-tone 24 bits/pixels device.

To prevent color flashing on X server visuals that have colormaps, animate creates a single colormap from the image sequence, which can be time consuming. You can speed up this operation by reducing the colors in the image *before* you animate them.

- Use mogrify to color reduce the images to a single colormap. See Chapter 9, Mogrify for details.
- Alternatively, you can use a standard colormap, or a static, direct, or true color visual. You can define a standard colormap with xstdcmap. See xstdcmap(1) for details. This method is recommended for colormapped X server because it eliminates the need to compute a global colormap.

Format

animate [options ...] file [[options ...] file ...]

Animating images

- To animate a set of images of a cockatoo, use

  ```
  animate cockatoo.*
  ```

- To animate a cockatoo image sequence using the Standard Colormap best, use

  ```
  xstdcmap -best
  animate -map best cockatoo.*
  ```

- To animate an image of a cockatoo without a border centered on a backdrop, use

  ```
  animate +borderwidth -backdrop cockatoo.*
  ```

Options

-backdrop

Displays the image centered on a backdrop.

A backdrop covers the entire workstation screen and lets you hide other X window activity while you view the image. The color of the backdrop is specified as the background color. See "X Resources" for details.

-colormap type

Type of colormap:

- Shared
- Private

This option applies only when the default X server visual is PseudoColor or GRAYScale. See "-visual type" for more details.

By default, a Shared colormap is allocated. The image shares colors with other X clients. Some image colors may be approximated and your image may not look the way you 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 fewer than you specify, but will never be more.

Note: This is a color reduction option. Duplicate and unused colors will be removed if an image has fewer unique colors than you specify. See -quantize for more details.

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

-colorspace value

Type of colorspace:

- GRAY
- OHTA
- RGB
- Transparent
- XYZ
- YCbCr
- YIQ
- YPbPr
- YUV
- 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 distances in RGB space. These color spaces may produce better results when you color-reduce an image. See quantize for more details.

The Transparent color space is unique. It preserves the matte channel of the image if it exists.

Note: The -colors or -monochrome options are required for the Transparent option to take effect.

-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 an 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. Omit the x and y offset to generate one or more subimages of a uniform size.

Use cropping to crop a particular area of an image. Use `-crop 0x0` to trim edges that are the background color. Add x and y offsets to leave a portion of the trimmed edges with the image. The equivalent X resource for this option is cropGeometry (class CropGeometry). See "X Resources" for details.

-delay <1/100ths of a second>x<seconds>I>

Displays the next image after pausing.

This option is useful for regulating the display of the sequence of images. 1/100ths of a second must pass before the next image can be displayed. The default delay is 6/100th of a second between each frame of the image sequence.

The second value is optional. It lets you specify the number of seconds to pause before repeating your animation sequence.

-density <width>x<height>

Vertical and horizontal resolution in pixels of the image.

This option lets you specify an image density when decoding a PostScript or Portable Document page. The default is 72 pixels per inch in the horizontal and vertical direction.

-display host:display[.screen]

Specifies the X server to contact. See X(1).

-dither

Applies the Floyd/Steinberg error diffusion to an image.

Dithering trades intensity resolution for spatial resolution by averaging the intensities of several neighboring pixels. Images that suffer from severe contouring when you reduce colors can be improved with this option.

The -colors or -monochrome options are required for dithering to take effect.

Use +dither to render Postscript without text or graphic aliasing.

-gamma value

Level of gamma correction.

The same color image displayed on two different workstations may look different because of 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 an 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>{+-}<yoffset>{!}{<}{>}

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 you map it.

The width and height are maximum values, by default. 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 you specify only one factor, both the width and height assume that value.

To specify the width or height as a percentage, 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. If the image dimensions are less than the geometry specification, < resizes the image.

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's resized to 640x480. When displaying an image on an X server, <x offset> and <y offset> are relative to the root window.

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

-interlace type

Type of interlacing scheme:

- none (default)
- line
- plane
- partition

This option lets you specify the type of interlacing scheme for raw image formats such as RGB or YUV.

Scheme	Description
None	Does not interlace (RGBRGBRGBRGBRGBRGB...)
Line	Uses scanline interlacing (RRR...GGG...BBB...RRR...GGG...BBB...)
Plane	Uses plane interlacing (RRRRRR...GGGGGG...BBBBBB...)
Partition	Similar to Plane except that 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.

-map type

Displays an image using this standard colormap type.

Choose from the following 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 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.

-monochrome

Transforms an image to black and white.

-remote string

Executes a command in an remote display process.

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

-rotate degrees{<}{>}

Applies Paeth image rotation to the image.

Use > to rotate the image only if its width exceeds the height. If the image width is less than its height, < rotates the image.

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's 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.

-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.

-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).

-title string

Assigns 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. The The following table shows these characters and their values.

Special Character	Value
%f	filename
%d	directory
%e	filename extention
%t	top of filename
%m	magick
%w	width
%h	height
%p	page number
%s	scene number
%b	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 whose width is 512 and height is 480.

-treedepth value

Normally, this integer value is 0 or 1, which tells display to choose an 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 option. Refer to quantize for more details.

Note: The -colors or -monochrome option is required for -treedepth value to take effect.

-verbose

Prints the following detailed information about the image:

- image scene number
- image name
- image size
- image class (DirectClass or PseudoClass)
- total number of unique colors
- number of seconds to read and transform the image

Refer to miff 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 for a description of these values.

-visual type

Displays image using this visual type.

Choose from these visual classes:

- StaticGray
- GrayScale
- StaticColor
- PseudoColor
- TrueColor
- DirectColor
- default
- visual ID

Note: The X server *must* support the visual you choose, otherwise an error occurs. If you don't specify a visual, the visual class that can display the most simultaneous colors on the default X server screen is chosen.

-window id

Sets 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. See "X Resources" for details.

Note: 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. 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
- -title

See X Resources for details.

Any option you specify on the command line remains in effect until you change it by specifying the option again with a different effect. For example

- To animate two images, the first with 32 colors and the second with only 16 colors, use:

  ```
  animate -colors 32 cockatoo.1 -colors 16 cockatoo.2
  ```

Options are processed in command line order. Any option you specify on the command line remains in effect until you change it by specifying the option again with a different effect. 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

  ```
  ps:image
  ```

  or specify the image type as the filename suffix

```
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 you specify no filename, you can clicking the mouse in the desired window to select it.

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 with | 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 animate 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
```

animates the files image00.miff, image01.miff, through image09.miff.

Image filenames may appear in any order on the command line if the image format is MIFF (refer to miff(5) and the scene keyword is specified in the image. Otherwise the images will display in the order they appear on the command line.

Mouse Buttons

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

Command Widget

The Command widget lists a number of submenus and commands. They are

- Animate

  Open

  Play

  Step

  Repeat

  Auto Reverse

- Speed

  Faster

  Slower

- Direction

  Forward

  Reverse

- Image Info
- Help
- Quit

Menu items with a indented triangle have a submenu. They are represented above as the indented items. To access a submenu item, move the pointer to the appropriate menu, press a button and drag.

When you find the submenu item you want, release the button and the command is executed. Move the pointer away from the submenu if you decide not to execute a particular command.

Keyboard Accelerators

Press this…	to do this…
Ctl+o	load an image from a file
space	display the next image in the sequence
<	speed up the display of the images (Refer to -delay for more information.)

Press this…	to do this… (Cont.)
>	slow the display of the images (Refer to -delay for more information.)
?	display information about the image; press any key or button to erase the information This information is printed: image name; image size; and the total number of unique colors in the image
F1	display helpful information about animate(1)
Ctl+q	discard all images and exit ImageMagick

X Resources

Animate 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.

All animate options have a corresponding X resource. In addition, the animate program uses the following X resources:

X Resource…	Specifies…
background (class Background)	the preferred color to use for the Image window background. The default is #ccc.

X Resource…	Specifies… (Cont.)
borderColor (class BorderColor)	the preferred color to use for the Image window border. The default is #ccc.
borderWidth (class BorderWidth)	the width in pixels of the Image window border. The default is 2.
font (class Font or FontList)	the name of the preferred font to use in normal formatted text. The default is 14 point Helvetica.
foreground (class Foreground)	the preferred color to use for text within the Image window. The default is black.
geometry (class geometry)	the preferred size and position of the image window. It is not necessarily obeyed by all window managers.
iconGeometry (class IconGeometry)	the preferred size and position of the application when iconified. It is not necessarily obeyed by all window managers.
iconic (class Iconic)	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.
matteColor (class MatteColor)	the color of windows. It's 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: #ddd.

X Resource…	Specifies… (Cont.)
name (class Name)	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.
sharedMemory (class SharedMemory)	whether animate should attempt to 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.
text_font (class textFont)	the name of the preferred font to use in fixed (typewriter style) formatted text. The default is 14 point Courier.
title (class Title)	the title to use for the Image window. This information is sometimes used by a window manager to provide some sort of header to identify the window. The default is the image file name.

Environment

DISPLAY

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

Appendix A
Supported Formats

ImageMagick™ supports over fifty image formats. Some of the image formats require additional programs or libraries. See the ImageMagick ReadMe file for information about where to find the related materials.

Format	Description	Notes
AVS	AVS X image file	
BMP	Microsoft Windows bitmap image file	
BMP24	Microsoft Windows 24-bit bitmap image file	
CGM	Computer graphics metafile	requires ralcgm;read only
CMYK	raw cyan, magenta, yellow, and black bytes	user -size command line option to specify width and height
DCX	ZSoft IBM PC multipage Paintbrush file	
DIB	Microsoft Windows bitmap image file	

Format	Description	Notes
EPDF	Encapsulated Portable Document Format file	
EPS	Adobe Encapsulated PostScript file	requires Ghostscript
EPS2	Adobe Level II Encapsulated PostScript file	requires Ghostscript
EPSF	Adobe Encapsulated PostScript Interchange format	requires Ghostscript
EPSI	Adobe Encapsulated PostScript Interchange format	requires Ghostscript
FAX	Group 3	
FIG	TransFig image format	requires TransFig
FITS	Flexible Image Transport System	
FPX	FlashPix format	use -DHasFPX to compile; requires FlashPIX SDK
GIF	CompuServer graphics interchange format	8-bit color
GIF87	CompuServer graphics interchagne format	8-bit color (version 87a)
GRADATION	gradual passing from one shade to another	specify the desired shading as the filename (e.g., gradation: red-blue)

Format	Description	Notes
GRANITE	granite texture	
GRAY	raw gray bytes	use -size command line option to specify width and height
HDF	Hierarchical Data Format	use -DHasHDF to compile
HISTOGRAM	histogram of an image	
HTML	Hypertext Markup Language with a client-side image map	requires HTML2PS to read this format
JBIG	Joint Bi-level Image Experts Group file interchange format	use -DHasJBIG to compile
JPEG	Joint Photographic Experts Group JFIF format	use -DHasJPEG to compile
ICO	Microsoft icon	read only
LABEL	text image format	specify label text as the file-name (e.g., label:This is a label)
MAP	colormap intensities and indices	
MIFF	Magick Image File Format	
MNG	Multiple Image Network Graphics	

Format	Description	Notes
MPEG	Motion Picture Experts Group file interchange format	use -DHasMPEG to compile
MTV	MTV Raytracing image format	
NETSCAPE	Netscape 216 color cube	
NULL	null image	useful for creating blank tiles with montage
PBM	portable bitmap format (black and white)	
PCD	Photo CD	maximum resolution written is 512 x 768 pixels
PCDS	Photo CD	decode with the sRGB color tables
PCL	Page Control Language	write only
PCX	ZSoft IBM PC Paintbrush file	
PDF	Portable Document Format	requires Ghostscript
PGM	portable graymap format (grayscale)	
PICT	Apple Macintosh QuickDraw/PICT file	
PIX	Alias/Wavefront RLE image format	read only

Format	Description	Notes
PLASMA	plasma fractal image	specify the base color as the filename (e.g., plasma:blue-yellow); use fractal to initialize randome value (e.g., plasma:fractal)
PNG	Portable Network Graphics	
PNM	portable anymap	use +compress to produce ASCII renditions
PPM	portable pixmap format (color)	
P7	Xv's visual schnauzer format	
PS	Adobe PostScript file	requires Ghostscript
PS2	Adobe Level II PostScript file	requires Ghostscript
PSD	Adobe Photoshop bitmap file	
RAD	Radiance image file	
RGB	raw red, green, and blue bytes	use -size command line option to specify width and height
RGBA	raw red, green, blue, and matte bytes	use -size command line option to specify width and height
RLA	Alias/Wavefront image file	read only

Format	Description	Notes
RLE	Utah run length encoded image file	read only
SCAN	Import image from a scanner device	requires SANE; specify device name and path as the filename (e.g., scan:mustek:/dev/scanner)
SGI	Irix RGB image file	
SHTML	Hypertext Markup Language with a client-side image map	write only
SUN	SUN rasterfile	
TEXT	raw text file	read only
TGA	Truevision Targa image file	
TIFF	Tagged Image File Format	use -DHasTIFF to compile
TIFF24	24-bit Tagged Image File Format	use -DHasTIFF to compile
TILE	tile image with a texture	read only
TIM	PSX TIM file	read only
TTF	TrueType font file	read only
UIL	X-Motif UIL table	

Format	Description	Notes
UYVY	16-bit/pixel interleaved YUV	use -size command line option to specify width and height
VICAR		read only
VID	Visual Image Directory	
VIFF	Khoros Visualization Image File Format	
WIN	select image from or display image to your computer screen	
X	select image from or display image to your X server screen	
XC	constant image of X server color	use -size command line option to specify width and height
XBM	X Windows system bitmap (black and white only)	
XPM	X Windows system pixmap file (color)	
XWD	X Windows system window dump file (color)	
YUV	CCIR 601 4:1:1 file	use -size command option to specify width and height

On some platforms, ImageMagick process the following extensions automatically:

- .gz for Zip compression
- .Z for Unix compression
- .bz2 for block compression
- .pgp for PGP encryption

For example, a PNM image called image.pnm.gz is decompressed and read with the gzip program automatically.