Image Alchemy™

Version 1.8

Handmade Software, Inc.

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Printed in the United States of America.

First Printing, September 1994

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Introduction to Image Alchemy

What is Image Alchemy?

Image Alchemy is a software utility that manipulates computer image files.

Primarily, Image Alchemy converts between various graphics file formats. Image Alchemy can translate between a large variety of file formats including industry standards such as GIF and TIFF as well as vendor-specific file formats such as Sun Raster and Scodl. Currently Alchemy supports over 60 different formats, and new formats are always being added; in fact, our goal is to have Image Alchemy be able to read and write every image file format in the world.

Image Alchemy can also resize an image, change the number of colours in an image, change an image from colour to black and white, and change the colour space an image uses.

Finally, Image Alchemy performs JPEG compression. This is a standard for image compression that can achieve much higher compression ratios than conventional compression techniques. For further information see Appendix C, "What is JPEG Compression".

About this manual

This manual is divided into 8 chapters, 11 appendices, a glossary, references, a colophon, and an index.

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Document conventions

Type style	Used for
italic	Parameters. You supply values for the items shown in italic. For example, if the description of a command includes *filename*, you would type in the name of the desired file.
[ ]	Brackets. Indicate optional items.
…	Ellipses. Indicates a list of items or items which may be repeated.
`fixedspace`	Examples of Alchemy usage which can be typed in exactly as written. Many of the examples give file names which probably don't exist on your system; substitute different file names as appropriate.

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Installing Image Alchemy

Overview

Installation of Image Alchemy is straightforward; it involves copying the Alchemy program and support files off of the supplied floppy disks or tape onto your hard drive or network and setting some environment variables.

The MS-DOS and 386 Enhanced versions of Alchemy includes an install program which copies the files for you.

You need to be familiar with the tar command if doing a UNIX installation. If you are unsure of how to use this command you may wish to read the manuals which came with your computer or ask someone to assist you.

The installation instructions are divided into different sections for Image Alchemy for MS-DOS, Image Alchemy/386 Enhanced, and Image Alchemy for UNIX. Please refer to the section which corresponds to the version of Image Alchemy you have.

Image Alchemy for MS-DOS

Required equipment

At a minimum you must have the following hardware and software to run Image Alchemy.

Computer

An MS-DOS computer equipped with an 80286, 80386, 80486, Pentium, or better Intel processor.

Many of the conversions that Alchemy does are CPU intensive, so a faster computer is definitely an advantage.

Memory

At least 400k of free memory.

Some conversions and some images require more memory (Alchemy will attempt to use all available system memory, so if you get out-of-memory errors or warnings try removing as many resident programs as you can (also, installing MS-DOS 5.0, MS-DOS 6.0, or a 3rd party memory manager such as 386MAX or QEMM will free up more memory)).

Alchemy makes use of extended and expanded memory to temporarily store information while performing conversions. This can greatly speed up the conversion process. In general you will need as much memory as the size of the image, in bytes, being converted. For example, a 640x480 true colour image will use 900k of memory.

Hard drive

A hard drive with at least as much free space as four times the size of the image being converted (i.e. a 640x480 image will require up to 1.2 megabytes of free space).

Operating system

MS-DOS or PC-DOS 3.x or greater (because of the additional free memory available, use of MS-DOS 5.0 or higher is recommended).

Optional equipment

The following hardware is optional.

Display

A supported SVGA, 8514/A, or XGA board, if you wish to view images.

Supported SVGA boards include those with a VESA driver or with the Paradise, Everex, Trident, Video 7, ATI, Ahead, NCR, or Tseng Labs chipsets.

Supported 8514/A boards include IBM and those with the Western Digital chipset.

Supported XGA boards include those from IBM.

Math co-processor

A math co-processor will increase the speed of raster scaling types c and d.

Packing list

The enclosed diskettes contain the following files:

`INSTALL.EXE`	The Image Alchemy installation program.
`READ.ME`	A text document describing any last minute revisions.
`ALCHEMY.EXE`	The Image Alchemy software.
`GUI.EXE`	The Image Alchemy graphical-user-interface (menu system).
`ALCHPCD.EXE`	The Kodak PhotoCD reading overlay used by Alchemy when reading PhotoCD images.
`ALCHEMY.ICO`	A Microsoft Windows icon (see chapter 3 for more information).
`ALCHEMY.PIF`	A Microsoft Windows PIF (Program Information File) (see chapter 3 for more information).

`\SAMPLES`	A directory containing sample data files and images. See the READ.ME2 file in this directory for further information.

Installation instructions

1. Insert the appropriate floppy disk in your disk drive.
2. Change to the drive by typing either `a:` or `b:`.
3. Type `install`. This will install Image Alchemy in the `c:\alchemy` directory.

   If you would like to install on a different drive or in a different directory, you can do this by typing `install` followed by the location where you want Image Alchemy installed.

   For example: `install d:\util\alchemy` will install the software in the `d:\util\alchemy` directory.

   If you install Alchemy in a different directory you will have to alter the environment variable instructions given below.
4. When prompted, change diskettes.
5. You have now successfully installed Image Alchemy.
6. The file `read.me` contains information which has changed since the manual was printed. To display the read.me file type `type read.me`.

Environment variables and config.sys

Alchemy uses several different environment variables to determine its behavior. These control, among other things, how Image Alchemy uses extended or expanded memory, which display resolutions are available for image viewing, where temporary files are stored, and whether or not to display time to completion estimate while converting files

config.sys

To insure that Alchemy can open the various files it needs while running, you should verify that the `files` value in your `\config.sys` file is set to at least 30 and the `buffers` value is set to at least 20.

autoexec.bat

There are several changes you may wish to make to your autoexec.bat file. These consist primarily of set commands, which are used to configure Image Alchemy.

path

So that MS-DOS can find Image Alchemy you must either add `c:\alchemy` to your path, copy the `alchemy.exe` and `alchpcd.exe` files to a directory which is already in your path, or be in the `c:\alchemy` directory when executing Alchemy.

Temporary disk files

Alchemy uses the environment variable `TMP` to determine where to open its temporary files. If Alchemy runs out of disk space while writing to a temporary file it will report an error.

An example of setting the `TMP` variable to the \temp directory on drive e: would be `set TMP=e:\temp`.

Use of extended and expanded memory

If there is enough extended or expanded memory available, Alchemy will use it instead of some of the temporary files it would otherwise use during conversions.

To use extended memory you must have an XMS driver installed in the config.sys file (such as HIMEM.SYS, QEMM, or 386MAX). To use expanded memory you must have a LIM 3.2 or LIM 4.0 expanded memory driver installed (such as EMM386, QEMM, or 386MAX).

Alchemy's use of extended/expanded memory can be disabled. To disable the use of extended and expanded memory, set the environment variable `alchemy` to `x` (type `set alchemy=x` at the DOS prompt).

The availability of extended or expanded memory will not allow you to convert larger images, it will just increase the speed of conversions. If you need to convert very large images contact us about upgrading to Alchemy/386, the 386 Enhanced version of Image Alchemy.

Checking for 8514/A boards

Alchemy will normally check to determine if there is an 8514/A board installed in the computer when viewing images. However, this can interfere with some network boards, as they use the same I/O addresses that 8514/A boards use. To disable 8514/A checking, set the environment variable `alchemy` to `8` (type `set alchemy=8` at the DOS prompt).

Note that this can be combined with other options; for example, to disable both 8514/A checking and extended/expanded memory usage, use `set alchemy=8x`.

Limiting maximum display resolution

Alchemy will automatically choose the lowest resolution which will fit the entire image when viewing images without specifying a display resolution with a VESA compatible VGA board. However, depending on the monitor and VGA board combination you have, this can be bad since the monitor may not support the particular resolution the SVGA board is trying to switch to. To avoid this problem, the environment variable `alchemy` may be set to indicate the maximum display resolution which Alchemy should use. Set the `alchemy` variable to the highest horizontal resolution which your monitor is capable of. Valid values are 1280, 1024, 800, and 640. For example, type `set alchemy=800` at the DOS prompt if your monitor only supports 640x480 mode and 800x600 mode.

To disable 8514/A checking, disable extended/expanded memory usage, and limit the viewing resolution to 640x480 use `set alchemy=8x640`.

Disabling time estimation information

When performing a long conversion Alchemy will automatically display an estimate of the time needed to complete the operation. To disable the display of this information, set the environment variable `alchemy` to `p` (type `set alchemy=p` at the DOS prompt).

To disable 8514/A checking, disable extended/expanded memory usage, limit the viewing resolution to 640x480, and disable time estimation use `set alchemy=8x640p`.

Image Alchemy/386 for MS-DOS

The main program for Image Alchemy 386 comes in two different variants: `alchemy.exe` and `alch386.exe`.

The `alchemy.exe` program is the standard version of Image Alchemy, and can be used to process files up to 3000 pixels by 3300 pixels at true colour (8.5" x 11" at 300 DPI).

The `alch386.exe` program is an extended 32-bit version of Image Alchemy which can be used to process files up to 65000 pixels by 65000 pixels. It is also somewhat faster than `alchemy.exe`. The disadvantage that `alch386.exe` has is that it has a longer startup time, so much so that converting small images takes longer than using `alchemy.exe`, and it does not support image viewing.

If you need to use `alch386.exe` simply substitute it for `alchemy.exe` in the examples shown in the manual.

Required equipment

At a minimum you must have the following hardware and software to run Image Alchemy/386.

Computer

An MS-DOS computer equipped with an 80386, 80486, Pentium, or better Intel processor.

Many of the conversions that Alchemy does are CPU intensive, so a faster computer is definitely an advantage.

Memory

At least 2 megabytes of memory.

Hard drive

A hard drive with at least as much free space as four times the size of the image being converted (i.e. a 640x480 image will require up to 1.2 megabytes of free space).

In addition, if you are converting very large images (over 10000 pixels x 10000 pixels) and have only 4 or 8 megabytes of memory you will probably need to have hard drive space available for a virtual memory swap file.

Operating system

MS-DOS or PC-DOS 3.x or greater (use of MS-DOS 5.0 or higher is recommended).

Optional equipment

The following hardware is optional.

Display

A supported SVGA, 8514/A, or XGA board, if you wish to view images.

Supported SVGA boards include those with a VESA driver or with the Paradise, Everex, Trident, Video 7, ATI, Ahead, NCR, or Tseng Labs chipsets.

Supported 8514/A boards include IBM and those with the Western Digital chipset.

Supported XGA boards include those from IBM.

Math co-processor

A math co-processor will increase the speed of raster scaling types c and d.

Packing list

The enclosed diskettes contain the following files:

`INSTALL.EXE`	The Image Alchemy installation program.
`READ.ME`	A text document describing any last minute revisions.
`ALCHEMY.EXE`	The Image Alchemy software.
`ALCH386.EXE`	The 32-bit version of Image Alchemy.
`GUI.EXE`	The Image Alchemy graphical-user-interface (menu system).

`ALCHPCD.EXE`	The Kodak PhotoCD reading overlay used by Alchemy when reading PhotoCD images.
`ALCHEMY.ICO`	A Microsoft Windows icon (see chapter 3 for more information).
`ALCHEMY.PIF`	A Microsoft Windows PIF (Program Information File) (see chapter 3 for more information).
`DOS4GW.EXE`	The DOS extender used by Image Alchemy.
`\SAMPLES`	A directory containing sample data files and images. See the READ.ME2 file in this directory for further information.

Installation instructions

1. Insert disk 1 in your disk drive.

2. Change to the drive by typing either `a:` or `b:`.

3. Type `install`. This will install Image Alchemy/386 in the `c:\alchemy` directory.

   If you would like to install on a different drive or a specific directory, you can do this by typing `install` followed by the location where you want Image Alchemy/386 installed.

   For example: `install d:\util\alchemy` will install the software in the `d:\util\alchemy` directory.

   If you install Alchemy 386 in a different directory you will have to alter the environment variable instructions given below.

4. When prompted, change diskettes and press any key to continue. Repeat this step for each diskette.

5. You have now successfully installed Image Alchemy.

6. The file `read.me` contains information which has changed since the manual was printed. To display the read.me file type `type read.me`.

Environment variables and config.sys

Alchemy uses several different environment variables to determine its behavior. These control, among other things, how Image Alchemy uses extended or expanded memory, which display resolutions are available for image viewing, where temporary files are stored, and whether or not to display time to completion estimate while converting files.

config.sys

To insure that Alchemy can open the various files it needs while running, you should verify that the `files` value in your `\config.sys` file is set to at least 30 and the `buffers` value is set to at least 20.

autoexec.bat

There are several changes you may wish to make to your autoexec.bat file. These consist primarily of set commands, which are used to configure Image Alchemy.

path

So that MS-DOS can find Image Alchemy you must either add `c:\alchemy` to your path, copy the `alchemy.exe`, `alch386.exe`, `dos4gw.exe`, and `alchpcd.exe` files to a directory which is already in your path, or be in the `c:\alchemy` directory when executing Alchemy.

Temporary disk files

Alchemy uses the environment variable `TMP` to determine where to open its temporary files. If Alchemy runs out of disk space while writing to a temporary file it will report an error.

An example of setting the `TMP` variable to the \temp directory on drive e: would be `set TMP=e:\temp`.

Use of extended and expanded memory

If there is enough extended or expanded memory available, Alchemy will use it instead of some of the temporary files it would otherwise use during conversions.

To use extended memory you must have an XMS driver installed in the config.sys file (such as HIMEM.SYS, QEMM, or 386MAX). To use expanded memory you must have a LIM 3.2 or LIM 4.0 expanded memory driver installed (such as EMM386, QEMM, or 386MAX).

Alchemy's use of extended/expanded memory can be disabled. To disable the use of extended and expanded memory, set the environment variable `alchemy` to `x` (type `set alchemy=x` at the DOS prompt).

The availability of extended or expanded memory will not allow you to convert larger images, it will just increase the speed of conversions. If you need to convert very large images use alch386.exe, which is the 386 Enhanced version of Image Alchemy.

Checking for 8514/A boards

Alchemy will normally check to determine if there is an 8514/A board installed in the computer when viewing images. However, this can interfere with some network boards, as they use the same I/O addresses that 8514/A boards use. To disable 8514/A checking, set the environment variable `alchemy` to `8` (type `set alchemy=8` at the DOS prompt).

Note that this can be combined with other options; for example, to disable both 8514/A checking and extended/expanded memory usage, use `set alchemy=8x`.

Limiting maximum display resolution

Alchemy will automatically choose the lowest resolution which will fit the entire image when viewing images without specifying a display resolution with a VESA compatible VGA board. However, depending on the monitor and VGA board combination you have, this can be bad since the monitor may not support the particular resolution the SVGA board is trying to switch to. To avoid this problem, the environment variable `alchemy` may be set to indicate the maximum display resolution which Alchemy should use. Set the `alchemy` variable to the highest horizontal resolution which your monitor is capable of. Valid values are 1280, 1024, 800, and 640. For example, type `set alchemy=800` at the DOS prompt if your monitor only supports 640x480 mode and 800x600 mode.

To disable 8514/A checking, disable extended/expanded memory usage, and limit the viewing resolution to 640x480 use `set alchemy=8x640`.

Disabling time estimation information

When performing a long conversion Alchemy will automatically display an estimate of the time needed to complete the operation. To disable the display of this information, set the environment variable `alchemy` to `p` (type `set alchemy=p` at the DOS prompt).

To disable 8514/A checking, disable extended/expanded memory usage, limit the viewing resolution to 640x480, and disable time estimation use `set alchemy=8x640p`.

UNIX Installation

Required equipment

At a minimum you must have the following hardware to run Image Alchemy.

Disk space

A hard drive with at least 2 megabytes of free space for the Alchemy software and four times as much free space as the size of the image being converted (i.e. a 640x480 image will require up to 1.2 megabytes of free space).

Packing list

The enclosed diskette or tape is in `tar` format and contains the following files:

`alchemy`	The Alchemy software.
`read.me`	A text document describing any last minute revisions.
`/samples`	A directory containing sample data files and images. See the `read.me2` file in this directory for further information.

Installation instructions

Use `tar` to copy the files from each of the distribution disks or tape to a subdirectory of the current directory called `alchemy`. The examples below assume you are installing Alchemy in `$HOME/alchemy`; if you install Alchemy elsewhere you will have to modify the examples appropriately.

Change to the directory where you wish to install Alchemy. To install into the default `$HOME/alchemy` directory do the following:

```
cd $home
mkdir alchemy
cd alchemy
```

To install the software from diskette insert each diskette, starting at disk 1, and issue the following command for each diskette:

```
tar xvf /dev/fd0
```

For tape installation insert the tape in the appropriate tape drive and replace `/dev/fd0` with the name of the tape device. The name of the tape device varies between different models and configurations of systems; ask your system administrator if you don't know the name of your tape device.

Environment variables

Alchemy uses an environment variable to determine where to place temporary files and whether or not to display time to completion estimate while converting files.

path

You must either add `$HOME/alchemy` to your path, copy the file `alchemy` to a directory which is already in your path, or be in the `$HOME/alchemy` directory when executing Alchemy.

Temporary disk files

Alchemy uses the environment variable `TMPDIR` to determine where to put its temporary files. This is usually set to `/usr/tmp` or `/tmp`, but if you are converting very large images there may not be enough space available in the partition those directories are on (for example, converting a 10000 x 10000 pixel 24 bit colour image can require up to 300 megabytes of free disk space for temporary file storage).

If there is not enough space in the usual `TMPDIR` directory you will need to set the environment variable `TMPDIR` to a directory on a different partition. For example, to set the temporary file directory to the directory `/home/images` use `setenv TMPDIR /home/images`.

Contact your system administrator if you have problems with Alchemy running out of disk space while converting images.

Disabling time estimation information

When performing a long conversion Alchemy will automatically display an estimate of the time needed to complete the operation. To disable the display of this information, set the environment variable `alchemy` to `p` (type `setenv alchemy=p` at the prompt).

Differences between UNIX and MS-DOS

The UNIX and MS-DOS versions of Image Alchemy are very similar. However, there are several important differences between the two versions:

Pathnames

Because the MS-DOS and UNIX operating systems use different conventions for path names, users of UNIX will have to substitute forward slashes, "/", for the back slashes, "\", found in the examples in this manual.

Unintentional wildcard expansion

UNIX users should also be aware that the UNIX shell they are using may be performing wildcard expansion on certain characters (generally "*" and "?"). Since these are options which Alchemy uses, they need to be escaped to prevent the wildcard substitution. This is done by using a back slash, "\", before the character (so -? becomes -\?).

Sending output directly to devices

Several of the examples show output being sent directly to a device (for example prn:). UNIX users cannot send output directly to a device using Image Alchemy and should substitute a file name for the output device name.

Viewing images

The UNIX command line version of Image Alchemy does not support image viewing at this time. We currently have an OpenLook version of Image Alchemy available for Sun SPARC workstations, and are working on Motif versions for the Sun SPARC and other workstations. Please contact us for information if you are interested in upgrading to one of these versions.

2

Introduction

Introduction

Image Alchemy is a command-line driven program. The MS–DOS version also includes a text-based graphical user interface (GUI), described in Chapter 3.

Basic instructions

The basic Image Alchemy usage instructions are:

```
alchemy inputFileName [outputFileName]
   [outputPathName] -options …
```

Options

Options are the commands that you give Alchemy so that it knows what you want it to do. So that Alchemy can distinguish between options and file names on the command line, options are preceded by a dash ("-").

The only option that is required is the output file format. Image Alchemy will make reasonable decisions for all of the other options.

Some options take parameters. The parameters may immediately follow the option or be separated by a space. For example, either `-c128` or `-c 128` is acceptable.

The options themselves are documented in Chapters 3 through 8.

Note that options can appear anywhere in the command line and usually they can be in any order (certain options take parameters; in those cases the parameters must follow the option). The case of the options is significant. For example, `-d` and `-D` mean different things.

InputFileName

The inputFileName is the file name of the existing image file that you are converting from or viewing and must be specified.

The inputFileName may include an optional drive and/or path.

OutputFileName

The outputFileName is the name of the file you are converting the image to. The outputFileName is optional; if it is not specified Alchemy generates one by substituting an appropriate extension to the input file name.

If you specify an outputFileName and it does not include an extension one will be added.

The outputFileName may include an optional drive and/or path. If you do not supply a path the current directory will be used as the destination directory.

The inputFileName and the outputFileName cannot be the same unless you are writing the output file to a different directory.

OutputPathName

The outputPathName is the location where you want to put the output file that Alchemy will create. The outputPathName is optional; if it is not specified Alchemy places the output in the current directory or in the directory specified as part of the outputFileName.

Specifying an outputPathName is useful when using the wildcard option to convert multiple files; see the wildcard command in Chapter 5 for more information.

If you are not using the wildcard option the outputPathName is usually specified on the command line as part of the outputFileName.

Limitations on filenames

Since Alchemy lets you optionally enter a space between an option and its parameter it is possible to confuse Alchemy if one of the filenames starts with a number. In particular, if you use an option which has an optional parameter, you choose not to supply the parameter, and you follow that option immediately with a filename which starts with a number, Alchemy doesn't realize that the filename is not the parameter. While it sounds unlikely that this would ever be a problem it actually happens quite often.

Example

If you wanted to convert the file `12.gif` to a Targa file with the name `output.tga` you would have to be careful of the order in which you specified things.

If you say:

```
alchemy -a 12.gif output.tga
```

Alchemy would misinterpret that as:

```
alchemy -a12 .gif output.tga
```

and would generate an error.

The easiest way around this problem is to always put the filenames first, such as:

```
alchemy 12.gif output.tga -a
```

Output path

The output path name is the location where Alchemy places its output. As mentioned earlier, this defaults to the current directory but can be the specified as part of the output file name or separately.

Examples

Convert the file test.gif in the directory \images to a TIFF file called temp.tif in the current directory:

```
alchemy \images\test.gif temp.tif -t
```

Do the same thing, placing the output in the directory \new:

```
alchemy \images\test.gif \new\temp.tif -t
```

Convert all of the GIF files in the directory \images to TIFF files, placing the TIFF files in the \new directory :

```
alchemy -- \images\*.gif \new -t
```

Using response files

Alchemy can read command line parameters from text files (called response files). Using response files is equivalent to typing the options and/or file names on the command line. Response files are useful when you have commonly used commands or when you have long commands which would be hard to remember or exceed the command line limits of your operating system.

To use a response file you create a text file containing the options and/or file names that you would ordinarily pass to Alchemy on the command line. You create this text file using a text editor. This file can have any name or extension you wish. To specify this file to Alchemy use the `@` operator, followed immediately by the name of the text file.

For example, if you frequently need to scale images to be no larger than 640x480, using 'b' quality scaling, and preserving aspect ratio, you can make a text file which looks like this (called `scale`, for purposes of this example):

```
-Xb640 -Yb480 -+
```

You would then use this text file with Alchemy by passing its name along with any other options (including the output file type option and the file names). For example:

```
alchemy @scale test.gif new.gif -g
```

would convert the GIF file test.gif to a GIF file called new.gif, while performing the desired scaling operation.

It is also possible to place filenames of images to convert and other response files in response files. For example, if you want to convert the files test1.gif, image.tga, scan1.tif, scan2.tif, and scan3.tif to JPEG files you can create a text which looks like this (called `files`):

```
test1.gif
image.tga
scan1.tif
scan2.tif
scan3.tif
```

And then use this command line to convert those files to JPEG files:

```
alchemy -- @files -j
```

Note the use of the `--` option to indicate to Alchemy that more than one filename will be specified.

For MS-DOS users it is also possible to place wildcards in response files. For example, if you want to convert all of the .gif, .tif, and .tga files to JPEG files you can create a text file which looks like this (called `wild`):

```
*.gif
*.tif
*.tga
```

And then use this command line to convert those files to JPEG files:

```
alchemy -- @wild -j
```

UNIX users can accomplish the same task by using `ls` and redirecting output to a file:

```
ls *.gif *.tif *.tga >wild
```

And then use this command line to convert those files to JPEG files (note the use of the `--` option to indicate to Alchemy that you are giving it more than one file to convert):

```
alchemy -- @wild -j
```

If you wanted to scale the images at the same time, using the `scale` text file created earlier, you would add that response file to the command line. For example:

```
alchemy -- @files @scale -j
```

Comments

A line in a response file which begins with a # is treated as a comment and ignored.

Response files may contain commands and filenames on multiple lines and may also contain blank lines.

Using multiple runs of Alchemy

Sometimes you may know what you want to accomplish but not how to specify the correct combination of options. For example, you may wish to resize a true colour Targa file that you have scanned and convert it to a 16 colour GIF file. Let's say that the input file name is `file.tga` and you want to generate a file with the name `file.gif`. In this case you could use:

```
alchemy file.tga -Xb640 -Yb480 -c16 -g
```

However, there would be no penalty in quality if you did things in two steps:

```
alchemy file.tga temp.raw -Xb640 -Yb480 -r

alchemy temp.raw file.gif -c16 -g
```

In this case you are telling Alchemy to use a temporary raw file called `temp.raw`. Except for having to delete the file `temp.raw`, this would give you identical results to doing things in one step.

However, the order of steps is important in many cases. For example, reversing the order of the two operations in the previous example:

```
alchemy file.tga temp.raw -c16 -g

alchemy temp.raw file.gif -Xb640 -Yb480 -g
```

would give different results. This is because the scaling operation has to temporarily convert the image to true colour, but the GIF file you are generating has to be paletted, so the second operation would re-dither the image, lowering the quality.

Illegal combinations of options

Sometimes you will have to perform operations using multiple steps because there are some combinations of options that Alchemy explicitly does not allow. These combinations of options are not allowed because the results would not be what you expect.

For example, using the spiff option, `-S`, in combination with the false colour option, `-F`, would spiff the image first and then false colour it, which would give the same results as just using the false colour option.

Since this is not the result you would most likely want, Alchemy will complain if you specify both of those options at the same time. In this case you could false colour the image first, generating a temporary image, and then spiff that image.

3

The Graphical User Interface (Menus)

MS-DOS Only

Introduction

Image Alchemy includes a Graphical User Interface (also referred to as a GUI, pronounced "gooey"), commonly referred to as a menu system. The GUI can make using Alchemy much easier for casual or infrequent users, since all the commands are accessed through pull-down or pop-up menus. This means the various command-line arguments do not need to be memorized.

The GUI is actually a separate application which gets information about the conversion from the user and then calls the actual Alchemy executable with the appropriate command line options. The GUI will let you view the command line parameters it uses, so that you can learn more about Alchemy itself and the options it requires to perform various conversions.

Using the GUI with Windows

The Alchemy GUI can be run as a DOS application from within Microsoft Windows. To make it easier to run you can set up the `ALCHEMY.ICO` and `ALCHEMY.PIF` files under Windows. This will give you an icon that you can double click to start the Alchemy GUI.

If you have installed Alchemy somewhere other than c:\alchemy or Windows somewhere other than c:\windows you will have to modify these instructions appropriately.

1. Copy the `ALCHEMY.ICO` and `ALCHEMY.PIF` files from the c:\alchemy directory to the c:\windows directory.

2. Within Windows, open the group in which you wish to place the Alchemy icon. From the Program Manager, select **New** from the **File** menu.

3. Select the **Program Item** choice and click **OK**.

4. Fill in the following information:

Description	`Image Alchemy`
Command Line	`alchemy.pif`
Working Directory	`c:\alchemy`

5. Select **Change Icon**.

6. Click **OK** to make the warning dialog box go away (the warning can be safely ignored, it is only telling you that the alchemy.pif file does not contain an icon).

7. Enter `c:\windows\alchemy.ico` for **File Name**.

8. Click **OK**.

9. Click **OK**.

10. Click **OK**.

Starting the GUI

From DOS

After installing Image Alchemy (described in Chapter 1), the Alchemy executable as well as the GUI should be on your working drive. The GUI will be able to find the Alchemy executable as long as it is in either the current directory or the search path.

Assuming the path has been correctly set, simply typing '`gui`' will start Alchemy's graphical user interface. If you have previously saved a settings file, you may have the GUI automatically load it by specifying the name of the settings file as a command-line parameter. For example, typing 'gui settings.sav' would start the GUI with the settings saved in the file settings.sav.

From Windows

Assuming you have installed the Icon for the Image Alchemy GUI as described above, double clicking on the Alchemy icon will start the GUI in a DOS Window.

When starting the GUI in this way the viewing options are unavailable. This is because Windows does not allow programs running within a DOS Window to have direct control over the SVGA display.

Using the GUI

If you have a mouse connected to your system, you can point-and-click through the menuing system, rather than using the keyboard. Clicking an entry on the menu bar will pull down that menu, and then clicking on a specific option will actually choose it.

Alternatively, you can move the mouse cursor to the menu bar, click on a sub-menu category like File, and while continuing to hold down the mouse button, select a specific item. When you release the mouse button, that item will be chosen.

To access the pull-down menu system using the keyboard, type Alt-?, where ? is the first character of the option. For example, typing Alt-F will bring down the File sub-menu, and Alt-D will bring down the Dither sub-menu.

Pressing and releasing the ALT key by itself will take you up to the menu bar and pull down the first entry (the File sub-menu). The left and right arrow keys will move between the various sub-menus. At this point, the up and down arrow keys can be used to highlight a specific option; pressing Return will select that option.

While in the menu system, pressing ESC will close the current menu; if you are being prompted for a value in a dialog box, ESC will abort the input, and retain the old value.

As you move through various options in the sub-menus, a short help message will appear on the bottom status line, giving you further information on the option you currently have selected.

Note that some sub-menu entries may be dimmed; this means that these options cannot be used at this time. This usually applies to the viewing and conversion commands, which cannot be chosen without first selecting an input file.

Quitting the GUI

To exit the GUI, select Quit from the File sub-menu. Alternatively, ALT-X or ALT-F4 will immediately quit the GUI without going through the menu system.

The File Sub-Menu

Select Input Image

Choosing this option will bring up a listing of all the files in the current directory. Using either the keyboard or the mouse, you can select the input file which Alchemy will work on. There are also listings for the parent directory and various subdirectories (if any), which allow you to move around on the drive.

Clicking on the Cancel button or hitting ESC will abort the selection process, keeping the previous input file name.

Note that the GUI does not check to make sure that the file you have selected is a valid image file (it would slow the GUI down too much to have to open each file as you highlight it). As such, it is possible for you to select a file which Alchemy itself will not recognize when a conversion or view is requested.

Select Output Type

Selecting the Output Type will display a scrolling window containing the different image formats to which Alchemy can output. The up and down arrow keys will move the highlight bar up and down one item, and the PgUp and PgDn keys will move the highlight bar up and down one page. Pressing Return selects the highlighted output type. The mouse can also be used to scroll through the window; clicking on the up and down arrows will move the highlight bar up and down one entry, and clicking in the scroll bar above or below the current location marker will page up and down through the list.

If you select an output format that has further options (such as compression type), a second pop-up menu will ask you to pick an option. Either typing the highlighted key or clicking on the name will select that option.

For more information on the output types available, and the options that each has, see Chapter 4.

Image Stats

After selecting an input file, selecting this option will display various information for that file, including the height and width, number of colours, and compression ratio. Other values may be displayed, if they are available, such as dots per inch (DPI), aspect ratio, and gamma.

Show Command Line

Choosing this option will display the parameters which will actually be passed to Alchemy if the Convert! entry is chosen. This allows you to see what parameters need to be passed to Alchemy on the command line to enable various options.

Generate Response File

Selecting this option causes the GUI to create a response file called ALCHEMY.RSP, based on the current options. This allows you to run Alchemy from the command line, without having to write down the parameters displayed with Show Command Line. To use the response file, simply type

```
alchemy @alchemy.rsp
```

from the command prompt. See Using Response Files in Chapter 2 for more information.

Convert!

This should be the last option you select when converting an image; use it only after you have selected all the options you need from the various other menus.

After choosing this option, you will be prompted for an output filename, with a default given based on the output type chosen. To accept this filename, simply press Return. You may of course modify the default by typing different names, drives, or directories.

The GUI will then generate a command line and run the Alchemy software, passing along information about the various options you have selected in the menu.

A progress dialog box will keep you informed of the status of the conversion. After the conversion you will be returned to the main screen. If the conversion generates an error it will be displayed in a dialog box.

Restore Settings

This option will restore the settings saved in a previous GUI session (see Save Settings below). The only options which are not overridden by the restore function are the input filename and the output type - they will retain their current values.

Alternatively, a settings file can be restored automatically when starting the GUI by specifying the name of the settings file as a command-line parameter.

Save Settings

Using this option, you can save the current GUI settings (with the exception of the input filename and output type) for later use. This is useful if you frequently perform the same operations on a number of files during different GUI sessions - you no longer have to use the menus to set each option every time you quit and restart the GUI.

Note that when specifying the name of a settings file, any existing file with the same name will be overwritten without warning.

Basic/Expert Menus

This menu entry will change, depending on the current status of the menu system. When first started, the GUI will default to Basic mode, which hides many of the less frequently used Alchemy options. Choosing this option will then force the GUI to use the full, more advanced menus which include all possible options.

When the Expert menus are being used, choosing this option will switch back to the Basic menu system.

Quit

This option will end your GUI session, and return you to the DOS prompt.

The View Sub-Menu

These four options are for viewing the image you have selected. See Chapter 8 for more information on the type of SVGA cards supported and details of the viewing commands.

mhw mhw Note that when the GUI is started via the supplied Windows PIF, viewing options are disabled. This is necessary because Windows does not allow DOS software to control the SVGA hardware, so attempting to view under Windows will cause the screen to produce garbage.

View Image

View Image will do a standard 8-bit view on an SVGA monitor, displaying only the center portion of the image if it exceeds maximum screen resolution.

View Scaled

Using the View Scaled option will work similarly, except it will use Nearest Neighbor scaling to make sure the entire image fits on the screen if it is larger than screen resolution.

View True Color

If you have an SVGA board and monitor capable of displaying images in true colour (15-, 16-, or 24-bits), select View True Color to take advantage of this. This option will try to view in the highest resolution possible, while displaying as much of the image as possible.

View True Color Scaled

If you have an image larger than what your card/monitor can display in true colour, using the View True Color Scaled option will scale the image so you can view the entire image in true colour.

The Resize Sub-Menu

The options in this sub-menu allow you to control various aspects of the output image concerning its size and DPI information. Along with being able to specify a certain image size, you can also tell Alchemy to make an image larger or smaller by some factor. Finally, you can specify the aspect ratio and DPI information from within this menu.

For further information about the scaling options, see Chapter 7.

The Palette Sub-Menu

The entries in the palette sub-menu allow you to control various aspects of the palette and its generation, including using Heckbert's algorithm, a uniform palette, or a black and white/grayscale palette. You can also tell Alchemy to use a palette from another image, or use an undercolour removal file during the conversion process.

For further information about these topics, see Chapter 6.

The Colors Sub-Menu

The colors sub-menu primarily allows you to specify the number of colours to be used in the output file. You can also generate a photographic negative of an image, as well as spiff it using one of three different algorithms. Finally, from within this sub-menu, you can modify the input, output, and palette gamma values.

For further information about the colors options, see Chapter 6.

The Dither Sub-Menu

The dither menu allows you to select the particular dithering algorithm to use. You can also specify whether you want a serpentine raster or some amount of perturbation; both of these options help break up visible patterns left by the dithering.

For further information about the dithering options, see Chapter 6.

4

Conversion Options

Introduction

The one option which is always required when running Image Alchemy is the output image file type. Even if you are just re-sizing an image, or changing the number of colours in an image, Alchemy needs to know what type of image you want to create.

The file types that Image Alchemy supports are listed below. In addition to the syntax required to generate the file, any known restrictions or limitations are listed. If you have trouble reading an image in one of the file formats we claim to support please contact us (see Appendix D, Customer Support).

The output option consists of a single letter, followed by any options needed for the file format you are writing. The output option, like all Alchemy options, is preceded by a dash, "-". The less common output options consist of a letter preceded by two dashes, "--".

Output variations

Some of the output formats have several variations; in those cases you specify which variation you want with an optional letter and/or number after the output option.

Example

The option to generate a Windows Bitmap file is `-w`. There are two types of Bitmap files: uncompressed and Run-Length-Encoded (RLE). To write out an uncompressed Bitmap file use `-w0`; to write out an RLE Bitmap file use `-w1` (the default Bitmap file is uncompressed, so a `-w` without any parameter following it would also generate an uncompressed Bitmap file). Note that Alchemy allows spaces between the option and parameter, so typing `-w 1` would be the same as `-w1`.

Further variations

Be aware that the other options specified on the command line may also affect the type of file that is generated.

Example

Within the Windows Bitmap file type there are 1 bit, 4 bit, 8 bit, and 24 bit files.

Alchemy always generates a file using the best match of the file type and the output image. So, in the case of Windows Bitmap files, if the output image is black and white a 1 bit file is generated. If the output image is paletted with 16 colours or less a 4 bit file is generated. If the output image is paletted with more than 16 colours an 8 bit file is generated. And if the output image is true colour a 24 bit file is generated.

You can explicitly force any of these file types by using other Alchemy options. For example, if you wanted a 1 bit Windows Bitmap file you would specify `-c2 -b -w`. To force a 4 bit file use `-c16 -w`. To force an 8 bit file use `-c256 -w`. And to force a true colour file use `-24 -w`.

Identifying image files

Image Alchemy identifies the type of file being read by checking various magic numbers and other information that varies from format to format. Unfortunately, some formats do not have a magic number; in those cases Alchemy uses other information to guess as to the image type. It is possible for Image Alchemy to incorrectly identify an image; if this happens you can use the `-=` option to force Alchemy to recognize the file as a particular format (see Chapter 5 for more information on the `-=` option)

Input Options

Some input file formats have optional parameters which affect how the input file is read. These parameters can specify such things as the page to read (for multi-page formats, such as PCL), which bands to read (for multi-band formats, such as Core IDC), or which resolution to read (for multi-resolution formats, such as PhotoCD).

The option used to specify input options is -Z. This is followed by one or more parameters which vary depending on the format being read. The comments section for each format describes any input options which apply to that format.

MacBinary

When reading images, Alchemy automatically recognizes and reads MacBinary II files (MacBinary files are generated when you accidentally leave MacBinary mode on when transferring a file from a Macintosh).

Other information

Alchemy will preserve as much information in each file as practical; this always includes the height and width of the image and the number of colours in the image. Some file types include other data, such as the name of the image, the aspect ratio of the image, the date the image was created, etc. Since most of these items are only supported by a few file formats, Alchemy discards everything but the height, width, number of colours, gamma, aspect ratio, resolution values, and, optionally, alpha channel information.

File Formats

The individual file formats supported by Alchemy are described in alphabetical order on the following pages. The descriptions follow the template given overleaf.

Name of format -option

Overview of file format.

Syntax Description of syntax.

Parameters Brief description of the parameters. Those parameters which require a detailed explanation are further documented under the comments section below.

Extensions The extensions commonly used for this image format. When multiple extensions are listed Alchemy writes files using the first one, but will check for files using all extensions (in the order listed). Some formats use more than one file per image, in that case the extension for each portion of the image is listed. Four letter extensions are skipped on MS-DOS systems.

Creator The company or individual who created this image format. Please contact them for more information on the format.

Used by Programs or types of software that use this image format.

Variations A list of the variations supported by Image Alchemy.

Limitations Any known limitations that Image Alchemy has when reading or writing this image format.

Comments Miscellaneous things of which you should be aware.

Related options Other Alchemy options that affect the reading or writing of this image format. Note that -8, -24 (and, for some formats, -15, -16, and -32), -c, and -b options have an effect for most image formats and are not listed explicitly.

Examples Sample conversions involving this image format.

ADEX --A

ADEX files are used by the ADEX Corporation ChromaGraph series of graphics cards.

Syntax

--A *compressionType*

Parameter

compressionType:
0:None
1:Run Length Coded
The default is None.

Extensions

.img
.rle

Creator

ADEX Corporation

Used by

ADEX ChromaGraph cards.

Variations

4 bit and 8 bit images.

Comments

Some ADEX files don't contain a palette; in those cases there's usually a second ADEX file which contains the palette to be used. To read those images that don't have palettes, use the -F false colour option to read the palette from a separate file.

Related options

-F False colour

Example

Convert the file test.gif to an uncompressed ADEX file called test.img:

```
alchemy test.gif --A
```

Adobe Acrobat PDF --d

Adobe Acrobat PDF (Portable Document Format) files are used by Adobe Acrobat.

Syntax

--d *compressionType*

Parameter

compressionType:

0:None
1:Run Length
2:LZW
3:CCITT Group 3 fax
4:CCITT Group 4 fax
5:JPEG Low Quality
6:JPEG Medium Quality
7:JPEG High Quality

The default is None.

Extension

.pdf

Creator

Adobe Systems Incorporated

Used by

Adobe Acrobat.

Variations

Writes 1 bit black and white, 8 bit grayscale, 8 bit paletted, and 24 bit colour images.

Limitations

Adobe Acrobat files can only be written, not read.

CCITT Group 3 fax and Group 4 fax files are always 1 bit, black and white. Selecting either compression type will cause Alchemy to automatically convert the input image to black and white.

Comments

Alchemy always writes a single page PDF file; this will be changed in a future release.

Example

Convert the JPEG file sample.jpg to a Run Length compressed PDF file:

```
alchemy sample.jpg --d 1
```

Alias Pix --I

Alias is a modeling software package for SGI and Macintosh computers.

Syntax

--I (upper case i)

Extension

.img
.als

Creator

Alias Research, Inc.

Used by

Alias
Vivid Ray Tracer

Variations

Reads and writes 24 bit RLE files.

Comments

This is the same format as used by the Vivid ray tracer (see Vivid, below)

Example

Convert the file spheres.qrt to an Alias Pix file:

```
alchemy spheres.qrt --I
```

Alpha Microsystems BMP -M

Alpha Microsystems BMP files are used by Alpha Microsystems.

Syntax

-M *compressionType*

Parameter

compressionType:
0:None
1:Packed
The default is None.

Extension

.bmp

Creator

Alpha Microsystems

Used by

Alpha Microsystems workstations.

Variations

Reads and writes 1, 4, 8, and 24 bit unpacked and packed (run-length encoded) RGB images.

Limitations

Reading and writing HLS images is not supported.

Comments

When reading an image without a palette Alchemy will assume the image is gray-scale.

Examples

Convert the GIF file, bigpict.gif, to an uncompressed Alpha Microsystems BMP file:

```
alchemy bigpict.gif -M
```

Do the same thing, but force a 24 bit image, and compress the image:

```
alchemy bigpict.gif -M1 -24
```

Autologic --a

Autologic files are black and white or gray-scale files for use with Autologic typesetting equipment.

Syntax

--a

Extensions

.gm
.gm2
.gm4

Creator

Autologic, Incorporated

Used by

Autologic typesetting equipment.

Variations

Graphics modes 2 (black/white) and 4 (gray-scale) are supported.

Limitations

Only the High Speed Interface inline format is supported.

When reading, images must be preceded by a Graphics Parameter Block.

Examples

Convert the file input.tif to a GM4 file called output.gm4:

```
alchemy input.tif output.gm4 --a -b
```

Convert the file input.tif to a GM2 file called output.gm2:

```
alchemy input.tif output.gm2 --a -b -c2
```

AVHRR --R

AVHRR files are used for satellite image data.

Syntax

--R *outputType*

Parameter

outputType
1:IDIDAS Uncompressed
2:IDIDAS Compressed type 1
The default is 1 (IDIDAS Uncompressed).

Extension

.sst

Creators

National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite Data Information Service (NESDIS)

Used by

IDIDAS
SSTMAP
IMGMAP

Variations

Reads 8 and 11 bits per pixel IDIDAS AVHRR files.

Writes 11 bits per pixel IDIDAS AVHRR files.

Limitations

Level 1B AVHRR files will be supported at a later date; please contact us for more information.

Alchemy discards all but the top 8 bits when reading 11 bit AVHRR files. When writing, the bottom 3 bits are set to 0.

Any graphics information is discarded when reading the file.

Since AVHRR images are always grayscale, Alchemy assumes the use of the -b and -8 options when writing an AVHRR file.

Comments

AVHRR images contain a lot of information which is not part of the image data. This information includes the time and date the image was captured, the satellite which captured the image, the type of instrumentation used, etc. When reading AVHRR images this information is discarded; when writing AVHRR images 0 is written for all values for which data is unavailable.

Example

Convert the GOES file, florida.goe, to an uncompressed IDIDAS AVHRR file:

```
alchemy florida.goe --R1
```

Binary Information Files (BIF) -B

There are quite a few programs which produce image files which contain just pixel data. These image files do not have a header and hence do not include enough information to allow Alchemy to read them. Using a BIF file Alchemy can read these images. However, since required information, such as the height and width of the image, is not present in these files, it must be supplied by the user.

BIF files can also be created by Image Alchemy for software which expects images to be just pixels.

See Appendix E, "Binary Information Files", for more information.

Syntax

-B *outputType*

Parameter

outputType:

0:Standard
1:3 Files
2:ASCII
3:Group III
4:Group IV
5:Packed, 1 bit per pixel, black and white

The default is Standard. See the comments section below for more information on the output types.

Extensions

.bif For ASCII file describing image.
.raw For actual image data.

Creator

Handmade Software, Inc.

Used by

Image Alchemy
Various image processing software

Variations

24 bit true colour, 8 bit gray-scale, and 1 bit black and white.

Limitations

Paletted files cannot be read in (a work around is to generate a .PAL file and then false colour the gray-scale image using the -F option).

Comments

BIF files are used to read and write files which consist entirely of image data. You have to generate a text file which describes the format of the data you are trying to read in. This file is called a BIF file. The format of BIF files is documented in Appendix E, Binary Information Files. You then instruct Alchemy to read the image data by giving it the name of the .BIF file.

Alchemy can generate a variety of different types of BIF data:

The standard BIF file consists of either gray-scale or byte interleaved RGB data in binary form. Each pixel is stored as one or three bytes and there is no padding at the end of lines or at the end of the image. This is the most common output type.

The three file BIF data has the red, green, and blue data stored in separate files. The red data will be stored in a file with a .r extension, the green data has the extension .g, and the blue data has the extension .b.

The ASCII BIF file is identical to the standard BIF file except that the data is stored as ASCII instead of binary. Each line of data in the original image is stored as one line of data in the BIF file, with a new-line character at the end of the line. There are commas separating each of the pixel values. This type of BIF file cannot be read by Image Alchemy.

The Group III BIF files that Alchemy outputs are CCITT Fax Group III compressed. They have the least-significant bit first, end-of-line markers before the first line, and after every line except the last, and are not byte aligned. This is the native order for a fax machine. This format can be useful if you are generating data to be sent via a fax modem.

The Group IV BIF files that Alchemy writes are CCITT Fax Group IV compressed; they have the least significant bit first.

Packed BIF files are required to be black and white. Packed files are identical to standard BIF files except that 8 pixels are packed together into one byte and the data is padded to a multiple of 8 pixels per line.

Related options

-F False colour

Examples

Convert the file data to a GIF file:

```
alchemy data.bif -g
```

Convert the image helen.pcx to a Binary file (this will create two files: helen.raw and helen.bif):

```
alchemy helen.pcx -B
```

Calcomp CCRF --l

Calcomp raster files are used by Calcomp thermal transfer printers and electrostatic and ink jet plotters.

Syntax

--l *type* (lower case l)

Parameter

type:
Thermal Transfer Printer:
0:Uncompressed
1:White Space Suppression
2:Run Length Compression
Electrostatic plotter (CCRF):
6:8 bit bytes, 8 bit compression units
7:8 bit bytes, 16 bit compression units
8:8 bit bytes, 32 bit compression units
Ink jet Plotter (Interleaved CCRF):
46:8 bit bytes, 8 bit compression units
47:8 bit bytes, 16 bit compression units
48:8 bit bytes, 32 bit compression units
The default is Thermal transfer, uncompressed.

Extensions

.crf
.ccrf
.prn

Creator

Calcomp

Used by

Calcomp thermal transfer printers and electrostatic and ink jet plotters.

Variations

Black and white or 1-bit CMYK.

Comments

If there is only black and white data in the image, a 1 bit file will be generated.

For colour images, the black plane will be omitted if it is empty. See Appendix G for information on how undercolour removal files control the black content of an image.

Since the Calcomp CCRF format is a 1-bit CMYK format you may want to use an undercolour removal file when converting a colour image to this format. See the -C option in Chapter 6 for more information.

Related options

-C Undercolour removal
-_ Offset image
--_ Center image

Example

Convert the Targa file image1.tga to a CCRF file using 16 bit compression units:

```
alchemy page1.tif --l7
```

CALS --c

Computer-aided Acquisition and Logistics Support (CALS) files are black and white images used by the US Government as part of their transition to electronic media.

Syntax --c

Extension .cal

Creator Defense Logistics Agency (DLA)

Used by Department of Defense (DoD)

Variations Reads and writes type 1 (Group 4 raster) CALS images.

Limitations Document labels, such as document ID and figure ID, are ignored.

Comments Since CALS files are always black and white, Alchemy assumes the use of the -b, -8, and -c2 options when writing CALS files.

CALS images are Fax Group IV compressed and are therefore a good way of storing black and white line drawings and scans.

Example Convert the TIFF file page1.tif to a CALS file:

```
alchemy page1.tif --c
```

Core IDC --B

Core IDC files are used by Core Software's GIS software.

Syntax --B

Extension .idc

Creator Core Software Technology

Used by Core Software Technology

Variations Reads and writes 1 and 3 band files.

Reads and writes 8 bit files.

Limitations Only 8 bit images can be read.

Alchemy cannot read 2 channel or 4 or more channel images without using the -Z option (see the comments section below for more information).

Comments 1 band files are read in as gray-scale images.

3 band files are read in as true colour images. The default colour mapping between RGB and bands 1, 2, and 3 is Red=Band 1, Green=Band 2, and Blue=Band 3, this can be changed by using the -Z option. See the example section below for details.

Using the -Z option it is possible to select a single channel or 3 channels when reading a multi-channel Core IDC image. To use the -Z option follow it with a single number to indicate which channel is to be read as a grey-scale image or three numbers to indicate which channels are to be read as a 24 bit colour image. See the example section below for details.

Examples

Convert the Core IDC file atlanta.idc to a Sun raster file:

```
alchemy atlanta.idc -s
```

Convert the file satellite.image to a Core IDC file.

```
alchemy satellite.image satellite.idc --B
```

The Core IDC file newyork.idc contains 9 bands, the next examples show various ways to read selected bands out of the image.

Convert the first band in the image to a grayscale Sun Raster file.

```
alchemy newyork.idc -Z 1 -s
```

Convert the sixth band in the image to a grayscale Sun Raster file.

```
alchemy newyork.idc -Z 6 -s
```

Convert the image to a 24 bit, colour Sun Raster file, using band 2 as the red channel, band 7 as the green channel, and band 4 as the blue channel.

```
alchemy newyork.idc -Z 2 7 4 -s
```

Cubicomp PictureMaker --P

Cubicomp PictureMaker files are used in broadcast-quality three dimensional modeling and animation.

Syntax

--P *type*

Parameter

type:
0:Allow any size image
1:Adjust image size to 512 x 488
The default is 0.

Extension

.r8	Red channel image data
.g8	Green channel image data
.b8	Blue channel image data
.a8	Alpha channel image data [optional]

Creator

Cubicomp Corp.

Used by

Cubicomp PictureMaker

Variations

Reads and writes 24 bit true colour images with or without alpha channel information.

Limitations

8-bit paletted PictureMaker files are unsupported.

Comments

This format is not the same as IBM Picture Maker.

The option for adjusting the image size to 512 x 488 is useful because Cubicomp PictureMaker does not work with images which are not of this exact size. If either the X or Y dimension is larger than 512 or 488, respectively, that dimension will be truncated. If either dimension is smaller than 512 or 488, the image will be padded on the right-hand side or bottom, as necessary, with black.

PictureMaker images have either three or four separate files per image: a red file, a green file, a blue file, and an optional alpha channel file. When reading or writing a PictureMaker file specify the name of the .r8 file, Alchemy automatically generates the name of the .g8, .b8, and .a8 files

When writing a PictureMaker file Alchemy will overwrite, without warning, existing .g8, .b8, and .a8 files.

To preserve the alpha channel information when converting to or from Cubicomp PictureMaker files use the `-I` option.

Related options

`-I` Alpha Channel

Example

Convert the 24-bit JPEG image stones.jpg to PictureMaker files:

```
alchemy stones.jpg --P
```

Dr. Halo CUT --C

Dr. Halo CUT files are used by various MS-DOS based paint programs.

Syntax

--C

Extension

.pal	Palette and header data
.cut	Pixel data

Creator

Media Cybernetics

Used by

Dr. HALO III Paint Package
HALO Desktop Imager

Variations

8 bits per pixel

Comments

Dr. Halo CUT images are actually two files. You specify the name of the .cut file and Alchemy automatically generates the name of the .pal file.

When writing a Dr. Halo CUT file Alchemy will overwrite, without warning, existing .pal files.

Examples

Convert the image test.pcx to a Dr. Halo CUT file:

```
alchemy test.pcx --C
```

Encapsulated PostScript (EPS) -e

EPS files are a subset of PostScript; they may be included by other PostScript files without requiring that the importing software be able to interpret the file.

Syntax

-e *type*

Parameter

type:

0:No preview
1:Device independent preview
2:TIFF preview

0:UNIX newlines
10:Mac newlines
20:MS-DOS newlines

100:No showpage

The default is device independent preview with UNIX newlines and showpage (type 1). Options are combined by adding (see below for an example).

Extensions

.epsi
.eps
.epi

Creator

Adobe Systems, Inc.

Used by

PostScript printers

Variations

Writes Black and White, Gray-scale, and RGB.

Limitations

Image Alchemy can only write EPS images, for information on upgrading to Image Alchemy PS, which can read EPS and Postscript files, please contact us.

Comments

If the output is black and white or gray-scale, it will work with any PostScript device. If it's colour, then the CMYK extensions or a level 2 device is required.

If you are writing an EPS file which you intend to send directly to an EPS output device, such as a printer, you will want to write a type 0 EPS file (No Preview, Unix Newlines, and include the showpage).

EPS files are normally written using the UNIX newline convention. To write an EPS file with Macintosh newlines, add 10 to the preview type. To write an EPS file with MS-DOS newlines add 20 to the preview type. See below for an example.

To omit the showpage from the end of the EPS file add 100 to the preview type. Some software which imports EPS files does not correctly handle EPS files which contain the showpage.

Related options

-_ Offset image
--_ Center image

Examples

Convert the file input.gif to a colour EPS file called input.eps with no preview:

```
alchemy input.gif -e0 -24
```

Convert the file input.gif to a gray-scale EPS file called gray.eps, with a device independent preview:

```
alchemy input.gif gray.eps -e -b
```

Convert the file test.gif to a black and white EPS file called test.eps, with a no preview and MS-DOS newlines:

```
alchemy test.gif gray.eps -e20 -b -c2
```

ER Mapper Raster --m

ER Mapper files are used by ER Mapper satellite image analysis software.

Syntax

--m

Extensions

.ers	Header data
.	Pixel data

Creator

Earth Resource Mapping

Used by

ER Mapper

Variations

Reads and writes single channel and 3 channel images.

Limitations

Alchemy cannot read 2 channel or 4 or more channel images without using the -Z option (see the comments section below for more information).

Comments

ER Mapper files are actually two files, one with the extension .ers and the other without any extension. The .ers file contains header information and the non-extensioned file contains the actual image data. You specify the name of the .ers file and Alchemy automatically generates the name of the other file.

When writing an ER Mapper file Alchemy will overwrite, without warning, existing ER Mapper image data files.

Using the -Z option it is possible to select a single channel or 3 channels when reading a multi-channel ER Mapper image. To use the -Z option follow it with a single number to indicate which channel is to be read as a grey-scale image or three numbers to indicate which channels are to be read as a 24 bit colour image. See the example section below for details.

Examples

Convert the Sun Raster file earth.ras to an ER Mapper file:

```
alchemy earth.ras --m
```

The ER Mapper file Landsat_TM_year_1991.ers contains 7 bands; the next examples show various ways to read selected bands out of the image.

Convert the first band in the image to a grayscale Sun Raster file.

```
alchemy Landsat_TM_year_1991.ers -Z 1 -s
```

Convert the fifth band in the image to a grayscale Sun Raster file.

```
alchemy Landsat_TM_year_1991.ers -Z 5 -s
```

Convert the image to a 24 bit, colour Sun Raster file, using band 2 as the red channel, band 7 as the green channel, and band 3 as the blue channel.

```
alchemy Landsat_TM_year_1991.ers -Z 2 7 3
-s
```

Erdas LAN/GIS --e

Erdas files are used by Erdas image processing software.

Syntax

--e

Extensions

.lan
.gis

Creator

Erdas Inc.

Used by

Erdas remote sensing software.

Variations

Reads and writes 1 and 3 band files.

Reads 4, 8, and 16 bit files. Writes 8 bit files.

Limitations

When writing Erdas files Alchemy does not change the extension depending on the number of bands in the image; according to the specification gray-scale files should have the extension .gis and true colour files should have the extension .lan. Alchemy always uses .lan.

Alchemy cannot read 2 channel or 4 or more channel images without using the -Z option (see the comments section below for more information).

Comments

1 band files are read in as gray-scale images.

3 band files are read in as true colour images. The default colour mapping between RGB and bands 1, 2, and 3 is Red=Band 1, Green=Band 2, and Blue=Band 3; this can be changed by using the -Z option. See the example section below for details.

Using the -Z option it is possible to select a single channel or 3 channels when reading a multi-channel Erdas image. To use the -Z option follow it with a single number to indicate which channel is to be read as a grey-scale image or three numbers to indicate which channels are to be read as a 24 bit colour image. See the example section below for details.

Examples

Convert the GIS file texas.gis to a Sun raster file:

```
alchemy texas.gis -s
```

Convert the file satellite.image to a GIS file.

```
alchemy satellite.image satellite.gis -b
--e
```

The Erdas file miami.gis contains 4 bands; the next examples show various ways to read selected bands out of the image.

Convert the first band in the image to a grayscale Sun Raster file.

```
alchemy miami.gis -Z 1 -s
```

Convert the fourth band in the image to a grayscale Sun Raster file.

```
alchemy miami.gis -Z 4 -s
```

Convert the image to a 24 bit, colour Sun Raster file, using band 2 as the red channel, band 1 as the green channel, and band 4 as the blue channel.

```
alchemy miami.gis -Z 2 1 4 -s
```

Fargo Primera --k

Fargo Primera files are used by Fargo Primera colour printers.

Syntax

--k *type*

Parameter

type:

0:Thermal 3 Pass Colour (CMY)
1:Thermal 4 Pass Colour (CMYK)
2:Thermal Black and White (K)
10:Dye Sub 3 Pass Colour
11:Dye Sub Black and White

The default is 0.

Extensions

.prn

Creator

Fargo Electronics, Inc.

Used by

Fargo Primera printers

Variations

Reads and writes 1, 3, and 4 channel Thermal files.

Writes 1 and 3 channel Dye Sub (photo-realistic) files.

Limitations

Reading Dye Sub (photo-realistic) files is not currently supported.

When writing a dye sub (photo-realistic) file the Fargo supplied file primera.fzp must be located in the directory the source file is in. The Primera printer needs the information to print dye sub images.

Comments

There seems to be little difference in the quality of Thermal 3 Pass files versus Thermal 4 Pass files.

When printing onto the T-Shirt transfer material you will probably want to use the mirror image option (--^, see below) so that the image will appear correct after it is transferred.

The Primera printer tends to print the left edge of the page off of the paper. You will probably want to specify a small image offset to prevent this (see the -_ option, Image Offset, below).

Related options

--^ Mirror Image
-_ Image Offset

Examples

Convert the sample JPEG file, sample.jpg, to a Thermal 3 Pass file:

```
alchemy sample.jpg --k
```

Convert the sample JPEG file, sample.jpg, to a Dye Sub 3 Pass file, scaling the image to be 6 inches wide (and a proportionate height), offsetting the image 1 inch from the left edge and 3 inches from the top of the page:

```
alchemy sample.jpg --k10 -Xb6i -+
-D200 200 -_ 1i 3i
```

First Publisher ART --F

First Publisher ART files are black and white images used as clip art by First Publisher.

Syntax --F

Extension .art

Creator Software Publishing Corp.

Used by First Publisher

Variations Black and white, 1 bit per pixel.

Comments Since ART files are always black and white, 1 bit per pixel, Alchemy assumes use of the -c2 and -b options when writing them.

Examples Convert the image scan.pcx to a First Publisher ART file:

```
alchemy scan.pcx --F
```

Freedom of Press --f

Freedom of Press is a PostScript interpreter from Custom Applications that converts PostScript files to raster files. The Freedom of Press format is one of the file types it can create.

Syntax --f

Extension .fop

Creator Custom Applications

Limitations Only CMYK 1 bit per component per pixel supported.

Comments Freedom of Press images are actually two files, a data file and an info file. You specify the name of the data file and Alchemy automatically generates the name of the info file. The output file is normally output.001, output.002, etc. Alchemy will strip the first part of the name and replace it with 'info', so if you specified an output filename of output.005 there will be another file created called info.005. If you don't specify an extension, Alchemy will use .fop, so you'll get two files named filename.fop and info.fop. Alchemy will overwrite info files without warning.

Since Freedom of Press images are 1-bit CMYK you may want to use an undercolour removal file when converting a colour image to this format. See the -C option in Chapter 6 for more information.

Related options -C Undercolour removal

Example

Convert the file image.tga to a Freedom of Press image called output.003 and info.003, controlling the undercolour removal process using sample.ucr, scaling the image to 2500 pixels across (and scaling proportionately vertically) using nearest neighbor scaling, and conserving memory:

```
alchemy --f -Csample.ucr -X2500 -+ -$
image.tga output.003
```

GEM VDI Image File --g

VDI files are files that were developed by Digital Research for use with GEM.

Syntax --g

Extension .img

Creator Digital Research Inc.

Used by GEM

Variations Reads 1-8 bit grayscale and 3 and 4 bit colour files.

Writes 1, 3, and 4 bit grayscale and 3 and 4 bit colour files.

Limitations The support for colour and multiple bit grayscale GEM files is not very universal. Therefore make sure the application you are using to read the GEM files supports them.

Alchemy defaults to writing out a 1 bit, black and white GEM file. You can explicitly force a 3 plane colour file by use of the -c8 option and a 4 plane colour file by use of the -c16 option (you may add a -b to write a grayscale file instead of a colour file).

Comments Because colour GEM files have only 3 or 4 bits of information and no palette support the quality is generally not very good for scanned images. The GEM format seems to have been designed for line drawings.

Examples Convert the image scan.pcx to a black and white GEM file:

```
alchemy scan.pcx --g
```

Convert the image bigscan.tga to a 640x480, 8 colour GEM file, using nearest neighbor scaling and type 2 dithering:

```
alchemy bigscan.tga -c 8 --g -X640
  -Y480 -d2
```

Do the same thing but write an 8 shade grayscale file with no dithering:

```
alchemy bigscan.tga -c 8 --g -X640
  -Y480 -d -b
```

GIF -g

GIF files were developed by CompuServe as a machine independent image file format. GIF files are the most popular way of storing 8 bit, scanned or digitized images. In addition the compression ratio achieved by GIF files is usually better than any other 8 bit format in common use.

Syntax

-g *version*

Parameter

version:
0:GIF87A
1:GIF89A
The default is GIF87A.

Extension

.gif

Creator

CompuServe, Incorporated

Used by

CompuServe
Everyone

Variations

Reads 1 through 8 bit GIF87A and GIF89A interleaved and non-interleaved files.

Writes 1 through 8 bit GIF87A and GIF89A non-interleaved files.

Limitations

When reading GIF89A files only the first image in the file is read. Any text, overlays, pauses, palette changes, etc. are ignored.

Because GIF files only store the size of the palette to the nearest power of 2 the exact palette size is lost when converting to and from GIF files. For example, if you convert a 240 colour Sun Raster file to a GIF file and back to a Sun Raster file the resulting Sun Raster file will have 256 colours.

Comments

GIF89A files are a new variation of GIF files that was introduced in 1990 which allow the inclusion of text and simple animations in GIF files.

When writing a file you probably want to use the GIF87A variation, since the GIF89A extensions aren't necessary to store single images and a lot of other software still can't read GIF89A images. The only advantage to GIF89A is that aspect ratio information is preserved (GIF87A does not have a provision for storing aspect ratio).

The GIF format includes a field for storing the colour to be used for the background when viewing files. Alchemy does not make use of this value. Alchemy sets the background colour to the darkest colour in the palette when viewing files and organizes the palette such that the first colour is the darkest colour when writing GIF files, if the palette is created by Alchemy (you can override this by using the -z option).

Related options

-z Palette Selection

Examples

Convert the image test.pcx to a GIF87A image.

```
alchemy test.pcx -g
```

Convert the file input.tga to a 16 colour GIF89A file:

```
alchemy input.tga -c16 -g1
```

GOES --G

GOES files are used for satellite image data.

Syntax

--G *goesType*

Parameter

goesType:
0:GARS format
1:McIDAS format
The default is 0 (GARS format).

Extension

.goe

Creators

The University of Wisconsin
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite Data Information Service (NESDIS)

Used by

Various satellite image processing software, including the McIDAS system.

Variations

Reads 8, 16, and 32 bits per pixel GOES images.

Writes 8 bits per pixel images.

Limitations

When reading 16 and 32 bit images Alchemy discards all but the top 8 bits of data.

Alchemy discards any calibration data and level maps when reading images.

Because of difficulty in getting a sufficient number of test images in the GOES format (especially the PUT format) reading GOES images has not been thoroughly tested. If you have any GOES images which Alchemy does not read correctly please contact us.

Comments

The GARS format is a 7680 bytes per block, Motorola byte-order, EBCDIC format; the MCIDAS format is a continuous data, Intel byte-order, ASCII format.

Since GOES images are always grayscale, Alchemy assumes the use of the -b and -8 options when writing a GOES file.

GOES images contain a lot of information which is not part of the image data. This information includes the time and date the image was captured, the satellite which captured the image, the type of instrumentation used, etc. When reading a GOES image this information is discarded; when writing a GOES image 0 is written for all values for which data is unavailable.

Examples

Convert the Erdas file, florida.gis, into a GOES GARS image:

```
alchemy florida.gis --G0
```

Do the same thing, but write out a GOES McIDAS image:

```
alchemy florida.gis --G1
```

Histogram -H

Histogram files are HSI Raw files which contain a histogram.

Syntax

-H *histogramOptions*

Parameter

histogramOptions:
1: Ignore white
2: Ignore black
3: Ignore sharp peaks

10: Generate a cumulative histogram

100: Use a white background for histogram
See the comments section below for more information. Options can be combined by adding (see below for an example). The default is 0.

Extension

.hst

Creator

Handmade Software, Inc.

Used by

Image Alchemy

Variations

Output only (can be read as a raw file).

Histogram files are always paletted with 8 colours.

Comments

Histogram files are HSI Raw files which contain the frequency of occurrence of pixel values. The horizontal axis indicates the intensity (from 0 at the left to 255 at the right). The vertical axis shows the frequency (the axis is automatically scaled so that 100% corresponds to the most frequently occurring value).

Ignore white and black automatically removes the white and black values from the histogram. This is useful if the background colour is white or black, which would make the interesting portion of the histogram too small.

Peak ignore does the same thing, except it automatically decides what are the most used intensities and ignores them.

The cumulative option generates a cumulative histogram instead of a discrete histogram.

The white background option makes the background white (which is nice if you are going to be printing the histogram).

Examples

Generate a histogram for the image sample.jpg:

```
alchemy sample.jpg -H
```

Generate a histogram for the image tiger.ras, ignoring the white background:

```
alchemy tiger.ras -H 1
```

Do the same thing, but make it a cumulative histogram:

```
alchemy tiger.ras -H 11
```

Hitachi Raster Format --h

Hitachi Raster Format (HRF) files are black and white images used by CADCore.

Syntax --h

Extension .hrf

Creator Hitachi Software Engineering Co., Ltd.

Used by Information and Graphics Systems, Inc. (IGS)

Variations Black and white, 1 bit per pixel.

Comments Since HRF files are always black and white, Alchemy assumes the use of the -b, -8, and -c2 options when writing HRF files.

Example Convert the TIFF file page1.tif to a HRF file:

```
alchemy page1.tif --h
```

HP Printer Command Language (PCL) -P

HP PCL files are used by HP LaserJets and compatible printers.

Syntax

-P *type*

Parameter

type:

0:Uncompressed
1:RLE compressed
2:TIFF compressed
3:Delta Row compressed

0:Portrait
10:Landscape

0:Standard Margins
50:Expanded Margins

100:LaserJet 4

See the comments section below for more information. Options are combined by adding (see below for an example). The default is 0 (Uncompressed, Portrait, Standard Margins).

Extension

.pcl

Creator

Hewlett-Packard Company

Used by

HP LaserJet printers
HP compatible laser printers

Variations

1 bit per pixel, black and white.

Reads and writes uncompressed, RLE compressed, TIFF compressed, and Delta Row Compressed files.

Reads and writes portrait and landscape files.

Limitations

In addition to raster images, PCL files can include text and vector graphics information. When reading Alchemy only pays attention to raster images in the file and attempts to skip everything else. See Appendix A, Answers to Frequently Asked Questions, for a further discussion of this.

The only resolutions allowed in PCL files are 75 DPI, 100 DPI, 150 DPI, and 300 DPI (and, in the case of LaserJet 4 type files, 200 DPI and 600 DPI) and the X and Y resolution are the same.

If you specify a non-allowable resolution Alchemy automatically uses the next higher resolution. For example, if you specify 250 DPI Alchemy will write a 300 DPI PCL file.

If no resolution is specified either on the command line or in the input file Alchemy automatically chooses the smallest resolution which will allow the entire image to fit on an 8.5" x 11" page.

Comments

Since PCL files are always 1 bit, black and white files, Alchemy assumes the use of the -b, -c2, and -8 options when writing a PCL file.

When converting colour or gray-scale images to PCL you will probably want to scale the output so the image will be larger than the input image. This will allow the dithering to preserve more detail in the image.

The best quality dither for PCL output is generally type 3 (Jarvis, Judice, & Ninke), with a serpentine raster, and some dithering noise (use `-ds3 10`, for example).

Not all PCL compatible printers can print all types of compressed PCL file. Specifically, LaserJet II, IID, and earlier printers can print only uncompressed PCL files. LaserJet IIp printers can print only uncompressed and RLE compressed files. LaserJet III, IIID, IIIp, IIIsi, and 4 printers can print all types of compressed PCL files.

In general, the higher the compression type, the better the compression ratio.

The Landscape option can be used to write a landscape PCL file. Because of changes in the PCL format, only LaserJet III and newer printers will correctly print Alchemy produced landscape PCL files.

PCL files can be used to generate output which can be printed on HP LaserJet and compatible printers. The easiest method is to simply generate a .PCL file and then copy it to the printer by using the copy command (when using the copy command from MS-DOS you will have to use a /B to make sure the entire file is copied to the printer; see the example below for more information).

For MS-DOS users it is possible to write a PCL file directly to a HP LaserJet or compatible printer. If you use the name of the device as the output file name Alchemy will redirect output to that device (for example, use `prn:` as the output file name if your LaserJet is attached to the `prn:` port) .

You may want to adjust the output gamma to compensate for dot gain when generating a PCL file to print on a laser printer. Typically specifying an input gamma of 1.0 and an output gamma of 2.0 produces good results (`-Gi 1.0 -Go 2.0`). See Appendix A, Answers to Frequently Asked Questions, for more information on dot gain.

When converting a PCL file which contains multiple pages you can specify which page to convert by using the -Z option followed by the page number. You can also convert all of the pages in the file by using the Multi-Page option (-U). See the examples section below for examples.

The expanded margin option adds PCL commands to the output file to reduce the margin when the page is printed. The upper left corner of the image will then correspond to the upper left corner of the paper (note that HP laser printers cannot print all the way to the edge of the paper, so some information will be lost).

Related options

-G Gamma correction
-U Multi-Page
-_ Offset image
--_ Center image

Examples

Convert the image image.gif to an HP PCL file, using no compression:

```
alchemy image.gif -P
```

Convert the image small.gif to a HP PCL file called out.pcl with dimensions of 2000 by 2000 at 300 DPI, performing gamma correction to compensate for dot gain, and using dithering type 3, with a serpentine raster, and adding dithering noise :

```
alchemy small.gif out -P -X2000 -Y2000
-D 300 300 -Gi 1.0 -Go 2.0 -ds3 10
```

Convert the image small.gif to a HP PCL file called out2.pcl with dimensions of 2000 by 2000 at 300 DPI, using TIFF compression:

```
alchemy small.gif -P2 -X2000 -Y2000
-D 300 300 out2
```

Print the image madonna.gif directly to your LaserJet 4 at the largest resolution, using Delta Row compression with dithering type 22 (printing directly to the printer works only in the MS-DOS version of Alchemy):

```
alchemy madonna.gif prn: -P104 -D600 600
-Xb4800 -YB6600 -+ -d22
```

Print all the TIFF files in the current directory directly to a HP LaserJet, while scaling them to fill the page and performing gamma correction to compensate for dot gain:

```
alchemy *.tif prn: -P -D 300 300 -Xb2400
-Yb3000 -+ -Gi1.0 -Go2.0
```

Convert the page 3 of the HP PCL file, contract.pcl, to a TIFF file:

```
alchemy contract.pcl -Z 3 -t
```

Convert all of the pages in the file to TIFF files (the output files will be called contract.001, contract.002, …):

```
alchemy contract.pcl -U -t
```

HP Raster Transfer Language (RTL) --r

RTL files are used by HP colour raster printers and plotters.

Syntax

--r *outputType*

Parameter

outputType:

0:PaintJet, PaintJet 300XL, PaintJet 1200C uncompressed
1:DesignJet 650C and HP7600 uncompressed
2:DesignJet 650C and HP7600 TIFF compressed
3:HP7600 planar, uncompressed
4:HP7600 planar, TIFF compressed
5:HP7600 planar, Group III compressed
6:DesignJet 600 and 650C on-the-fly, uncompressed
7:DesignJet 600 and 650C on-the-fly, TIFF compressed
9:PaintJet 300XL and PaintJet 1200C TIFF compressed
10:Encad NovaJet TIFF compressed
11:DesignJet 650C compressed, 4 channel
12:DesignJet 650C on-the-fly, compressed, 4 channel
13:DesignJet 650C compressed, 24 bit
14:DesignJet 650C on-the-fly, compressed, 24 bit
15:DesignJet 650C compressed, 24 bit, old dithering
16:DesignJet 650C on-the-fly, compressed, 24 bit, old dithering

The default is Type 2. See the comments section below for information on output types 11 through 16.

Extension

.rtl

Creator

Hewlett-Packard Company

Used by

HP raster plotters and printers including PaintJets, DesignJet, and HP 7600 Series plotters.

NovaJet Plotters.

Variations

CMYK, 1 bit per component per pixel.

Black and white, 1 bit per pixel.

24 bits per pixel.

Limitations

Output only.

Comments

RTL files can be used to produce output which can be printed on HP colour printers and raster plotters. The file can be printed by sending the file to the plotter.

Compression types 6 and 7 are equivalent to types 1 and 2 except they tell the plotter it may plot the data as received instead of waiting for the entire image. This is useful on the DesignJet plotters which have small buffers compared to the imageable area.

Output types 11 through 16 are only available on Revision B HP 650C. Types 11 and 12 are the same as types 2 and 7 respectively, with the difference that types 11 and 12 allow for independent control over the black channel (types 2 and 7 always perform 100% black removal). Types 13 through 16 send 24 bit data to the plotter, allowing it to perform the RGB to CMYK conversion; types 13 and 14 use a stochastic dither pattern, types 15 and 16 use a digital halftone dither. Types 13 through 16 can also be used to scale the image, by specifying a different DPI value than the 300 DPI value the plotter natively uses, see the examples section below for an example.

Specifying on-the-fly mode instructs the plotter to start plotting as soon as it receives data (as opposed to buffering the data until the end of the image). Using on-the-fly mode is a good idea when plotting large images on the 650c, otherwise the plotter will buffer the data until it runs out of memory, then it will plot that information, and then revert to on-the-fly mode. The two different plotting methods produce a slightly different banding effect, which can be noticeable in the output image.

The NovaJet option causes Alchemy to create RTL files which are compatible with NovaJet plotters.

Alchemy will generate a colour RTL file unless the input file is black and white or grayscale or the -b option is specified as part of the conversion.

There is no additional setup required for the PaintJet or DesignJet plotters.

HP7600 series plotters should be in HP-GL/2 mode; best results will generally be achieved with compensation off. To get colour plots from the HP7600 series the plotter must be in 4 or 5 pass mode.

If the input is black and white, you can do the conversion without an undercolour removal file and with dithering off. This will result in a faster conversion.

If the input is gray-scale, you probably do want to use an undercolour removal file to perform density correction, but with 100% black removal (the black removal tables should contain 0 through 255, increasing by one each line) so that the output won't contain cyan, magenta, or yellow. The samples directory on the distribution diskette has a UCR file called gray.ucr which has 100% black removal.

MS-DOS users can send the RTL file directly to the plotter when generating an RTL file of type 0, 1, 2, 6, 7, and 9 through 16. To send the file directly give the name of the output device as the output file (for example, if your plotter is connected to your computer via lpt1: specifying `lpt1:` as the output file will send output directly to that device).

Since the HP RTL format is a 1-bit CMYK format you may want to use an undercolour removal file when converting a colour image to this format. See the -C option in Chapter 6 for more information.

The best quality dither for HP RTL output is generally type 3 (Jarvis, Judice, & Ninke), with a serpentine raster, and some dithering noise (use `-ds3 10`, for example).

You may want to adjust the output gamma to compensate for dot gain when generating a HP RTL file. Typically, specifying an input gamma of 1.0 and an output gamma of 1.8 produces good results (`-Gi 1.0 -Go 1.8`). See Appendix A, Answers to Frequently Asked Questions, for more information on dot gain.

Related options

-C Undercolour removal
-d Specify dither type
-G Gamma correction
-_ Offset image
--_ Center image

Examples

Convert the black and white image test.wpg to an RTL file for a PaintJet called test.rtl, not using a UCR file and with dithering off:

```
alchemy test.wpg --r0 -d0
```

Convert the file image.tga to an RTL file for a PaintJet called image.rtl, using the undercolour removal file sample.ucr:

```
alchemy image.tga --r0 -Csample.ucr
```

Do the same thing, but use gamma correction instead of the undercolour removal file:

```
alchemy image.tga --r0 -Gi1.0 -Go1.8
```

Convert the file image.tga to a planar RTL file called image.rtl using TIFF compression, controlling the undercolour removal process using sample.ucr, scaling the image to 3000 pixels across using good quality scaling, preserving the aspect ratio (by proportionately scaling the image vertically), and conserving memory:

```
alchemy image.tga --r4 -Csample.ucr
-Xb3000 -+ -$
```

Convert the file image.tga to an RTL file for a DesignJet 650C, sending the image directly to the plotter, using the UCR file sample.ucr, dithering type 3 (with a serpentine raster), and scaling the image to be 17 inches wide and preserving the aspect ratio (the plotter is attached to the lpt1: port of an IBM PC):

```
alchemy image.tga lpt1: --r7 -Csample.ucr
-ds3 -Xb17i -+
```

Convert the 640 x 480 image sample.jpg to a 24 bit RTL image (for use with a Revision B 650C). Specify the DPI value such that the image will be plotted at 24 inches x 18 inches. The -D 27 27 value is calculated by dividing the size of the image (in dots) by the desired output size (in inches), to derive the required dots per inch value (640/24=26.6667). Note that because the dots per inch value is required to be an integer this will not produce a plot that is exactly 24 inches x 18 inches, but instead will be 23.7 inches x 17.78 inches. Also note that the 650C uses pixel replication scaling to increase the size of the images (this is equivalent to Image Alchemy type 'a' scaling).

```
alchemy sample.jpg --r14 -D 27 27
```

HP-48sx Graphic Object (GROB) --H

Graphic Object files are used by HP-48sx calculators.

Syntax

--H *type*

Parameter

type:
0:Binary
1:ASCII
The default is Binary.

Extension

.grb
.asc

Creator

Hewlett-Packard Company

Used by

HP-48sx calculators.

Variations

Black and white, 1 bit per pixel.

Comments

Since GROB files are always black and white, Alchemy assumes the use of the -b, -8, and -c2 options when writing GROB files.

Example

Convert the image madonna.gif to a ASCII HP-48sx GROB file

```
alchemy madonna.gif --H 1
```

HSI JPEG --j

The HSI JPEG format is a variation of the JPEG format that was designed by Handmade Software to better compress paletted images.

Syntax --j

Extension .jpg

Creator Handmade Software, Inc.

Used by Image Alchemy
GIF2JPG (another Handmade Software product)

Variations 8 bit paletted

Comments Paletted images often have large areas where the image consists of 1 or 2 colours; JPEG compression does a poor job on these sections when compared to LZW compression. HSI JPEG files are a combination of JPEG and LZW compression.

HSI JPEG files are not compatible with JPEG or JFIF files. If you intend to transfer files to other systems do not use this format, use the standard JPEG format instead (using the -j option).

If you are interested in adding support for HSI JPEG files to your software please contact us for information on the format.

Example Convert the file madonna.gif to an HSI JPEG file:

```
alchemy madonna.gif --j
```

HSI Palette -l

PAL files are palettes which are ASCII files that can be edited with a text editor.

Syntax -l (lower case L)

Extension .pal

Creator Handmade Software, Inc.

Used by Image Alchemy

Variations Palette files are always ASCII files.

Limitations .PAL files contain only a palette.

Comments The format of PAL files is described in Appendix H.

Related options

-f Match image to specified palette
-F False colour with specified palette
-L Output Multi-Image Palette

Examples Extract the palette from the GIF file madonna.gif:

```
alchemy madonna.gif -l
```

Convert the file image.tga to a GIF file, matching the palette found in standard.pal:

```
alchemy image.tga -g -f standard.pal
```

HSI Raw -r

HSI Raw files are used internally by Image Alchemy when converting between certain combinations of image formats. If you are interested in converting custom format images to be used with Image Alchemy we suggest using HSI Raw Files.

Syntax -r

Extension .raw

Creator Handmade Software, Inc.

Used by Image Alchemy

Variations 8 bit paletted and 24 bit true colour, uncompressed, not packed.

Comments This format is used internally as temporary files by Alchemy when doing certain image conversions; it can also be explicitly read and written. This format is described in Appendix F.

Examples Convert the file test.lbm to a raw file:

```
alchemy test.lbm -r
```

IBM Picture Maker --i

IBM Picture Maker files are used by IBM presentation software.

Syntax --i

Extension .pic

Creator IBM Corp.

Used by IBM Storyboard Live!

Variations Reads and writes 256 colour Picture Maker files.

Limitations 16 colour Picture Maker files are not supported.

Picture Maker images cannot be larger than 640x480.

Comments This is not the same format as Cubicomp PictureMaker.

Picture Maker files may be either 320x200 or 640x480. Image Alchemy will write the smallest variation that the image will fit in, with the image centered and the borders filled with colour 0. If you attempt to write a Picture Maker file which is larger than 640x480 an error is generated.

Example Convert the PCX file, giraffe.pcx, into an IBM Picture Maker file:

```
alchemy giraffe.pcx --i
```

IFF/ILBM -i

IFF (Interchange File Format) files are used by Amiga computers for storing a number of types of data, including images, text, and music; ILBM (InterLeaved BitMap) is a type of IFF file used to store images.

Syntax

-i

Extensions

.lbm
.iff
.ilbm

Creator

Commodore-Amiga Corp.

Used by

Amiga
Deluxe Paint

Variations

Reads 1 through 8 bit, 24 bit, HAM, and PBM images

Writes 1 through 8 bit and 24 bit images.

Limitations

Dynamic Hi-Res images are not supported.

Does not write images in any of the Amiga-specific display modes.

Comments

If you're writing an ILBM file for use on an Amiga, you probably want to write either a paletted file with 32 colours or a 24 bit file. 24 bit ILBM files can then be converted to one of the Amiga-specific display modes with various third-party utilities.

Example

Convert the file input.pcx to an IFF/ILBM file called output.lbm with 32 colours:

```
alchemy input.pcx output.lbm -i -c32
```

Img Software Set --Q

The Img Software Set is a collection of tools for manipulating graphic images freely available for various UNIX workstations.

Syntax

--Q

Extensions

.img
.p
.a

Creator

Paul Raveling

Used by

Img Software Set

Variations

Reads and writes 8 bit paletted and 24 bit images.

Limitations

Alchemy does not read nor write compressed (.Z) images. Use the UNIX supplied `uncompress` program to decompress those images before reading with Alchemy.

Comments

The Img Software Set is available via anonymous ftp as expo.lcs.mit.edu:contrib/img_1.3.tar.Z or venera.isi.edu:pub/img_1.3.tar.Z or on floppy disk from us.

Example

Convert the Sun Raster file test.ras to an Img Software Set file:

```
alchemy test.ras --Q
```

Jovian VI --J

Jovian VI files are created by the Jovian Logic video capture boards.

Syntax --J

Extensions .vi

Creator Jovian Logic Corp.

Used by Jovian Logic

Variations Reads 1, 4, 6, and 8 bit gray-scale images, 4 and 8 bit paletted images, and 16 and 24 bit true colour images.

Writes 8 bit gray-scale, 4 and 8 bit paletted images, and 16 and 24 bit true colour images.

Limitations Reads files with 6 and 8 bit palettes, always writes 6 bit palettes.

Gray-scale files are always 8 bit.

Comments When writing a VI file the palette always starts at 0, but colour 0 will not necessarily be black (this is the way that Jovian VI files are written).

Example Convert the GIF file, test.gif, to a 16 colour VI file:

```
alchemy test.gif --J -c16
```

JPEG/JFIF -j

JPEG is an image file format that uses a lossy compression technique to achieve high compression ratios. See Appendix C, JPEG Compression, for more information on the JPEG file format.

Syntax

-j[*coding*] *quality*

Parameters

coding:

Specify the type of entropy coding to perform.

none:default Huffman coding
h:optimum Huffman coding

quality:

1 through 100 (larger is higher quality)

The default quality is 32.

Extension

.jpg

Creator

Joint Photographic Experts Group (JPEG)

Used by

Lossy compression of photographic images.

Variations

Gray-scale images are saved as single channel JPEG files; colour images are saved as three channel JPEG files.

Reads and writes baseline JPEG with CCIR-601 YCbCr colour space, interleaved components, Huffman coded.

Alchemy can read files with any component sub-sampling up to 4x4; it always writes 2h:1v 1h:1v 1h:1v.

Alchemy JPEG files comply with the industry standard 'JFIF' interchange format.

Limitations

JPEG files are always lossy, which means that the compressed image is not identical to the original image. At high quality factors (32 and above) this loss is generally so slight as to be barely noticeable. There is no quality factor which is guaranteed to be lossless.

Comments

By default, Image Alchemy uses a fixed set of Huffman tables to compress an image. If the -j is immediately followed by an 'h', Alchemy will generate a set of custom tables optimized for the image and quality factor. This usually produces 5-20% better compression (depending on the image content and quality factor) but requires an additional pass over the image data, so it takes a little longer to compress (there's no effect on the decompression time).

Quality may vary between 1 and 100; the default is 32. The higher the number the higher the quality of the image and the lower the compression ratio. Quality factors below 10 will produce images with significant loss of quality.

JPEG files are based on the Joint Photographic Experts Group (JPEG) CD 10918-1 draft standard.

Since JPEG compression was designed for use with continuous tone images (such as those produced by a scanner or digitizer), poor results can be expected when compressing line drawings.

Related options

-q Apply Smoothing when decompressing a JPEG image. Because JPEG compression works on 8x8 pixel blocks there may be discontinuities at the edges of these blocks producing block artifacts. Smoothing attempts to reduce these artifacts. Smoothing is really only necessary at very low quality settings (less than 10); even then the effects of smoothing are not particularly significant.

Examples

Convert the file photo.tga to a JPEG file called photo.jpg, using a high quality setting:

```
alchemy photo.tga -j70
```

Convert the file photo.tga to a JPEG file called photo.jpg, using a low quality setting and generating optimum Huffman tables:

```
alchemy photo.tga -jh10
```

Convert the JPEG file, lores.jpg, to a PCX file using smoothing:

```
alchemy lores.jpg -p -q
```

Lumena CEL --L

Lumena CEL files are used by Time Arts software.

Syntax --L

Extension .cel

Creator Time Arts

Used by Lumena

Variations Reads and writes 15 and 32 bit images.

Comments To preserve the alpha channel information when converting to or from Lumena CEL files use the -I option.

Related options -I Alpha Channel

Example Convert the file test.tga to a Lumena CEL file:

```
alchemy test.tga --L
```

Macintosh PICT/PICT2 -m

PICT files were created by Apple Computer as a common format for Macintosh applications to use. Virtually every Macintosh application can use PICT files.

Syntax

-m *macBinary*

Parameters

macBinary:
0:Do not write a MacBinary file
1:Write a MacBinary file
The default is to not write a MacBinary file.

Extensions

.pict
.pic

Creator

Apple Computer, Inc.

Used by

Macintosh computers

Variations

Reads 1, 2, 4, 8, 16, and 32 bit PICT and PICT2 images

Writes 1, 2, 4, 8, and 32 bit PICT2 images.

Limitations

Only pays attention to pixMaps in the image; attempts to skip everything else.

Comments

Due to the enormous number of options allowed in PICT files, reading PICTs may not always work. See Appendix A, Answers to Frequently Asked Questions, for more information.

Adding a MacBinary header to a PICT file is useful if transferring the file to a Macintosh computer by modem. The MacBinary header will allow the Macintosh to automatically recognize the file as a PICT file.

To preserve the alpha channel information when converting to or from PICT files use the `-I` option.

Related options

`-I` Alpha Channel

Example

Convert the file input1.gif to a Mac PICT file called input1.pic:

```
alchemy input1.gif -m
```

MacPaint --t

MacPaint files are black and white images used by Macintosh computers.

Syntax

--t *macBinary*

Parameters

macBinary:
0:Do not write a MacBinary file
1:Write a MacBinary file
The default is to not write a MacBinary file.

Extensions

.mac

Creator

Apple Computer, Inc.

Used by

Macintosh computers

Variations

1 bit per pixel, black and white.

Limitations

MacPaint images are always 576x720 pixels. If you attempt to write a MacPaint image which is larger, Alchemy will report this as an error. If you write an image which is smaller Alchemy will pad the image with white space along the right-hand side and bottom.

Because MacPaint images are always black and white, the -c2, -8, and -b options are assumed when writing an image.

Comments

Adding a MacBinary header to a MacPaint file is useful if transferring the file to a Macintosh computer by modem. The MacBinary header will allow the Macintosh to automatically recognize the file as a MacPaint file.

Example

Convert the file input1.gif to a MacPaint file called input1.mac:

```
alchemy input1.gif --t
```

MTV Ray Tracer --M

MTV files are used by the MTV RayTracer, a public domain ray tracer for Suns and other workstations.

Syntax --M

Extension .mtv

Creator Mark T. VandeWettering

Used by MTV Raytracer

Variations 24 bit true colour.

Comments MTV is a public domain ray-tracer available free of charge via anonymous ftp from drizzle.cs.uoregon.edu or via floppy disk from us.

Example Convert the file spheres.img to a MTV file:

```
alchemy spheres.img --M
```

Multi-Image Palette -L

This option will generate an optimum palette for a number of images. This is useful for finding a common palette where multiple images are used (animations, for instance).

Syntax

-L *filename*

Parameters

filename:
name of the output file to contain the optimized palette

Extension

.pal

Creator

Handmade Software, Inc.

Used by

Image Alchemy

Variations

Palette files are always ASCII files.

Limitations

.PAL files contain only a palette.

Comments

The format of PAL files is described in Appendix H.

This output option is unique in that it will cause Alchemy to generate only one output file, independent of how many input files are specified (the other output options generate one output file per input file). Also the file name of the output file must be specified immediately after the -L option (ordinarily the output file name can appear anywhere on the command line).

Related options

-f Match image to specified palette
-F False colour with specified palette
-l Generate a palette file for a single image

Examples

Generate an optimum palette called final.pal for all GIF files in the current directory:

```
alchemy -- *.gif -L final.pal
```

Now map all the GIF files to that palette, putting the results in a sub-directory call new (the files cannot be placed in the current directory because the file names would conflict with the original image file names):

```
alchemy -- *.gif -f final.pal new\
```

OS/2 Bitmap (BMP) -O

OS/2 BMP files are used by IBM OS/2 2.0.

Syntax

-O *compressionType* (Uppercase letter o)

Parameter

compressionType:
0:None
1:RLE
2:OS/2 1.1 format
The default is none.

Extension

.bmp

Creator

IBM Corp.

Used by

OS/2 2.0

Variations

Reads 1, 4, 8, and 24 bit RGB (raw), RLE4, and RLE8 files.

Writes 1, 4, 8, and 24 bit RGB (raw), RLE4, and RLE8 files.

Comments

OS/2 1.1 files are older version files which are supported because some OS/2 software cannot read current OS/2 bitmaps. OS/2 1.1 files seem to be identical to Windows 2.0 bitmap files, and Alchemy identifies them as such when reading them.

Examples

Convert the image test.jpg to a OS/2 BMP file:

```
alchemy test.jpg -O
```

PCPAINT/Pictor Page Format -A

The Pictor format was designed by John Bridges. It is optimized so that an image can be loaded into various IBM PC graphics adapters very quickly; it does this by almost exactly duplicating the organization of the graphics adapter memory. This makes the format hardware dependent.

Syntax

-A *type*

Parameter

type:

0:320x200x4 CGA*
1:320x200x16 PCjr/Tandy*
2:640x200x2 CGA*
3:640x200x16 EGA
4:640x350x2 EGA
5:640x350x4 EGA
6:640x350x16 EGA
7:720x348x2 Hercules*
8:640x350x16 VGA
9:320x200x16 EGA
10:640x400x2 AT&T/Toshiba*
11:320x200x256 VGA/MCGA
12:640x480x16 VGA
13:720x348x16 Hercules InColor*
14:640x480x2 VGA/MCGA
15:800x600x2 EGA/VGA
16:800x600x16 EGA/VGA
17:640x400x256 SVGA
18:640x480x256 SVGA
19:800x600x256 SVGA
20:1024x768x2 SVGA
21:1024x768x16 SVGA

22:360x480x256 VGA
23:1024x768x256 SVGA
The default is 640x480x256 SVGA.
*These modes are not yet supported (if you are interested in support for any of these modes please contact us).

Extension

.pic
.clp

Creator

John Bridges

Used by

PCPAINT
GRASP

Variations

There are variations for most IBM and third party graphics adapter display modes.

Limitations

Only the EGA and VGA modes are supported at this time.

Text modes are not supported.

Comments

Some Pictor files do not contain palettes. For those files Alchemy will default to using a standard palette appropriate to the display mode the file was saved in. However, the image may not use the default palette; in that case you can read the palette from another file with the -F false colour option.

Related options

-F False colour

Example

Convert the file image.pcx to a Pictor file called image.pic, for 800x600x256 SVGA mode:

```
alchemy image.pcx -A19
```

PCX -p

PCX files are used extensively by IBM PC computers. Originally created by ZSoft for use by their paint software, PCX files can be read and written by almost all MS-DOS paint software and desktop publishing software.

A variation of PCX file, DCX, is used by many MS-DOS fax boards.

Syntax

-p *type*

Parameter

type:

0:Standard PCX
1:DCX
2:PCJ

The default is standard PCX.

Extension

.pcx.dcx

Creator

ZSoft Corporation

Used by

PC Paint
Publisher's Paintbrush
Most paint and desktop publishing software can read and write PCX files.
Fax board software uses the DCX variation of PCX.

Variations

1, 4, 8, and 24 bits per pixel for standard PCX files.
1 bit per pixel for DCX files.
8 bits per pixel for PCJ files.

Limitations

PCX format files are often written out incorrectly; Alchemy attempts to figure out what is wrong and make intelligent decisions (things Alchemy can deal with include PCX files without palettes, files missing the last line of image data, and files with illegal (and incorrect) combinations of bits per pixel and planes).

The 24 bit PCX file variation is new and many programs which support PCX do not support the 24 bit variation. Therefore, unless you are sure that the software you are using can read a 24 bit PCX file, you probably want to use the -8 option to force Alchemy to write a paletted file when generating a PCX file.

DCX files are multiple page PCX images which are used by various manufacturers of fax boards and fax software. Alchemy always writes single page DCX files.

Comments

Because so many software packages can read and write PCX files we are especially interested in supporting as many variations as possible. If you have any PCX files which Alchemy does not read correctly please contact us.

Since DCX files are always 1 bit, black and white images, Alchemy assumes the use of -b -c2 -8 when writing the DCX variation of PCX.

Recently some of the header information in PCX files has been changed to include image resolution information. Some fax board software makes use of this information when transmitting PCX or DCX files as faxes. See the example section below for an example of how to specify image resolution when writing a PCX file.

PCJ files are a variation of 256 colour PCX files which have the palette in a separate file. The palette file has the extension .p13. Alchemy will automatically look for the palette file in the same directory as the PCJ file when reading.

When converting a DCX file which contains multiple pages you can specify which page to convert by using the -Z option followed by the page number. You can also convert all of the pages in the file by using the Multi-Page option (-U), see the examples section below.

Related options

-D Specify image resolution.
-U Multi-Page

Examples

Convert the GIF file, lush.gif, to a PCX file:

```
alchemy lush.gif -p
```

Convert the scanned image, page1.tif, to a DCX file:

```
alchemy page1.tif -p1
```

Convert the scanned image, page2.tif, to a DCX file, specifying an image resolution of 200x100 (a common resolution for fax images):

```
alchemy page2.tif -p1 -D 200 100
```

Convert the image, flower.tif, to a PCJ file:

```
alchemy flower.tif -p2
```

Convert page 3 of the DCX file, fax.dcx, to a TIFF file:

```
alchemy fax.dcx -Z 3 -t
```

Convert all of the pages in the file to TIFF files (the output files will be called fax.001, fax.002, …):

```
alchemy fax.dcx -U -t
```

PDS --p

PDS labeled images are used by NASA for planetary images.

Syntax

--p

Extensions

.ibg
.imq

Creator

NASA

Used by

NASA distributes collections of planetary images on CD-ROM in PDS format.

Variations

Reads 1 and 8 bit uncompressed and 8 bit first difference Huffman compressed files.

Writes 8 bit gray-scale uncompressed PDS files.

Limitations

PDS images must begin with either an "SFDU_LABEL" or a "FILE_TYPE" record for Alchemy to be able to identify it.

Occasionally a PDS labeled image has a palette. There doesn't seem to be any standard format for the palette; Image Alchemy handles the palettes we've encountered.

Any portions of the PDS labels not required to extract the image, such as longitude and latitude, are ignored.

Comments

Since Image Alchemy only writes gray-scale PDS images, Alchemy assumes the use of the -b option when writing PDS files.

Some PDS images actually consist of two files, a label file and a data file. To read that type image you should use the name of the label file and Alchemy will find the data file.

Example

Convert the GOES file, phoenix.goe, into a PDS labeled image:

```
alchemy phoenix.goe --p
```

PhotoCD (MS-DOS only)

PhotoCD files are multi-resolution images produced by Kodak

Extensions .pcd

Creator Eastman Kodak Company

Used by Eastman Kodak Company

Variations Reads single channel and three channel images.

Limitations Image Alchemy cannot write PhotoCD files (due to patent licensing restrictions imposed by Kodak).

Only the MS-DOS version of Image Alchemy can read PhotoCD files (due to patent licensing and library availability restrictions imposed by Kodak).

The full path of the PhotoCD file must by specified as the input file (e.g. L:\photo_cd\images\img0001.pcd, assuming your CD-ROM drive is configured as L:).

Comments The Alchemy overlay file, alchpcd.exe, is used by Image Alchemy when reading PhotoCD images. This file must either be in the same directory as alchemy.exe or any directory in your path.

PhotoCD files contain multi-resolution image data. You may specify which resolution image you want Alchemy to read by using the -Z option, followed by the resolution value. Available resolutions are:

2: 192 x 128
3: 384 x 256
4: 768 x 512
5: 1536 x 1024
6: 3072 x 2084

The default is 3 (384x256).

Alchemy automatically rotates the image to the "correct" orientation (as was determined by the technician who recorded your PhotoCD), however, you may override this feature by using a second parameter after the -Z option. The second parameter can take on one of the these values:

0: don't rotate the image
1: flip the image vertically
2: flip the image horizontally
3: rotate the image 180 degrees (the same as both a vertical and a horizontal flip)
4: rotate the image 90 degrees counter-clockwise
5: rotate the image 90 degrees counter-clockwise and flip the image vertically
6: rotate the image 90 degrees counter-clockwise and flip the image horizontally
7: rotate the image 90 degrees clockwise (the same as rotating the image 90 degrees counter-clockwise and flipping it both vertically and horizontally)

The default is 0 (don't rotate the image).

If you specify a -b as part of the command line Alchemy will read a grayscale version of the image.

Examples

Convert the first PhotoCD image to a TIFF file, using the default resolution of 384x256:

```
alchemy L:\photo_cd\images\img0001.pcd -t
```

Do the same thing, this time reading the 768x512 version of the image:

```
alchemy L:\photo_cd\images\img0001.pcd -t
-Z 4
```

Do the same thing, this time rotating the image 90 degrees counter-clockwise:

```
alchemy L:\photo_cd\images\img0001.pcd -t
-Z 4 3
```

Portable BitMap (PBM) -k

The Portable BitMap format was developed by Jef Poskanzer to allow the transferring of black and white image files between different workstations. The PBM format has grown to include black and white, gray-scale, and true colour images, a large set of programs to convert various other image formats to and from PBM, and a set of image manipulation tools.

Syntax

-k

Extensions

.pnm
.pbm
.pgm
.ppm

Creator

Jef Poskanzer

Used by

Portable BitMap Package
Various workstation graphic programs

Variations

Reads and writes 1, 8, and 24 bit RAWBITS (binary) images.

To write out a PBM file use -b -c2.
To write out a PGM file use -b -c256.
To write out a PPM file use -24.

Limitations

When writing a PBM file Alchemy always uses the .pnm extension (the extension should be changed based on the type of file being written).

Comments

By convention the extension of a PBM file changes depending on the type of image data which it is storing, based on the following table:

.pnm	Portable aNyMap (Any of those below)
.pbm	Portable BitMap (Black and white)
.pgm	Portable GrayMap (Gray-scale)
.ppm	Portable PixelMap (True colour)

Alchemy does not make use of this convention when writing images, always writing files with the extension .pnm.

The PBM package is a set of image manipulation tools which run on various workstations. The software is available free of charge via anonymous ftp from expo.lcs.mit.edu as contrib/pbmplus.tar.Z, ftp.ee.lbl.gov as pbmplus.tar.Z, or via floppy disk from us.

Examples

Convert the file sun.im32 to a PBM file:

```
alchemy sun.im32 -k -b -c2
```

Convert the file sun.im32 to a PGM file, overwriting any existing sun.pnm file:

```
alchemy sun.im32 -k -b -c256 -o
```

Convert the file sun.im32 to a PPM file called image77:

```
alchemy sun.im32 image77 -k -24 -.
```

Puzzle --U

The Puzzle format is used by the UNIX supplied Puzzle program

Syntax --U

Extensions .pzl
.puzzle
.cm

Creator Unknown

Used by The puzzle program.

Variations 8 bits per pixel

Comments Since puzzle files are always paletted, Alchemy assumes the use of the -8 option when writing a puzzle file.

Example Convert the file einstein.im8 to a Puzzle file:

```
alchemy einstein.im8 --U
```

Q0 --q

The Q0 format is apparently commonly used by various Japanese scanning, painting, and viewing software to store 24 bit images. Handmade Software has no information other than a basic description of the format and some sample images; if you have further information on the Q0 format please contact us.

Syntax

--q

Extensions

.q0 For pixel data
.rgb For pixel data
.fal For image header information

Creator

Unknown

Used by

Various Japanese image processing software.

Variations

24 bits per pixel

Comments

Q0 files are actually two files, one with the extension .rgb or .q0 and the other with the extension .fal. The .rgb or .q0 file contains the actual image data and the .fal file contains the header information. You specify the name of the .rgb or .q0 file and Alchemy automatically generates the name of the .fal file.

When writing a Q0 file Alchemy will overwrite, without warning, existing .fal files.

Since Q0 files are always true colour, Alchemy assumes the use of the -24 option when writing a Q0 file.

Example

Convert the file dogcow.gif to a Q0 file:

```
alchemy dogcow.gif --q
```

QDV --D

The QDV format is used by Giffer, a Macintosh program which displays and converts image files.

Syntax --D

Extension .qdv

Creator Steve Blackstock

Used by Giffer

Variations QDV files are always 8 bits per pixel.

Comments Giffer is a great shareware (Beerware™, actually) program for the Macintosh that converts between various image file formats and allows viewing of graphics files.

Since QDV files are always paletted, Alchemy assumes the use of the -8 option when writing QDV files.

Example Convert the file input.tga to a qdv file:

```
alchemy input.tga --D
```

QRT Raw --T

QRT files are generated by the QRT Ray Tracer, a public domain ray-tracer for Amiga, Macintosh, and IBM PC computers.

Syntax --T

Extension .raw

Creator Steve Korn

Used by QRT Ray Tracer

Variations 24 bits per pixel

Comments Since QRT files are always true colour, Alchemy assumes use of the -24 option when writing a QRT file.

Example Convert the file spheres.gif to a QRT file called spheres.raw:

```
alchemy spheres.gif --T
```

RIX -R

RIX files were developed by ColoRIX to use with their paint software.

Syntax -R

Extension .scx
.rix

Creator RIX Softworks, Inc.

Used by ColoRIX software

Variations Reads and writes Type 0 (8 bits per pixel) and Type 4 (4 bits per pixel) images.

Limitations We would like to add support for Type 1 and Type 2 images but we haven't been able to find any documentation on this variation. If you have information please contact us.

Comments A type 0 file will be written if there are more than 16 colours in the image; otherwise a type 4 file will be written.

Since RIX files are always paletted, Alchemy assumes use of the -8 option when writing a RIX file.

Example Convert the file test.gif to a RIX file:

```
alchemy test.gif -R
```

Scodl --s

Scodl files are used by Agfa/Matrix slide recorders.

Syntax

--s *type*

Parameter

type:
0:Non-scalable image (pre MVP version 4.2)
1:Scalable image (MVP version 4.2 or later)
The default is 0 (Non-scalable).

Extension

.scd

Creator

Agfa Corporation / Matrix Instruments Inc.

Used by

Agfa/Matrix slide recorders

Variations

Writes 8 and 24 bit run-length coded (RLC) images.

Limitations

Output only.

Comments

Agfa/Matrix made significant changes to the Scodl file format when they introduced version 4.2 of the MVP and Conductor software in 1992. Old version Scodl files could not be scaled by the MVP software; new version Scodl files can be scaled but only work the newer version of the MVP and Conductor software.

Scalable Scodl images have the advantages that they do not have to be scaled to a specific output resolution and are therefore generally smaller than pre-scaled Scodl images. They can also be imaged on a film recorder with any output resolution or previewed on a monitor.

The disadvantage of scalable Scodl images is that you must be using at least Scodl MVP version 4.2 and the Scodl MVP software does not perform very high-quality scaling. In particular, the MVP software only does pixel replication scaling when increasing the size of an image (this corresponds to type 'a' scaling in Alchemy) and pixel averaging when reducing the size of an image (corresponding to Alchemy 'b' scaling).

Note that Alchemy pays attention to the aspect ratio or dots per inch information specified as part of the command line or present in the original image when converting to a Scodl scalable image. Therefore you should ensure that this information is correct when writing a Scodl scalable image.

When writing Non-scalable Scodl files the image should be scaled up to either 2000x1366 or 4000x2732 to fill the slide.

There are some limitations with the MVP software driver supplied by Agfa/Matrix:

> 24 bit Scodl files are not correctly interpreted by the MVP driver version 4.1 and earlier. 8 bit images are correctly interpreted.
>
> When sending very large images to the background MVP driver you must be using version 4.0 or later and have lots of EMS memory (4 megabytes is recommended). When using the foreground MVP program turning on disk caching is necessary.

Examples

Convert the file pict.im32 to a Scodl file using high quality scaling and preserving the aspect ratio:

```
alchemy pict.im32 --s -Xc2000 -Yc1366 -+
```

Do the same thing, but generate a scalable Scodl file:

```
alchemy pict.im32 --s1
```

Silicon Graphics Image (SGI) -n

Silicon Graphics Image files are used by Silicon Graphics workstations.

Syntax

-n *compressionType*

Parameter

compressionType:
0:Verbatim (uncompressed)
1:RLE compressed
The default is 0 (Verbatim).

Extension

.sgi

Creator

Silicon Graphics, Inc.

Used by

Silicon Graphics workstations.

Variations

Reads and writes 8 (gray-scale) and 24 bit verbatim (uncompressed) and RLE files.

Comments

Only gray-scale images may be 8 bit files. Alchemy will automatically switch to 24 bit mode when writing a colour image.

To preserve the alpha channel information when converting to or from SGI files use the `-I` option.

Related options

-I Alpha Channel

Examples

Convert the Sun raster file sun.im8 to a SGI file called sgiout:

```
alchemy sun.im8 sgiout -n -.
```

Do the same thing, but write out a RLE compressed SGI file:

```
alchemy sun.im8 sgiout -n1 -.
```

SPOT Image --S

SPOT Image files are high-resolution satellite images produced by SPOT Image Corporation.

Syntax

--S

Extensions

For GIS (tape) format:

.hdr Header information
.bil Pixel data
.clr Palette data [optional]

For CCT (CD-ROM) format:

.dat

Creator

SPOT Image Corp.

Used by

SPOT Image Corp.

Variations

Reads and writes 8 bits per pixel GIS (tape) format files

Reads 8 and 24 bits per pixel CCT (CD-ROM) format files

Limitations

Only GIS (tape) format images are currently written; contact us if you are interested in writing CCT SPOT Image files.

Comments

SPOT Image GIS (tape) images are actually three files. You specify the name of the .hdr file and Alchemy automatically generates the name of the .bil and .clr files.

If no palette file (.clr file) exists Alchemy will assume the image is grayscale.

There may also be a statistics file with a .stx extension, but Alchemy ignores this file.

When writing a SPOT file Alchemy will overwrite, without warning, existing .bil and .clr files.

When reading a CCT (CD-ROM) format image specify the complete path and name of the image file. For example, on an MS-DOS system: `alchemy l:\scene04\imag_04.dat -g` will convert the scene 4 image to a GIF file.

Example

Convert the Erdas file, phoenix.lan, to a SPOT Image file:

```
alchemy phoenix.lan --S
```

Stork -K

Stork files are CMYK images used by Stork's colour proofing machines.

Syntax

-K *compressionType*

Parameter

compressionType:
0:None
1:Run length coded
The default is none.

Extensions

.idx Header information
.pre Image data
.tab Colour lookup table

Creator

Stork Colorproofing B.V.

Used by

Stork Colorproofing machines

Variations

Reads and writes 32 KCMY, 32 KCMY RLC, 16 CLU, and 16 CLU RLC images (type 100, 101, 300, and 301, respectively).

Limitations

Alchemy can't write paletted files with more than 256 colours.

When reading paletted files with more than 256 colours they are treated as true colour.

Comments

Stork images are stored in two or three files (depending on whether or not there's a colour lookup table associated with the image). The filename given to Alchemy should be the name of the data file (normally with a suffix of .pre); Alchemy will generate the names of the other files by stripping the extension and appending .idx for the index file and .tab for the colour lookup table (if any).

Alchemy will overwrite existing .idx and .tab files without warning when creating Stork files.

Since Stork images are CMYK data files you will probably want to use an undercolour removal file to control the RGB to CMYK conversion process. See the -C option in Chapter 6 for more information.

Related options

-C Undercolour Removal File

Example

Convert the file image.tga to an uncompressed Stork image called image.pre and image.idx, using the undercolour removal file sample.ucr:

```
alchemy image.tga -K -Csample.ucr
```

Sun Icon --N

Sun Icon files are used by Sun Microsystems workstations to contain icon information.

Syntax

--N

Extensions

.icon
.ico

Creator

Sun Microsystems, Inc.

Used by

Sun workstations

Variations

1 bit, black and white.

Comments

This is not the same format as Sun Raster (see below).

Since Sun Icon files are always black and white, Alchemy assumes use of the -8, -c2, and -b options when writing a Sun Icon file.

Example

Convert the sun raster file icon.im1 to a sun icon file called program.ico:

```
alchemy icon.im1 program.ico --N
```

Sun Raster -s

Sun Raster files are used by Sun Microsystems workstations.

Syntax

-s *compressionType*

Parameter

compressionType:
0:None
1:Run length compression
The default is None.

Extensions

.rast
.ras
.im
.im1
.im8
.im24
.im32

Creator

Sun Microsystems, Inc.

Used by

Sun workstations

Variations

Reads 1, 8, 24, and 32 bit Standard, BGR, RGB, and Byte Encoded (RLE) files.

Writes 1, 8, 24, and 32 bit Standard files, and 1 and 8 bit Byte Encoded (RLE) files.

Comments

There is no standard extension for Sun Raster files; the extensions that Alchemy uses are the most common.

Some versions of the PBM toolkit read and write Sun Raster files which have the wrong RGB order (causing the red and blue channels to be swapped). You can correct for this problem by using the swap RGB option (see Chapter 6, for more information).

To preserve the alpha channel information when converting to or from Sun Raster files use the `-I` option.

Related options

`-I` Alpha Channel

Examples

Convert the SGI file sgiout to a sun raster file called sun.im8:

```
alchemy sgiout sun.im8 -s
```

Do the same thing, writing out a compressed sun raster file:

```
alchemy sgiout sun.im8 -s1
```

Do the same thing, preserving the alpha channel information:

```
alchemy sgiout sun.im8 -s1 -I
```

Convert the Sun Raster file lena.im24 to an uncompressed TIFF file, correcting for a wrong RGB order in the Sun Raster:

```
alchemy lena.im24 --n -t0
```

Targa -a

Targa files were created to support the line of Targa graphics cards. The Targa format is popular with scanners and high end paint packages.

Syntax

-a *outputType*

Parameter

outputType:
0:Uncompressed
1:Run Length Coded
10:Uncompressed, no footer
11:Run Length Coded, no footer
The default is 0 (Uncompressed).

Extension

.tga

Creator

Truevision, Inc.

Used by

Various scanning and paint software.

Variations

Reads 8, 15, 16, 24, and 32 bit images, ignoring the alpha channel for 32 bit images.

Writes 8, 15, 16, 24, and 32 bit images, writing an empty alpha channel for 32 bit images.

Comments

15 and 16 bit output are actually the same except for one field in the header.

Targa files allow a footer containing additional information such as aspect ratio. However some software is unable to read Targa files which have a footer, so Alchemy allows all valid combinations to be written. The most common variant for software to be able to read is 24 bit uncompressed (specify `-a0` and `-24`).

To preserve the alpha channel information when converting to or from Targa files use the `-I` option.

Related options

`-I` Alpha Channel

Examples

Convert the file input.tif to an uncompressed 24 bit Targa file:

```
alchemy input.tif -a -24
```

Convert the file input.tif to an uncompressed 15 bit Targa file called output.tga with no footer:

```
alchemy input.tif output.tga -a10 -15
```

TIFF (Tagged Interchange File Format) -t

TIFF is designed to be a universal raster image format. It's very popular with desktop publishing packages.

Syntax

-t *compressionType*

Parameter

compressionType:

0:None
1:LZW
2:PackBits
3:Group III Fax
4:Group IV Fax
5:CCITT RLE

100:Write a one strip file

200:Write a bit reversed Fax compressed file

400:Write a CMYK file

The default is LZW Compression, not one strip, not bit reversed, and not CMYK. See the comments section below for more information. Options are combined by adding (see below for an example).

Extensions

.tiff
.tif

Creator

Aldus Corp.
Microsoft Corp.

Used by

Various desktop publishing and scanning software.

Variations

Reads TIFF class B, G, R, and most class P files.

Reads 1 through 8, 12, 24, and 32 bit images.

Input compression types supported are raw, LZW, PackBits, Group III fax, Group IV fax, CCITT RLE (byte and word aligned), NeXT, Thunderscan, PICIO, and SGI RLE.

Writes class B, G, P, and R files, depending on the input file and options specified.

Writes 1, 4, 8, 24, and 32 bit images.

Output compression types supported are raw, LZW, PackBits, Group III fax, Group IV fax, and CCITT RLE.

CMYK images are always 8 bits per component.

Limitations

Class P TIFF files can only be read if they have 1, 4, or 8 bits per pixel.

Comments

TIFF files are often written out incorrectly; Alchemy attempts to figure out what is wrong and make intelligent decisions. If you have TIFF files which Alchemy cannot read please contact us.

1,4, and 8 bit output files are paletted unless the palette is all gray, in which case the output is a gray-scale file.

When writing TIFF files using any of the fax compression types (Group III, Group IV and CCITT RLE), Alchemy uses a photometric interpretation of minIsWhite.

See Appendix A, Answers to Frequently Asked Questions, for more information on writing TIFF files which conform to the various TIFF classes.

LZW compression is patented by Unisys Corporation and used under license (for more information see Appendix I, Acknowledgments).

Specifying a one strip TIFF output option causes Alchemy to generate a TIFF file which contains the image data in one long strip (ordinarily you do not want the entire image data be in one strip, since this increases the memory requirements of software reading the image; if you do not specify one strip TIFF output Alchemy will generate a TIFF file which has 8k strips). This option is useful because some software (primarily fax software) cannot handle multi-strip TIFF files.

Some Fax decoding software requires the bit order to be backwards when reading a Fax compressed TIFF file. You can write such a file by adding 200 to the appropriate output type when writing a TIFF file.

When converting a TIFF file which contains multiple pages you can specify which page to convert by using the -Z option followed by the page number. You can also convert all of the pages in the file by using the Multi-Page option (-U); see the examples section below.

To preserve the alpha channel information when converting to or from TIFF files use the `-I` option.

Related options

-I Alpha Channel
-U Multi-Page

Examples

Convert the file input.gif to an uncompressed gray-scale TIFF file called output.tif:

```
alchemy input.gif output.tif -t 0 -b
```

Convert the file cover.bmp to a Group III Fax compressed TIFF file, with the bit order reversed

```
alchemy cover.tmp -t 203
```

Convert page 3 of the TIFF file, contract.tif, to a PCX file:

```
alchemy contract.tif -Z 3 -p
```

Convert all of the pages in the file to PCX files (the output files will be called contract.001, contract.002, …):

```
alchemy contract.tif -U -p
```

Utah Raster Toolkit (RLE) --u

The Utah Raster Toolkit is a set of public domain utilities for manipulating and converting images for various workstations.

Syntax

--u

Extension

.rle

Creator

The University of Utah
The University of Michigan

Used by

Utah RLE toolkit

Variations

Reads and writes 1 and 3 channel 8 bits per pixel files, with or without an alpha channel.

Limitations

While reading, files which are 1 channel and have either no colour map or a single channel colour map are assumed to be gray-scale images. The colour map, if present, will be used as a gamma correction table.

Files which are 1 channel and have a 3 channel colour map are assumed to be paletted colour files.

Files which are 3 channel are assumed to be true colour.

When writing RLE files Alchemy will generate a 1 channel file with a 3 channel colour map for paletted images and a 3 channel file with no colour map for true colour images.

Comments

The Utah Raster Toolkit is available free of charge via anonymous ftp as pub/urt_3.0.tar.Z from cs.utah.edu, weedeater.math.yale.edu, or freebie.engin.umich.edu or via floppy disk from us.

To preserve the alpha channel information when converting to or from Utah RLE files use the `-I` option.

Related options

`-I` Alpha Channel

Example

Convert the PBM file, image.ppm, to a Utah RLE file:

```
alchemy image.ppm --u
```

Verity Image Format (VIF) --E

VIF is used by the Topic text retrieval software.

Syntax --E

Extension .vif

Creator Verity Corp.

Used by Topic

Variations Reads and writes 1 bit, black and white, CCITT Group 4 compressed images.

Example Convert the file fax.tif to a VIF file:

```
alchemy fax.tif --E
```

VITec -T

VITec files are used by VITec image processing software.

Syntax -T

Extension .vit

Creator VITec

Used by VITec ELT

Variations Reads 8 bit grayscale and 24 bit colour files, untiled and tiled files.

Writes 8 bit grayscale and 24 bit colour files untiled files.

Example Convert the file map.erm to a VITec file:

```
alchemy map.erm -T
```

Vivid --I

Vivid is a shareware ray-tracer for MS-DOS computers.

Syntax

--I (upper case i)

Extension

.img.als

Creator

Stephen B. Coy

Used by

Vivid Ray Tracer
Alias

Variations

Reads and writes 24 bit RLE files.

Comments

The Vivid Ray Tracer is a shareware program for PCs and is available from:

Stephen Coy
15205 NE 13th Pl., #2904
Bellevue, WA 98007

or from us.

This is the same format as used by Alias (see Alias, above).

Example

Convert the file spheres.qrt to a Vivid file:

```
alchemy spheres.qrt --I
```

Windows Bitmap (BMP) -w

Windows BMP files are used by Microsoft Windows.

Syntax

-w *compressionType*

Parameter

compressionType:
0:None
1:RLE
10:Write an ICOn file
The default is none.

Extension

.bmp

Creator

Microsoft Corp.

Used by

Microsoft Windows

Variations

Reads 1, 4, 8, and 24 bit RGB (raw), RLE4, and RLE8 files.

Writes 1, 4, 8, and 24 bit RGB (raw), RLE4, and RLE8 files.

Limitations

Several of the programs which claim to read and write RLE files do not do so correctly; we do not recommend writing RLE files unless you have verified that they work with your intended application.

Comments

Microsoft supplied Windows utilities cannot read nor write RLE4 or RLE8 files.

If you are converting an image to use as wallpaper on a 16 colour display you will want to match the palette of the output image to one of the existing 16 colour BMP images supplied with Windows (chess.bmp, for example). If you do not do this the wallpaper will not be loaded correctly. See the example section below.

If you are converting an image to use as wallpaper on a 256 colour Windows 3.1 display you will want to reserve the first 8 colours. Use the `-c 256 8` option to do this (see below for an example). This will force the first 8 colours of the palette to be the standard Windows colours.

If you are writing a Windows icon (.ico) file you must scale the image to a width and a height of 16, 32, or 64 pixels (32 being the best choice, since Windows displays all icons as 32x32). Also, Windows seems to remap all icons to the standard 16 colours, so the best results can be obtained if you match the palette of your icons to an existing icon (see the -f option). If you don't have any other icons you can also match to one of the 16 colour wallpaper files supplied with Windows.

Alchemy can write a BMP file which contains an identity palette as specified in the Microsoft Multimedia Development Kit. These images provide for quicker bitmap loading when used with the Multimedia Extensions. A palette identity file has the first and last 10 palette entries reserved for 20 system defined colours. Alchemy will write such an image if you specify `-c 246 10` as part of the command line. Note that ordinarily this would produce a file which has 246 palette entries, but in this special case the file will have 256 palette entries (20 fixed by the Windows specifications and 236 chosen by Alchemy). Note that you can also specify a number smaller than 246, but the palette will always have 256 colours (since the last 10 have to occupy positions 246 through 255).

Related options

-c Specify number of colours
-f Match to existing palette

Examples

Convert the image test.gif to a Windows BMP file:

```
alchemy test.gif -w
```

Convert the image test.gif to a 16 colour Windows BMP file to be used as wallpaper (the file chess.bmp is supplied with Windows 3.0 (substitute leaves.bmp when using Windows 3.1); this example assumes that it is in the current directory):

```
alchemy test.gif -f chess.bmp -w
```

Convert the image test.gif to a 256 colour Windows BMP file to be used as wallpaper with Windows 3.1:

```
alchemy test.gif -c256 8 -w
```

Convert the image test.gif to an icon file for use with Windows 3.1:

```
alchemy test.gif -Xb32 -Yb32 -w 10
   -f leaves.bmp
```

Convert the image test.gif to an identity palette BMP file:

```
alchemy test.gif -w -c 246 10
```

WordPerfect Graphic File -W

WordPerfect files are images which can be imported into WordPerfect and various other word processors and desktop publishing programs.

Syntax -W

Extension .wpg

Creator WordPerfect Corp.

Used by WordPerfect

Variations 1 through 8 bits per pixel are supported.

Comments In addition to raster images WordPerfect files may contain vectors and text information. Such information is lost when reading WordPerfect files.

Since WordPerfect Graphic files are always paletted, Alchemy assumes use of the -8 option when writing a WordPerfect Graphic file.

Example Convert the image, newpict.pcx, to a black and white WPG file:

```
alchemy newpict.pcx -b -c2 -W
```

XBM --b

XBM files are used by the X Windowing System. XBM files are C source code files which can be read and written by various X utilities and are designed to be included in C source code for use as icons and other bit-mapped graphic images.

Syntax

--b

Extensions

.xbm
.bm

Creator

MIT

Used by

The X Windowing system

Variations

1 bit per pixel

Limitations

Because .xbm files are actually C source code files there can be many variations of .xbm files. Since adding a C preprocessor to Alchemy to handle all the theoretically allowable .xbm files is impractical we have instead designed Alchemy to interchange .xbm files with the PBM utilities and the X supplied utilities, and to read the sample .xbm files from Sun Microsystems. If you run across any .xbm files which Alchemy cannot read please contact us.

The hotspot field is ignored when reading .xbm files.

Since XBM files are always black and white, Alchemy assumes use of the -8, -c2, and -b option when writing a XBM file.

Comments

Most of the X supplied utilities (bitmap, for example) are designed to edit small .xbm images.

Example

Convert the file picture.im32 to an XBM file using high quality scaling and preserving the aspect ratio:

```
alchemy picture.im32 --b -Xb64 -+
```

XPM --x

XPM files are used by the X Windowing System. XPM files are C source code files which can be read and written by various X utilities and are designed to be included in C source code for use as icons and other bit-mapped graphic images.

Syntax

--x *type*

Parameter

type:

0:XBM similar style
1:XPM3 style
2:XPM2 style

10:XBM similar style with 48 bit colours
11:XPM3 style with 48 bit colours
12:XPM2 style with 48 bit colours

The default is XBM similar style (see the Comments section below for a discussion of the different XPM file types).

Extensions

.xpm
.pm

Creator

MIT

Used by

The X Windowing system

Variations

8 bits per pixel

Limitations

Because .xpm files are actually C source code files there can be many variations of .xpm files. Since adding a C preprocessor to Alchemy to handle all the theoretically allowable .xpm files is impractical we have instead designed Alchemy to interchange .xpm files with the PBM utilities and the X supplied utilities, and to read the sample .xpm files from IBM. If you run across any .xpm files which Alchemy cannot read please contact us.

Some XPM files contain colour names instead of colour values for some of the colours. The conversion information to convert these names into values is in a file supplied with the X Windowing system called `rgb.txt`. When needed, Alchemy will look for this table in the following directories: the current directory, `/usr/lib/X11`, `$OPENWINHOME`, and `/usr/openwin/lib`. If your system has the `rgb.txt` file in a different location you may have to copy it to the current directory (its location is system dependent; ask you system administrator if you need help finding it).

Comments

The different type XPM files can be identified as follows:

Type 0 (XBM similar style):

```
#define type0_format 1
…
static char *type0_colors[] = {
"a", "#000000",
"b", "#ff0000",
…
```

Type 1 (XPM3 style):

```
/* XPM */
static char * type1[] = {
"32 20 12 1",
"a c #000000",
"b c #ff0000",
…
```

Type 2 (XPM2 style):

```
! XPM2
32 20 12 1
a c #000000
b c #ff0000
…
```

The 48 bit colour XPM files are identical except that the colour values are written as a 48 bit number (instead of a 24 bit number). Some software expects XPM files that have 48 bit numbers (Alchemy automatically reads either). For example:

Type 10 (XBM similar style with 48 bit colours):

```
#define type0_format 1
…
static char *type0_colors[] = {
"a", "#000000000000",
"b", "#ffff00000000",
…
```

The other formats (11 and 12) are analogous.

When writing an XPM file with less than 27 colours Alchemy writes 1 character XPM files, otherwise Alchemy writes 2 character XPM files.

XPM files are usually quite small, therefore many utilities (the PBM toolkit for example) may have trouble reading large XPM files.

Since XPM files are always paletted, Alchemy assumes use of the -8 option when writing a XPM file.

Example

Convert the file picture.im32 to an XPM file using high quality scaling and preserving the aspect ratio:

```
alchemy picture.im32 --x -Xb64 -+
```

XWD --w

XWD is the file format used by xwd, the X window dumping utility.

Syntax

--w *type*

Parameter

type:

0:Z type
1:XY type

The default is Z type.

Extension

.xwd

Creator

MIT

Used by

The X Windowing System

Variations

Reads 1, 4, 8, and 24 bits per pixel Z format and 1, 4, and 8 bit XY format XWD files.

Writes 1, 8, and 24 bits per pixel Z format and 1 and 8 bit XY format XWD files.

Example

Convert the XBM file, icon.xbm, to an XWD file:

```
alchemy icon.xbm --w
```

5

General Options

Introduction

General options are options which do not affect the conversion of the image. They control such things as the overwriting of existing files and the way that memory is used.

Conserve Memory -$

Purpose

Use as little memory as possible when converting images.

Syntax

-$ (dollar sign)

Comments

Normally Alchemy tries to work on chunks of the image several lines long to improve performance. Use of the -$ option will cause it to use the smallest size chunks possible for the conversion being performed. On MS-DOS based systems using the standard version of Alchemy this will usually allow conversion of larger images than would otherwise be possible. On UNIX systems and in the 386 Enhanced version of Alchemy this may reduce paging when converting very large images.

Example

Convert the image giant.tga to a TIFF file conserving memory:

```
alchemy giant.tga -$ -t
```

Display Image Stats -x

Purpose

Display image statistics.

Syntax

-x *option*

Parameter

option:
0:Traditional image statistics
1:Verbose image statistics
Default is 0.

Comments

Displays image type, size, number of colours, aspect ratio, resolution, and compression ratio.

Option 1 image stats contains the same information to Option 0 image stats, but the information is presented in a manner to allow it to be more easily parsed by a computer.

Example

Find out about the image called image.tga:

```
alchemy -x image.tga
```

Do Not Alter Output Filename -.

Purpose

Disable automatic appending of the output image type to the output file name.

Syntax

-. (period)

Comments

By default, if there's no '.' in the output filename, Alchemy will add an extension indicating the type of file. If the -. option is specified no extension will be added.

This is most useful on non-MS-DOS systems where '.' is not a special character in filenames.

Examples

Convert the file called infile.gif to a PCX file called outfile (if you did not use the -. option Alchemy would automatically change the output file name to outfile.pcx):

```
alchemy infile.gif outfile -p -.
```

Help -h

Purpose

Give you information on how to use Image Alchemy.

Syntax

-h *option*

Parameter

option:

0:General help
1:General options
2:Output formats A through L
3:Output formats M through Z
4:Colour options
5:Scaling and Filtering Options
6:Display options (MS-DOS Only)

Default is 0, general help

Limitations

The help option cannot be combined with any other options.

Comments

The help information given by this command is only a summary.

The numbers in braces after the command name refer to the page numbers in this manual.

Related options

-? support and update information

Example

Get help on the colour options:

```
alchemy -h4
```

Multi-Page -U

Purpose

Allow the conversion of multiple pages with a single execution of Alchemy.

Syntax

-U

Comments

The multi-page option allows you to process all the pages of an image when reading an image file which contains multiple pages. Each page of the image will be written to a separate file. The output file names will be as specified, with the extension replaced with .001 for first page, .002 for the second, and so on.

When using the multi-page option in conjunction with wildcards the number of output files generated can be very large.

Limitations

The only file formats which support multi-page reading are: TIFF, DCX (PCX), and PCL.

There is currently no way to write a multi-page document.

Alchemy does not intelligently retain information between pages. For example, if you are matching a multi-page document to an existing palette, the inverse palette generation step is performed for each page. This only affects the speed of conversions, not the quality.

Examples

Convert all the pages in the PCL file doc.pcl to TIFF files:

```
alchemy doc.pcl -U -t
```

Convert all the pages of all the TIFF files to PCX files, placing the output files into the directory \images\output:

```
alchemy *.tif -U -p \images\output
```

Override Input Type -=

Purpose

Force Alchemy to treat the input file as the specified file type. This can be used if Alchemy cannot identify or misidentifies the format of an input image.

Syntax

-= inputType

Parameter

The *inputType* must be a valid number identifying a supported format. The *inputTypes* are as follows:

Comments

Rarely will Alchemy misidentify a file; the file is usually damaged in some way when this happens. If the file is damaged, or if you specify an input type that does not correspond to the actual type of the image, the results will be unpredictable. If you have a file which Alchemy misidentifies but is otherwise undamaged please contact us.

Example

Convert the file unknown.xxx to an OS/2 Bitmap file called output.bmp, forcing unknown.xxx to be treated as a Sun Raster image:

```
alchemy unknown.xxx output.bmp -O -=8
```

Overwrite -o

Purpose

Allow Alchemy to overwrite existing files on the disk.

Syntax

-o

Comments

Image Alchemy will not overwrite an existing file unless the -o option is specified.

Limitations

The input file name and the output file name cannot be the same.

Example

Convert the file input.tga to a GIF file called output.gif, overwriting the existing file called output.gif:

```
alchemy input.tga output.gif -g -o
```

Program information -?

Purpose

Give you information on how to get support for Image Alchemy or inquire about update information.

Syntax

-?

Comments

UNIX users have to escape the question mark with a back-slash (instead of -? use -\?). This is because the UNIX shell will attempt to perform wildcard expansion on the question mark.

Limitations

The information option cannot be combined with any other options.

Related options

-h help with commands

Example

Get support information:

```
alchemy -?
```

Quiet -Q

Purpose

Suppress all status messages (but not error messages).

Syntax

-Q

Comments

This is useful when running Alchemy in the background on UNIX systems or in batch files on MS-DOS systems (and you don't want the output of Alchemy scrolling important messages off of the screen).

Limitations

There is no way to suppress error messages.

Example

Convert the file dummy.gif to a PCX file but don't report any status messages:

```
alchemy dummy.gif -Q -p
```

Use Input Directories for Output File --.

Purpose

Place the output files into the same directory as the input files.

Syntax

--. (period)

Comments

By default Alchemy places output files into either the current directory or a directory specified on the command line. If the --. option is used the output files will be written to the same directory as the input files.

Example

Convert all the PCX files in the directories imgs\ and photos\ to JPEG files, placing the output files in the same directories the input files were read from:

```
alchemy -- imgs\*.pcx photos\*.pcx -j --.
```

Warnings --W

Purpose

Treat missing input files, unidentifiable input files, and non-overwriteable output files as a non-fatal errors.

Syntax

--W

Comments

When used in conjunction with the Wildcard option (see below) the Warnings option allows Alchemy to proceed even when certain error conditions occur. Specifically, any input files which are missing or can't be identified as valid image files and any output files which already exist but are not to be overwritten are skipped and processing continues with the next file.

At the end of processing Alchemy displays lists of the files which were not found, which could not be identified, and which already existed but could not be overwritten.

This option was added at the request of our customers who routinely convert large numbers of files and don't want Alchemy to stop if it finds a file missing or finds that an output file already exists.

Limitations

Any errors which occur during the processing of an image file are always fatal.

This option can only be used with the Wildcard option.

Example

Convert all the GIF files in the current directory to JPEG files, skipping any files which can't be identified or already have existing JPEG files:

```
alchemy -- *.gif -j --W
```

Wildcard --

Purpose

Allow the conversion of multiple files with a single execution of Alchemy.

Syntax

-- (dash)

Comments

The wildcard option allows you to specify multiple file names and file names which include wild card characters. Alchemy will perform the same conversion for each input file name that it finds.

On MS-DOS systems the use of the wildcard option (--) is not required if the first file name specified includes a wildcard character (* or ?); however to reduce confusion it is still recommended.

Limitations

The wildcard option (--) must be specified before any file names.

If you are using the wildcard option you may not specify an output file name; the file names are automatically generated by substituting an appropriate extension to the input file names. If you do specify an output file name it will be misinterpreted as another input file. An output path name may specified and all output files will be stored there (see the Examples section below for an example of this).

Any error will terminate the execution of Alchemy; any images which appear in the filename list after the one causing the error will not be processed. This includes attempting to overwrite an already existing file without specifying the -o option. If you use the --W option in conjunction with wildcards certain errors will be treated as warnings and not cause Alchemy to terminate. These errors are: missing input files, input files which could not be identified, and output files which already existed but could not be overwritten (because the -o option was not specified).

Alchemy does not intelligently retain information between files. For example, if you are matching a group of files to an existing palette, the inverse palette generation step only needs to be performed once, but it is in fact done for each file. This only affects the speed of conversions, not the quality.

Examples

Convert all the GIF files in the current directory to JPEG files:

```
alchemy -- *.gif -j
```

Convert all the TIFF files in the directory \tiff to PCX files in the directory \images\output:

```
alchemy -- \tiff\*.tif -p \images\output
```

Convert all the GIF files in the current directory, in the directory \images, and in the directory \more to GIF files, scaling them to be no larger than 640x480 and write them to the directory \small:

```
alchemy -- *.gif \images\*.gif \more\*.gif
   -g -Xb640 -Yb480 -+ \small
```

Convert the files madonna.gif, bay4.gif, everest.tga, and basil.tif to JPEG files, overwriting any existing files:

```
alchemy -- madonna.gif bay4.gif
   everest.tga basil.tif -o -j
```

Convert the files test1.tif, test2.tif, and new*.gif to ILBM files, matching them to the palette from the file output.pal:

```
alchemy -- test1.tif test2.tif new*.gif -f
   output.pal -i
```

6

Colour and Palette Options

Introduction

Colour and Palette options are options which affect the appearance of the output image. They control such things as the number of colours in the output image and the dithering techniques used.

Alpha Channel -I

Purpose

Preserve Alpha channel information when converting an image.

Syntax

-I (capital i)

Comments

Some file formats include alpha channel information. The alpha channel is often used to store information such as transparency. By default Image Alchemy does not preserve the alpha channel data when converting images; using the -I preserves the alpha channel when reading a file which has an alpha channel and writing a file format which supports alpha channel information.

If you are reading a file which does not have an alpha channel using the -I option will create an empty alpha channel in the output file.

If you are writing a file format which does not support alpha channel data the -I option will be ignored.

Limitations

Alpha Channel information is supported for these file formats: Cubicomp PictureMaker, HSI Raw, Lumena CEL, Mac PICT, TIFF, Targa, Sun Raster, SGI, and Utah RLE.

Example

Convert the image giant.tga to a TIFF file preserving the alpha channel information:

```
alchemy giant.tga -I -t
```

Black and White -b

Purpose

Convert the image to black and white or gray-scale.

Syntax

-b

Comments

The -b option causes an image to be converted to either black and white or gray-scale. If the -c2 option is specified the output image will be black and white. Any other number of colours specified with -c will cause Alchemy to generate a file with that many shades of gray uniformly distributed from 0 to 255.

If the -c option is not used the default is to write a file with 256 shades of gray when converting from a true colour image. When converting from a paletted image the number of shades of gray defaults to the number of colours in the original image.

When converting from true colour the image will be changed to a paletted image unless the -24 option is used.

Related options

-8 Paletted output
-24 True colour output
-c Specify number of colours

Examples

Convert the file sample.jpg into a 256 shades of gray raw file:

```
alchemy sample.jpg -b -r
```

Convert the file madonna.jpg into a 4 shades of gray gif file called gray.gif:

```
alchemy madonna.gif gray.gif -b -c4 -g
```

Colours -c

Purpose

Specify the number of colours for the output file.

Syntax

-c *colours* [*reserveColours*]

Parameters

colours:
Specifies the number of colours in the output image. May be between 2 and 256.

reserveColours:
Specifies the number of colours to reserve in the output image. May be between 0 and 255.

Comments

If the input file has a larger number of colours than specified for the output file, the image will be quantized using Heckbert's median cut algorithm and dithered. For further information on Heckbert's median cut algorithm see Appendix B, Colour and Dithering.

The number of colours to reserve is an optional parameter. If it is present it causes the specified number of colours to be reserved from the beginning of the palette. The output image will not contain any of those colour indices. This can be useful if you have menus or other information you wish to display at the same time as the images and they use colours at the beginning of the palette. The menu colours will then not interfere with the image. The first indices are set to black unless 16 is specified, in which case they are set to the standard VGA colour palette.

Limitations

Specifying the number of colours only has an effect if you are writing a paletted file (using the -8 option) or if the output file type is always paletted.

Converting an image with a large number of colours to a small number of colours (less than 8) will usually give poor results.

The reserved colours will be set to black unless 16 colours are reserved. In that case they will be set to the standard VGA colours.

Related options

-8 Convert to paletted image
-d Specify dither type
-u Use uniform palette

Examples

Convert the image colours.gif into a 16 colour PCX file called colour16.pcx

```
alchemy colours.gif colour16.pcx -p -c16
```

Convert the image colours.tga into a 256 colour GIF file called output.gif, reserving the first 16 colours.

```
alchemy colours.tga output.gif -g -c256 16
```

Dither -d

Purpose

Specifies the type of dithering to apply to the image.

Syntax

-d[*s*] *ditherType* [*perturbation*]

Parameters

If the -d is immediately followed by an '*s*', then a serpentine raster is used.

ditherType:

0:None
1:Floyd-Steinberg
2:Stucki
3:Jarvis, Judice, & Ninke
4:Stevenson and Arce
5:Sierra Lite
20:Halftone (clustered dot)
21:Bayer (dispersed dot)
22:Halftone 2 (clustered dot)

The default is Floyd-Steinberg.

perturbation:

0 through 127

The default is 0.

Comments

Dithering reduces the colour banding in an image caused by the palette not having a perfect match for every colour in the image.

Types 1 through 5 are all error-diffusion dithers. Types 1 and 5 are the fastest of the diffusion dithers, and they usually look the best on low resolution devices like CRTs. Types 2, 3, and 4 all tend to cause an image to appear more grainy on low resolution output devices (such as CRTs). However, they produce better results than types 1 or 5 on high-resolution, low colour output devices such as laser printers or 1 bit CMYK plotters.

Type 22 is a digital halftone; this will produce the most accurate grays on a laser printer, but the image won't be as sharp as one produced by the error-diffusion dithers. Type 21 is a dispersed dot ordered dither; it's only advantage over the error-diffusion algorithms is speed. Type 20 is an additional halftone pattern. It's similar to type 22, but with a coarser screen.

The -d option only has an effect if the number of colours is being reduced or the image is being re-mapped to a new palette.

Specifying a perturbation adds noise to the image, which can help break up visible patterns introduced by dithering. The parameter specifies the magnitude of the noise. Perturbation has no effect on dither types 20, 21, and 22.

Using a serpentine raster can also help to reduce visible patterns introduced by dithering. Using a serpentine raster has no effect on dither types 20, 21, and 22.

In general we use `-d1` when converting 24 bit images to 8 bit paletted, and `-ds3` when converting colour images to black and white and 1 bit CMYK (for sending to a laser printer or plotter).

Examples

Convert the 256 colour file image.gif to a 16 colour PCX file using a uniform palette and no dithering:

```
alchemy image.gif -p -c16 -d0 -u
```

Convert the true colour image sample.jpg into a 256 colour GIF file called sample.gif, using Stucki dithering:

```
alchemy sample.jpg -g -d2
```

Convert the 256 colour image sample.gif into a one bit black and white PCL file called sample.pcl, using Jarvis, Judice, and Ninke dithering, a serpentine raster, and a little noise:

```
alchemy sample.gif -P -b -c2 -ds3 20
```

EGA Palette -E

Purpose

Optimize the image quality for display on an EGA board and monitor.

Syntax

-E

Comments

If you are converting images to display on an EGA board and monitor this option will optimize the image quality.

This option reduces the palette resolution to two bits and automatically specifies the following: `-8 -c16 -z0 2 0`.

Limitations

The number of colours in an EGA palette must be less than or equal to 16; the number of colours defaults to 16 but can be reduced by using the -c option.

Related options

-c specify number of colours

Example

Convert the image dave1.tga into dave1.pcx, a PCX file with a palette optimized for EGA use:

```
alchemy dave1.tga -E -p
```

False Colour -F

Purpose

False colour an image using the palette from a file. The input image will be changed to use the palette found in the specified filename but no attempt at picking the best match will be done.

Syntax

-F *filename*

Parameter

filename:
Any valid image file which contains a palette.

Comments

This feature can be used to add false colour to monochrome images.

The output file is not dithered.

False colour may only be used with paletted input files.

Limitations

Cannot be combined with the spiff (-S) or match palette (-f) options.

Example

False colour the file scan.gif using the palette from the file colorful.pcx, creating the GIF file new.gif:

```
alchemy scan.gif new -F colorful.pcx -g
```

Gamma correction -G

Purpose

Specify the gamma of an input, output, or palette file and/or perform gamma correction.

Syntax

-G *gammaType gammaValue*

Parameters

gammaType:

i:Specify input gamma
o:Specify output gamma
p:Specify gamma of palette

gammaValue:

0.1 to 4.0

Comments

To perform gamma correction, Alchemy needs to know both the input and output gamma. For some file formats the gamma is known; if you're reading a file with known gamma, such as JPEG, PICT, PCPAINT, or a Targa file with a gamma field, you don't need to specify the input gamma. Likewise, if you're writing a file which has a fixed gamma you don't need to specify an output gamma. Even if reading or writing a file format which has a known gamma you may override it by using the -Gi or -Go option.

However, even if both input and output gamma are known based on the input file and the output format, you must still enable gamma correction for any correction to take place; you can do this with just '-G' (if you had specified input, output, or palette gamma, this would be implied). This is because there are quite a few images around that have specified or implied gammas that are wrong, which could cause Alchemy to make matters worse instead of better.

Typical gamma values are 1.0 for images from Macintoshes and 2.2 for images from PCs.

Examples

To convert the Mac PICT file test.pic, which has a gamma of 1.0, to a PCX file for use on a PC (which should have a gamma of 2.2), use:

```
alchemy test.pic -p -Gi1.0 -Go2.2
```

In this example the input gamma could have been omitted, as PICT files have an implied gamma of 1.0, but it's best to include it to reduce confusion.

To convert the file image.tga, which has a gamma of 2.2, to a GIF file for use on a Mac, matching the palette test.pal which was created with a gamma of 1.5:

```
alchemy image.tga -g -Gi2.2 -Go1.0 -Gp1.5
   -ftest.pal
```

Match Palette -f

Purpose

Match the output to a palette read from a file. The input image will be re-mapped to use the palette found in the specified file.

Syntax

-f *filename*

Parameter

filename:
Any valid image file which contains a palette

Comments

Using the -f option will cause the output image to be dithered (unless you specify no dithering by using the -d0 option).

The -f option can be useful if you are combining several images into a collage or want to match an image to a pre-existing palette. You can also create a custom palette from scratch by using a text editor and creating a .PAL file.

Limitations

Cannot be combined with the spiff option (-S) or the false colour option (-F).

The number of colours in the final image will be equal to the number of colours in the palette being read in.

The specified file must contain a palette (i.e. cannot be true colour).

Related options

-l Generate palette file
-F False colour
-d Dither

Examples

Convert the image bigimage.tif to a pcx file using the palette from the file standard.pal:

```
alchemy bigimage.tif -p -f standard.pal
```

Convert the image colour.gif to a gif file called colour2.gif using the palette from the file newpal.gif:

```
alchemy colour.gif colour2 -fnewpal.gif -g
```

Negate -N

Purpose

Changes the image to a negative.

Syntax

-N

Comments

This option is equivalent to a photographic negative. When used on black and white images black is changed to white and white is changed to black. On colour images each of the Red, Green, and Blue channels are inverted separately (so that bright blue will become bright yellow).

Example

Negate the file sample.gif, generating a GIF file called negative.gif:

```
alchemy sample.gif negative -N -g
```

Palette -8

Purpose

Force the output image to be paletted.

Syntax

-8

Comments

This option is -8 because paletted images are typically 8 bits per pixel.

Alchemy defaults to the -8 option if the input file is paletted or gray-scale.

Some file formats require files to be paletted; for those formats the -8 option is assumed. Some file formats do not have a paletted variation; in those cases the -8 option will be ignored if specified. Some file formats only allow gray-scale files to be 8 bit; in those cases Alchemy will ignore the -8 option if the image being written is not gray-scale.

The actual number of bits per pixel is determined by the -c option (below).

If the input file is true colour the output file will be quantized and dithered (see the -c and -d options below).

Related options

-15 True colour output
-16 True colour output
-24 True colour output
-32 True colour output
-c specify number of colours in image
-d dither

Examples

Convert the JPEG file bigimage.jpg into a paletted TIFF file with 256 colours:

```
alchemy bigimage.jpg -8 -t
```

Convert the Targa file madonna.tga to a 16 colour PCX file (note that the -8 option is implied by the use of the -c16 option):

```
alchemy madonna.tga -c16 -p
```

Palette Selection: Heckbert Tuning -zh

Purpose

Select the specific Heckbert quantization method to use.

Syntax

-zh *heckbertType*

Parameters

heckbertType:

0:Method 0
1:Method 1
2:Method 2
3:Method 3

The default is Method 0.

Comments

The default Heckbert quantization method produces good results for most images; however, you may find the results are better for your images using one of the other methods. This may be especially true when reducing images to a small number of colours (in this case method 1 will probably produce better results).

Image Alchemy v1.7.7 and earlier used Heckbert quantization method 2. To produce images identical to those versions use -zh2 on the command line.

Example

Convert the file input.tga to a gif filed called output.gif with 16 colours, using Heckbert Method 1 for the colour reduction.

```
alchemy input.tga output.gif -g -zh 1 -c16
```

Palette Selection: Palette Sorting -zo

Purpose

Sort the colours in the palette produced by Alchemy

Syntax

-zo *sortType*

Parameters

sortType:

0:None
1:Popularity
2:Luminance (lightest to darkest)
3:RGB
4:Luminance (darkest to lightest)

The default is None.

Comments

This option only affects palettes that are generated by Image Alchemy. To sort an existing palette you can save the image as a true colour file (such as HSI Raw), by using the -24 -r options, and then convert that back to a paletted file, specifying the desired sort type. In most cases this will not change the image (other than the palette order); however if the palette had entries representing colours that are nearly identical then the image may be slightly modified. See the Example section below for an example.

Examples

Convert the image sample.jpg to a GIF file, sorting the palette by Luminance (lightest colours first):

```
alchemy sample.jpg -g -Zo 2
```

Sort the colours by Luminance (darkest colours first) in the paletted image test1.gif:

```
alchemy test1.gif -r -24
alchemy test1.raw test1.gif -g -Zo 4 -o
```

Palette Selection: Palette Swapping -zs

Purpose

Force certain colours to be in certain places when generating a palette.

Syntax

-zs *swapType*

Parameters

swapType:

0:None
1:IBM (colour 0 is black, 7 is white)
2:Macintosh (colour 0 is white, 255 is black)
3:Sun (colour 0 is white, 1 is black)

The default is based on the file type being written out (Macintosh for Mac PICT, Sun for Sun Raster, and None for all others).

Comments

This option forces black and white to be located in certain places in the palette. This is primarily useful when displaying images on certain hardware which uses black and white to display menus and other information.

Example

Generate a GIF file which has black at colour 1 and white at colour 0:

```
alchemy sample.jpg -g -zs 3
```

Palette Selection: Palette Selection -zs

Purpose

Alter the method which Heckbert quantization uses to select colours.

Syntax

-zp *selectionType*

Parameters

selectionType:

0:Mean
1:Median
2:Corner

The default is Mean.

See Appendix B, Colour and Dithering, for an explanation of these choices.

Comments

See Appendix B.

Example

Convert the file sample.jpg to a GIF file, using the corners of the Heckbert boxes to select the palette entries:

```
alchemy sample.jpg -zs 2
```

Spiff -S

Purpose

Enhance the image contrast by stretching the pixel colour values to the full 0 to 255 range.

Syntax

-S *spiffType*

Parameter

spiffType:

a:Histogram stretching
b:Histogram linearization
c:Histogram stretching with black and white ignored

The default is Histogram stretching.

Comments

This command can be used if the image you are converting is shifted in brightness or squished in contrast. This can happen if you scan or digitize a very dark or very bright image.

The default type, histogram stretching, simply insures that the image has pixels which are distributed over the entire output range (0 to 255).

Histogram linearization insures that the distribution of pixels over the output range is linear.

Type c spiffing is identical to type a spiffing except that the colours absolute black and absolute white are ignored in the image. This is useful when you have images which have black borders or white captions, since type a spiffing would treat these as part of the image data and not perform any spiffing.

Histogram linearization can produce significantly better results than histogram stretching for some images. Generally you will want to try both types to see which gives better results.

Limitations

The -S option cannot be used at the same time as the -b option when converting from a true colour image. A work around is to do the operation in two steps, converting it to black and white first and then spiffing the resulting image.

Using the spiff option at the same time as the match palette, -f, or false colour, -F, options is not allowed. This is because the spiff option would be performed before the palette is changed, which would nullify the effects. A work around is to do the matching or false colouring first, and then spiff the resultant image.

Related options

-b Black and White
-f Match palette
-F False colour image
-H Histogram output option

Examples

Convert the file gloomy.pcx into a PCX file called better.pcx:

```
alchemy gloomy.pcx better.pcx -S -p
```

Do the same thing using histogram linearization instead of histogram stretching:

```
alchemy gloomy.pcx better.pcx -Sb -p
```

Swap RGB --n

Purpose

Swap the red channel with the blue channel.

Syntax

--n

Comments

This option is usually only needed if you have an incorrectly written file or are writing a file which will be read by a broken file reader.

Example

Convert the Targa file wrong.tga to another Targa file called right.tga, swapping the red and blue channels:

```
alchemy wrong.tga right.tga -a --n
```

True Colour (15 bits) -15

Purpose

Force the output image to be true colour, 15 bits (5 bits per component).

Syntax

-15

Comments

See the True Colour (24 bits) section, below.

Related options

-8 Paletted output
-16 True colour output (16 bits)
-24 True colour output (24 bits)
-32 True colour output (32 bits)

Example

Convert the GIF file test.gif into an uncompressed, true colour 15 bit Targa file called test.tga:

```
alchemy test.gif -a0 -15
```

True Colour (16 bits) -16

Purpose

Force the output image to be true colour, 16 bits (5 bits each for red and blue, 6 for green).

Syntax

-16

Comments

See the True Colour (24 bits) section, below.

Related options

-8 Paletted output
-15 True colour output (15 bits)
-24 True colour output (24 bits)
-32 True colour output (32 bits)

Example

Convert the GIF file test.gif into an uncompressed, true colour 16 bit Targa file called test.tga:

```
alchemy test.gif -a0 -16
```

True Colour (24 bits) -24

Purpose

Force the output image to be true colour, 24 bits (8 bits per component).

Syntax

-24

Comments

This option is -24 because true colour images are typically 24 bits per pixel.

Some file formats require files to be true colour; for those formats the -24 option is assumed. Some file formats only have a paletted variation; in those cases the -24 option will be ignored if specified.

The file formats which may be either true colour or paletted default to true colour if the input file is true colour.

Certain file formats may only be paletted if the images are gray-scale, in those cases Alchemy will automatically switch to true colour if the output image is colour.

Converting a paletted image to true colour will not improve its quality or change its appearance. The primary use of this option is to force an image to be true colour when converting to a format which allows either paletted or true colour, but where the paletted variation is not well supported (like the Targa image format).

If the file format you are converting to does not have a 24 bit mode the closest true colour mode available will be chosen, in the following order: 32 bit, 16 bit, 15 bit.

Related options

-8 Paletted output
-15 True colour output (15 bits)
-16 True colour output (16 bits)
-32 True colour output (32 bits)

Example

Convert the GIF file test.gif into an uncompressed, true colour Targa file called test.tga:

```
alchemy test.gif -a0 -24
```

True Colour (32 bits) -32

Purpose

Force the output image to be true colour, 32 bits (8 bits per component, 8 bits for the alpha channel).

Syntax

-32

Comments

See the True Colour (24 bits) section, above.

Related options

-8 Paletted output
-15 True colour output (15 bits)
-16 True colour output (16 bits)
-24 True colour output (24 bits)

Example

Convert the GIF file test.gif into an uncompressed, true colour 32 bit Targa file called test.tga (the alpha channel will be empty):

```
alchemy test.gif -a0 -32
```

Undercolour Removal -C

Purpose

Control the undercolour removal process, colour correction, and density correction for output formats which use the CMYK colour space. You will probably want to use an undercolour removal file when converting images to a format which uses the CMYK colour space.

Syntax

-C *filename*

Parameter

filename:
The name of the file which contains the undercolour removal information

Comments

The undercolour removal portion of the file is compatible with the format used by Stork Colorproofing B.V. The format of this file is described in Appendix G, Undercolour Removal Files.

Sample undercolour removal files can be found in the samples directory on the Alchemy distribution disk or tape. We are also developing additional UCR files for use with specific devices; contact us for more information.

Example

Convert the file image.tga to an HP RTL file called image.rtl using the undercolour removal file sample.ucr:

```
alchemy image.tga --r4 -Csample.ucr
```

Uniform Palette -u

Purpose

Use a Uniform Palette.

Syntax

-u

Comments

Instead of using the Heckbert median cut algorithm to generate a custom palette for the image, use a palette with entries which are evenly distributed in the RGB colour cube.

The advantage of using a uniform palette is that it's faster than generating a custom palette. However, this is at the expense of image quality since the palette isn't generated based on image content.

When just viewing a true colour image on a paletted display a uniform palette is used.

The -c option can be used in conjunction with -u to specify the size of the uniform palette; in that case Alchemy will generate a palette with not more than the specified number of colours (but not less than 8).

Limitations

The palette size will not necessarily match the specified size, as the actual size must be the product of three integers. Alchemy picks integers that roughly correspond to the sensitivity of the human eye to red, green, and blue (30%, 59%, and 11%).

Related options

-c Specify number of colours
-d Dither type

Examples

Convert the file many.tga to a gif file using a 256 colour uniform palette:

```
alchemy many.tga -g -u
```

Convert the file many.tga to a gif file with up to 128 colours in a uniform palette:

```
alchemy many.tga -g -u -c128
```

7

Scaling and Filtering Options

Introduction

These options are all related to image scaling and filtering.

Center Image --_

Purpose

The center image option changes the position of the image on the page. It only affects printer and plotter formats.

Syntax

--_ *xSize*[*units*] *ySize*[*units*] (underscore)

Parameter

xSize:
The width of the page.

ySize:
The height of the page.

units:
The units each size parameter is in:
p:Pixels
i:Inches
c:Centimeters
units is optional; the default is pixels. The units value must immediately follow the appropriate size parameter.

Comments

To only center the image in one dimension use 0 for the dimension that you do not want centered (this is useful when you have roll paper loaded into your ink jet plotter).

Limitations

Only works for those output options that support centering. These are Calcomp, EPS, Fargo, HP PCL, and HP RTL.

If you specify the page size in inches or centimeters you must also specify a dots per inch value.

Can be used in conjunction with offset image to offset the image from the center of the page.

Related options

-_ Offset image

Example

Convert the image temp.gif to an HP PCL file at 300 DPI, centering it on the page:

```
alchemy temp.gif -P50 --_ 8.5i 11i -D300
300
```

Change Image Resolution --y

Purpose

Change the image resolution (see the comments section below for a more detailed explanation).

Syntax

--y[*scaleType*] *dotsPerInchX dotsPerInchY*

Parameters

scaleType:

The type of scaling to use:

a:Nearest Neighbor
b:Averaging/Linear Interpolation
c:Lanczos2
d:Lanczos3

scaleType is optional; the default is Nearest Neighbor. The higher the scale type the higher the quality (and the longer the processing time).

dotsPerInchX:

The resolution of the image in the X direction, in dots per inch.

dotsPerInchY:

The resolution of the image in the Y direction, in dots per inch.

Comments

Changing the resolution of an image is a combination of changing the image DPI and the image size (in pixels). For example, if you print an image which was scanned at 600 DPI on a 300 DPI laser printer the printed image would ordinarily be twice the size of the original image. You could use Alchemy to scale the image a proportional amount (using, in this case, `-X 0.5x -Y 0.5x -D300 300`), but this method requires you to calculate the scale factor (0.5, in this case). Changing the image resolution does this for you.

Nearest neighbor type scaling is faster than the other types but introduces aliasing (which reduces image quality). The highest quality scaling supported is lanczos3, but it takes much longer than averaging/linear interpolation and usually doesn't produce significantly better results.

If the DPI information in the input file is missing or incorrect you can supply a DPI value using the -D option.

Related options

-X Scale in horizontal dimension
-Y Scale in vertical dimension
-D Specify image resolution

Examples

Convert a TIFF file that was scanned at 400 DPI to a 300 DPI PCL file, preserving the size of the image:

```
alchemy image.tif -P --y 300 300
```

Convert a GIF file, which was designed to be viewed on a 72 DPI monitor to a GIF file which will look the same size on a 100 DPI monitor, using medium quality scaling (we use the -D 72 72 option because the original GIF file does not contain that information):

```
alchemy orig.gif new.gif -g -D 72 72
   --yb 100 100
```

Convolve Image -yf

Purpose

Applies any one of a number of convolutions to an image (such as sharpen or blur).

Syntax

-yf *filename*

Parameter

filename:
The name of the file which contains the convolution information

Comments

The various convolutions that ship with Image Alchemy are found in the samples\ directory. Additional convolutions are available from our BBS, in the files filters.zip and filters.tar.

Examples

Convert the TIFF file image.tif to a TIFF file called new.tif, sharpening it in the process:

```
alchemy image.tif new.tif -t -yf
samples\sharpen
```

Convert the TIFF file image.tif to an HP RTL file for the NovaJet, scaling it to 2500x2550 and blurring it:

```
alchemy image.tif --r10 -yf samples\blur
-X2500 -Y2550
```

Flip Image -^

Purpose

Flip image vertically (turn image upside-down).

Syntax

-^ (caret)

Comments

Causes the image to be turned upside-down.

May be combined with the mirror image option (see below) to cause the image to be rotated 180 degrees.

Related options

--^ Mirror image

Example

Convert the Targa file head.tga to another Targa file called tail.tga:

```
alchemy head.tga tail.tga -a -^
```

Mirror Image --^

Purpose

Flip image horizontally (mirror image).

Syntax

--^ (caret)

Comments

Causes the image to be mirrored.

May be combined with the flip image option (see above) to cause the image to be rotated 180 degrees.

Related options

-^ Flip image

Example

Convert the Targa file left.tga to another Targa file called right.tga:

```
alchemy left.tga right.tga -a --^
```

Offset Image -_

Purpose

The offset image option changes the position of the image on the page. It only effects printer and plotter formats.

Syntax

-_ *xOffset*[*units*] *yOffset*[*units*] (underscore)

Parameter

xOffset:

The amount to shift the image horizontally.

yOffset:

The amount to shift the image vertically.

units:

The units each size parameter is in:

p:Pixels
i:Inches
c:Centimeters

units is optional; the default is pixels. The units value must immediately follow the appropriate offset parameter.

Comments

The offset is measured from the upper left corner for Calcomp, HP PCL, and HP RTL files and from the lower left corner for EPS files.

Can be used in conjunction with center image to offset the image from the center of the page.

Limitations

Only works for those output options that support an offset. These are Calcomp, EPS, Fargo, HP PCL, and HP RTL.

If you specify the offset in inches or centimeters you must also specify a dots per inch value.

Related options

--_ Center image

Example

Convert the image temp.gif to an HP PCL file at 300 DPI, positioning it on the page 1 inch from the top and 200 pixels from the left:

```
alchemy temp.gif -P -_ 200 1i -D300 300
```

Preserve Aspect Ratio -+

Purpose

Preserve aspect ratio when scaling.

Syntax

-+ (plus)

Comments

If specified with either the -X or -Y option Alchemy will choose the other dimension to preserve the aspect ratio of the image.

If specified in conjunction with both -X and -Y Alchemy will use the values specified as a bounding box, reducing one dimension if necessary to preserve the image aspect ratio.

Limitations

Does not pay attention to the pixel aspect ratio values in the input image.

Related options

-X Scale image in horizontal dimension
-Y Scale image in vertical dimension

Examples

Change the size of the image toobig.gif so that the width is 640 and the height is the correct number to preserve the aspect ratio of the image (the new image will be called notbig.gif):

```
alchemy toobig.gif notbig -X640 -+ -g
```

Do the same thing but guarantee that the image will not be larger than 640 by 480:

```
alchemy toobig.gif notbig -X640 -Y480 -+
   -g
```

Do the same thing but use better quality scaling:

```
alchemy toobig.gif notbig -Xb640 -Yb480 -+
   -g
```

Scale Image in Horizontal Direction -X

Purpose

Scale the horizontal dimension of the image to the specified size.

Syntax

-X[*scaleType*] *size*[*units*]

Parameters

scaleType:

The type of scaling to use:

a:Nearest Neighbor
b:Averaging/Linear Interpolation
c:Lanczos2
d:Lanczos3

scaleType is optional; the default is Nearest Neighbor. The higher the scale type the higher the quality (and the longer the processing time).

size:

The size of the output image in the horizontal dimension.

units:

The units the size parameter is in:

p:Pixels
i:Inches
c:Centimeters
x:Factor

units is optional; the default is pixels. The units value must immediately follow the size parameter.

Comments

Nearest neighbor type scaling is faster than the other types but introduces aliasing (which reduces image quality). The highest quality scaling supported is lanczos3, but it takes much longer than averaging/linear interpolation and usually doesn't produce significantly better results.

Specifying a units value of `x` causes the size parameter to be treated as a scale factor; e.g. `-X 2.5x` scales the image by a factor of 2.5 in the X direction.

If you specify a units for the image size in inches or centimeters you must specify a dots per inch value for the output image.

Limitations

All of the scale types other than nearest neighbor give much better results than nearest neighbor scaling, but they are slower and require a new palette to be generated for paletted output files (you can force alchemy to use the original palette by using the -f option and specifying the original image as the palette file).

Related options

-Y Scale in vertical dimension
-+ Preserve aspect ratio
-D Specify image resolution

Examples

Scale the input image, test.gif, to 640 by 480 using good quality scaling, calling the output file test2.gif:

```
alchemy test.gif test2.gif -Xb640 -Yb480
   -g
```

Scale the input image, big.tga, using fast scaling to an image which is 320 pixels across and the same aspect ratio as the input image, calling the output file out.tga:

```
alchemy big.tga out -X320 -+ -a
```

Scale the input image, oddsize.gif, using the highest quality scaling, to an image which is no larger than 640x480, but has the same aspect ratio as the original image, calling the output image new.gif:

```
alchemy oddsize.gif new.gif -Yd480 -Xd640
   -+ -g
```

Do the same thing as the previous example, but retain the same palette:

```
alchemy oddsize.gif new.gif -Yd480 -Xd640
   -+ -g -f oddsize.gif
```

Scale the input image, test.gif, to 2.5 times its original size in both dimensions using good quality scaling, calling the output file test2.gif:

```
alchemy test.gif test2 -Xb2.5x -Yb2.5x -g
```

Scale the input image, silly.tga, to 1/3 its original size in the X dimension and 1/4 the original size in the Y dimension, using low quality scaling in the X dimension and very high quality scaling in the Y dimension, calling the output file test.tga:

```
alchemy silly.tga test -a -Xa.33x -Yd0.25x
```

Scale, using type b scaling, the input image, test.jpg, to 3" x 4.5" inches writing a 300 DPI HP PCL file:

```
alchemy test.jpg -P -Xb3i -Yb4.5i
   -D300 300
```

Print all JPEG images in the current directory to an HP LaserJet at 300 DPI, using dither type 22, scaling the images to fill the page and preserving aspect ratio (we use 8.16" x 10.66" inches as the printable area since the printer has a 1/6" border on all four edges):

```
alchemy -- *.jpg -P -Xb8.16i -Yb10.66i -+
   -D300 300 -d22
```

Scale Image in Vertical Direction -Y

Purpose

Scale the vertical dimension of the image to the specified size.

Syntax

-Y[*scaleType*] *size*[*units*]

Parameters

scaleType:

The type of scaling to use:

a:Nearest Neighbor
b:Averaging/Linear Interpolation
c:Lanczos2
d:Lanczos3

scaleType is optional; the default is Nearest Neighbor. The higher the scale type the higher the quality (and the longer the processing time).

size:

The size of the output image in the vertical dimension.

units:

The units the size parameter is in:

p:Pixels
i:Inches
c:Centimeters
x:Factor

units is optional; the default is pixels. The units value must immediately follow the size parameter.

Comments

Nearest neighbor type scaling is faster than the other types but introduces aliasing (which reduces image quality). The highest quality scaling supported is lanczos3, but it takes much longer than averaging/linear interpolation and usually doesn't produce significantly better results.

Specifying a units value of `x` causes the size parameter to be treated as a scale factor; e.g. `-Y 2.5x` scales the image by a factor of 2.5 in the Y direction.

If you specify a units for the image size in inches or centimeters you must specify a dots per Inch value for the output image.

Limitations

All of the scale types other than nearest neighbor give much better results than nearest neighbor scaling, but they are slower and require a new palette to be generated for paletted output files (you can force alchemy to use the original palette by using the -f option and specifying the original file name).

Related options

-X Scale in horizontal dimension
-+ Preserve aspect ratio
-D Specify image resolution

Examples

See the -X option, Scale Image in Horizontal Direction, above, for examples.

Specify Image Aspect Ratio -D

Purpose

Specify aspect ratio for the output image.

Syntax

-D *aspectRatio*

Parameter

aspectRatio:
The percentage of the width of a pixel to its height.

Comments

This option does not actually change the aspect ratio of the image, it just adds the aspect ratio value to the output file. This is important when trying to export the image to software which expects this information.

The aspect ratio of an image is the ratio of the width of a single pixel to the height of a single pixel. (So to specify an aspect ratio of 5:6 use -D 83, since (5/6)*100 is 83).

Alchemy attempts to preserve the aspect ratio value when converting images whenever one is found in the input image, but since so few file formats have aspect ratio information this hardly ever happens.

To write an output image without aspect ratio information specify an aspect ratio of 0 (zero).

This option also has an effect when using the MS-DOS version of Image Alchemy and displaying images.

Limitations

It is not possible to specify both an aspect ratio and a dots per inch value for an image. This is because specifying a dots per inch value implies an aspect ratio.

Many file types do not have an aspect ratio value; specifying one when writing such a file type will have no effect.

Related options

-D Specify resolution

Examples

You are converting a 640x350 IBM EGA PCX image called ega.pcx (which has an aspect ratio of 35:48) to a TIFF image and you want the TIFF image to have the correct aspect ratio value (so that an intelligent TIFF reader will correctly interpret the image). Note that the value of 73 is (35/48)*100:

```
alchemy ega.pcx -D 73 -t
```

The resulting image will still be 640x350, but the TIFF file now contains the information that the pixels are not square (and in fact are 35:48).

If you had instead wanted to convert the image to a 640 by 480 image (with square pixels) you could have used:

```
alchemy ega.pcx -Y480 -D100 -t
```

The -D option isn't really needed here, since any software reading the TIFF file will assume that if there is no aspect ratio specified the pixels are square.

Specify Image Resolution -D

Purpose

Specify image resolution in dots per inch for the output image.

Syntax

-D *dotsPerInchX dotsPerInchY*

Parameters

dotsPerInchX:
The resolution of the image in the X direction in dots per inch.

dotsPerInchY:
The resolution of the image in the Y direction in dots per inch.

Comments

You must specify both dotsPerInchX and dotsPerInchY, even if they are the same.

When converting from a raster file this command does not actually change the resolution of the image, it just adds the resolution fields to the output image. This is important when trying to import the image into software which expects this information. For example, Microsoft Word is much more likely to give the expected results when importing a TIFF image for printing on a laser printer if the image has a resolution of 300 dpi.

Reasonable values to use for dotsPerInch include 72 (the resolution of a 13 inch monitor displaying 640x480) and 300 (the resolution of most laser printers).

To write an output image without resolution information specify a resolution of 0 0 (zero zero).

Alchemy will preserve this information when converting files whenever possible.

Many file types do not have a resolution value, specifying one when writing such a file will only effect raster scaling functions when using the inches or centimeter output option.

This option can also has an effect when using the MS-DOS version of Image Alchemy and displaying images.

Limitations

It is not possible to specify both an aspect ratio and a dots per inch value for an image. This is because specifying a dots per inch value automatically implies an aspect ratio.

This option is ignored when writing a file format which does not have image resolution.

Related options

-D Specify aspect ratio

Examples

Convert the Targa file input.tga to a TIFF file called output.tif, specifying that the resolution of the image in the TIFF file is 300 dpi by 300 dpi:

```
alchemy input.tga output -t -D 300 300
```

Convert the file scan.tif to a DCX variation of a PCX file, scaling the output image to 1500 by 750 (preserving the image's aspect ratio) and setting the resolution to 200 DPI by 100 DPI (this is useful if you will be faxing the image using a fax card):

```
alchemy scan.tif -p1 -X1500 -Y750 -+
-D 200 100
```

8

Viewing Options

MS-DOS Only

Introduction

Image Alchemy is primarily designed as an image file conversion utility but it can also display images on properly equipped MS-DOS based computers.

Using wildcards or multiple file names allows you to display a series of images. After each image is displayed, pressing the space bar will skip to the next image. After the last image is displayed pressing the space bar will return to DOS. Pressing the space bar while an image is being displayed will stop the display of the image (see the Actions during viewing section below for other things you can do while displaying images).

Display hardware

Depending on the hardware you have installed, Alchemy supports the following display resolutions: 640x480, 800x600, 1024x768, and 1280x1024.

Also depending on the hardware, Alchemy supports the following display depths: 8 bit, 15 bit, 16 bit, and 24 bit (for 256, 32768, 65536, and 16,777,216 colours, respectively).

In addition, Alchemy supports the standard VGA mode of 320x200x256, the quasi-standard VGA mode of 360x480x256, and the common SVGA mode of 640x400x256.

When instructed to display an image, Alchemy automatically detects which type of display board you have installed. If there are multiple display boards installed in your computer then Alchemy will display images on the first board it finds, searching in the following order:

Western Digital based 8514/A board
AI compatible 8514/A board
XGA board
VESA compatible SVGA board
Other SVGA board

Western Digital 8514/A

8514/A boards which are equipped with the Western Digital chipset are automatically recognized by Alchemy. Depending on the model board and the amount of memory installed, 640x480x256, 1024x768x256, and 1280x1024x256 modes are available.

AI 8514/A

Alchemy requires AI to be installed to use 8514/A displays which aren't based on the Western Digital chipset. In addition to 8514/A boards Alchemy should also be able to display on other AI compatible boards, such as 340x0 based boards; however this has not been tested. For AI based boards the only resolution available is 1024x768x256.

XGA

Alchemy automatically detects the presence of an XGA or XGA2 board and will use it when displaying images. The display modes available for XGA boards are 640x480x256, 1024x768x256, and 640x480x65536 (the actual modes available vary with the model XGA board installed and the amount of memory available).

VESA

The best support for SVGA boards is available for VESA compatible SVGA boards. VESA is an SVGA standard which allows application software, such as Image Alchemy, to interrogate the SVGA board to determine which display modes are available.

Some SVGA boards have VESA support built directly into the BIOS found on the board; in this case Alchemy will automatically detect the VESA driver and use it. Other SVGA boards require a software driver to be installed; these drivers are usually found on the floppy disks which came with your SVGA board (typically the driver is called VESA.EXE).

If you can't find a driver on the diskettes and the documentation does not explicitly mention that VESA support is built into the BIOS you might call the manufacturer to see if a VESA driver is available.

VESA drivers are currently available for SVGA boards using chipsets from Cirrus Logic, ATI Technologies, Chips and Technologies, Everex Systems, Genoa Systems, Paradise Logic, Sigma Designs, STB Systems, Tecmar, Headland Technology (Video 7), Orchid Technology, Appian Technology, Trident Microsystems, and Oak Technology.

Other SVGA

If Alchemy cannot find a VESA SVGA board it attempts to determine what kind of SVGA board is present. If Alchemy can identify the type of SVGA board installed, either a 640x400x256 or 640x480x256 mode will be available.

SVGA boards which are known to work with Alchemy include Paradise, Tseng Labs 3000 & 4000, Video 7, Trident, and Everex chipset based SVGA Boards.

VGA

The 320x200x256 mode is a standard IBM VGA mode and will work on all VGA boards. The 360x480x256 is a non-standard VGA mode which should also work on all VGA boards.

Display Resolution

Unless you explicitly specify a resolution after the view command, Alchemy automatically uses the lowest resolution mode which will display the entire picture.

Alchemy can be told to not use above a particular resolution by setting the environment variable `alchemy` to the largest horizontal resolution to be used.

For example, if your monitor can only display up to 800x600 pixels, but your VESA compatible VGA board can display up to 1024x768 pixels. You would `set alchemy=800`, to insure that Alchemy won't try to use the 1024x768 mode. You may want to add this command to your `autoexec.bat` file, so that it is automatically set when your computer is turned on.

When an image is displayed that is smaller than the screen resolution the image will be centered in the display and the area around the image will be set to the darkest colour in the image (which is usually black).

Wrong RGB order

There seem to be a number of SVGA boards that have incorrect RGB order information in their VESA driver (thus switching the red and blue information). You can correct for this problem while viewing by the using the swap RGB option (--n); see Chapter 6 for more information.

Actions during viewing

While images are being viewed there are several actions that you can perform. These include: skipping to the next image (if you are using wildcards to view multiple images), marking the current image, and deleting the current image file. These actions can be useful if you are viewing a large number of images (such as you might have downloaded from a bulletin board).

These keys may be pressed either while the image is being displayed, or afterward, while Alchemy is waiting for a keystroke to go on to the next image (pressing any other key at that point will skip to the next image):

Key	Action
`q`	Quit viewing
`s`	Skip to next image
`m`	Mark the image
`alt-d`	Delete the image

A list of images that were marked is displayed after Alchemy finishes. If you redirect the output from Alchemy to a file, the file will contain a list of the images that were marked. This file can then be used with Alchemy as a response file.

For example, to view all of the GIF files in the current directory, redirecting the resulting list of any files that are marked to a file called list:

```
alchemy *.gif -v >list
```

If you then what to convert all of the marked files to TIFF files:

```
alchemy -- @list -t
```

See Chapter 2 for more information on response files.

Disabling actions

You can disable these keystrokes by setting the alchemy environment variable to k (e.g. `set alchemy=k` at the DOS prompt).

Offset View -_

Purpose

The offset view option changes the position of the image on the screen during viewing.

Syntax

-_ *xOffset yOffset* (underscore)

Parameter

xOffset:
Number of pixels to shift the image horizontally.

yOffset:
Number of pixels to shift the image vertically.

Examples

View moving the image up 100 pixels:

```
alchemy madonna.gif -v -_ 0 -100
```

View moving the image to the right 200 pixels and down 50 pixels:

```
alchemy madonna.gif -v -_ 200 50
```

View Image -v

Purpose

View file.

Syntax

-v *horizontalResolution*

Parameter

horizontalResolution:

320:Use 320x200 mode
360:Use 360x480 mode
640:Use 640x480 mode
800:Use 800x600 mode
1024:Use 1024x768 mode
1280:Use 1280x1024 mode

Comments

If displaying on a Western Digital chipset 8514/A or VESA compatible VGA board, an optional parameter may follow the -v command. This parameter specifies horizontal resolution and may be 320, 360, 640, 800, 1024, or 1280. The default is to use the lowest resolution which can fit the entire image. You may set the environment variable `alchemy` to indicate the highest horizontal resolution you want Alchemy to use when displaying images (for example, `set alchemy=800` to will cause Alchemy to use only 640x480 and 800x600 resolutions when displaying images).

If the image is true colour, a uniform palette will be used and the image will be dithered (dithering may be disabled by use of the -d option, see above). See Appendix B, Colour and Dithering, for more information.

Related options

-V Reduce image to fit display

Example

View the image madonna.gif:

```
alchemy madonna.gif -v
```

View Image in True Colour Mode --v

Purpose

View file using 15, 16, or 24 bits/pixel mode. This allows true colour images to be viewed without dithering to a uniform palette.

Syntax

--v *horizontalResolution*

Parameter

horizontalResolution:

640:Use 640x480 mode
800:Use 800x600 mode
1024:Use 1024x768 mode
1280:Use 1280x1024 mode

Comments

Requires a VESA compatible SVGA board or a Tseng 4000, S3, ATI, Genoa, Speedstar24, or a Speedstar24X with an appropriate DAC and at least 1 megabyte of memory on the SVGA board.

Resolutions above 640x480 are only supported by SVGA boards with a VESA driver. 640x480 mode is supported for various SVGA boards with sufficient memory and the correct DAC.

Alchemy automatically picks the highest colour resolution which will fit the image you are trying to view. For example, if your SVGA board supports 800x600x15 bit and 640x480x24 bit, Alchemy will use the 640x480x24 bit mode when viewing images which are 640x480 and smaller and the 800x600 mode when viewing larger images. You can of course override this by giving Alchemy a resolution parameter after the view command (for example, `--v 640`, to view in 640x480x24 bit mode). You may also set the environment variable `alchemy` to indicate the highest horizontal resolution you want Alchemy to use when displaying images (for example, `set alchemy=800` to will cause Alchemy to use only 640x480 and 800x600 resolutions when displaying images).

If the image being displayed is a 24 bits per pixel true colour image, and the display mode is 15 or 16 bits per pixel, the image will be dithered (dithering may be disabled by use of the -d option, see above).

Example

View madonna.tga:

```
alchemy madonna.tga --v
```

View Scaled Image -V

Purpose

View image while scaling image to fit on monitor and correcting aspect ratio.

Syntax

-V *horizontalResolution*

Parameter

horizontalResolution:

320:Use 320x200 mode
360:Use 360x480 mode
640:Use 640x480 mode
800:Use 800x600 mode
1024:Use 1024x768 mode
1280:Use 1280x1024 mode

Comments

If displaying on a Western Digital chipset 8514/A or VESA compatible VGA board, an optional parameter may follow the -v command. This parameter specifies horizontal resolution and may be 320, 360, 640, 800, 1024, or 1280. The default is to use the lowest resolution which can fit the entire image. You may set the environment variable `alchemy` to indicate the highest horizontal resolution you want Alchemy to use when displaying images (for example, `set alchemy=800` to will cause Alchemy to use only 640x480 and 800x600 resolutions when displaying images).

This command will scale the image and correct the aspect ratio of the image by removing rows and/or columns from the image.

Note that this option can also be useful for displaying images which are not larger than the screen but which have an aspect ratio different than the display.

Limitations

Alchemy assumes that the aspect ratio of a display pixel is 1:1 when in 640x480, 800x600, 1024x768, and 1280x1024 modes, 5:6 when in 640x400 mode and 320x200 modes, and 16:9 in 360x480 mode.

If not otherwise specified by using the -D option or in the file, Alchemy assumes that the aspect ratio of pixels in 640x400 images and 320x200 images is 5:6 and the aspect ratio of pixels in 640x350 images is 35:48. You can override any of these assumptions with the -D option.

Don't worry if this is confusing; in practice Alchemy deals with everything automatically if you use the -V option. However, there is a problem with displaying 320x400 IFF files; see Appendix A, Answers to Frequently Asked Questions, for more information.

Related options

-D Specify image resolution
-v View image

Example

View madonna.gif:

```
alchemy madonna.gif -V
```

View Scaled Image in True Colour Mode --V

Purpose

View image in 15 bit mode while scaling image to fit on monitor and correcting aspect ratio.

Syntax

--V *horizontalResolution*

Parameter

horizontalResolution:

640:Use 640x480 mode
800:Use 800x600 mode
1024:Use 1024x768 mode
1280:Use 1280x1024 mode

Comments

Requires a Tseng 4000, S3, ATI, Genoa, or Speedstar24 or an appropriate VESA compatible SVGA board with an appropriate DAC and 1 megabyte of memory on the SVGA board.

Resolutions above 640x480 are only supported by SVGA boards with a VESA driver. 640x480 mode is supported for various SVGA boards with sufficient memory and the correct DAC.

Alchemy automatically picks the highest colour resolution which will fit the image you are trying to view. For example, if your SVGA board supports 800x600x15 bit and 640x480x24 bit, Alchemy will use the 640x480x24 bit mode when viewing images which are 640x480 and smaller and the 800x600 mode when viewing larger images. You can of course override this by giving Alchemy a resolution parameter after the view command (for example, `--v 640`, to view in 640x480x24 bit mode). You may also set the environment variable `alchemy` to indicate the highest horizontal resolution you want Alchemy to use when displaying images (for example, `set alchemy=800` will cause Alchemy to use only 640x480 and 800x600 resolutions when displaying images).

If the image being displayed is a 24 bits per pixel true colour image, and the display mode is 15 or 16 bits per pixel, the image will be dithered (dithering may be disabled by use of the -d option, see above).

This command will scale the image and correct the aspect ratio of the image by removing rows and/or columns from the image.

Note that this option can also be useful for displaying images which are not larger than the screen but which have an aspect ratio different than the display.

Limitations

The same limitations as for scaled 8 bit viewing apply (see above).

Related options

-D Specify image resolution
--v View image in True colour mode

Example

View big.jpg in true colour 640x480 mode, reducing the image to fit on the screen:

```
alchemy big.jpg --V 640
```

A

Answers to Frequently Asked Questions

Question **When I view a JPEG compressed image on my VGA board it looks much worse than when I first convert it to a GIF file and then view it. Why is this?**

Answer To save time Alchemy automatically uses a uniform palette when you are just viewing a true colour image. When converting to a different file format Alchemy uses Heckbert quantization to generate a palette. The difference in image quality is the difference between using a uniform palette and an optimum palette. See Appendix B, Colour and Dithering, for more information on palette generation.

Question **Why is decompressing or compressing a JPEG image so slow?**

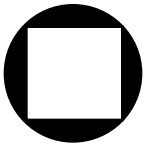
Answer There are a large number of calculations that have to be done during JPEG compression. This is an inherent limitation of JPEG compression. Image Alchemy has been optimized quite a bit to reduce the number of calculations, and we are working to further reduce the number of calculations. If you are transferring files over modems or storing them on slow media (tape) the compression times are usually more than made up for by the decrease in transmission or retrieval times.

Question

I'm using Alchemy to print an image. The print out is much darker than the original image. Why is this?

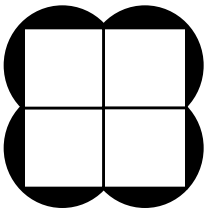
Answer

Many hard copy output devices, including laser printers, ink jet printers, and ink jet plotters, have a property known as dot gain. Dot gain causes more toner or ink to be placed on the paper than is expected. This is caused by the fact that the individual pixels being output are round, and in order to completely fill in a square grid with round pixels the round pixels have to be larger than the square (in fact the circle has $\pi/2$ times as much area as the square). In this example of a single pixel the black area represents the "extra" toner or ink that is being printed:



You can compensate for dot gain by adjusting the gamma of the image during the conversion process. The exact gamma value will depend on the output device, but in general, specifying an output gamma of 2.0 produces good results (`-Gi 1.0 -Go 2.0` on the command line will accomplish this). (If you are using a UCR file you can also compensate for dot gain by using a UCR file with a gamma of 2.0.)

It is not as necessary to compensate for dot gain when printing at a resolution less than the printer's maximum resolution. This is because the output device automatically groups individual pixels together to make the output pixel, which reduces the amount of extra toner or ink being deposited on the page, as in this example of printing a 150 DPI pixel on a 300 DPI device:



The same is true if you are using dithering types 20 and 22 (since those dithering types cluster the dots).

Question

How do I capture screens when running in Microsoft Windows (or on the Macintosh)?

Answer

To capture the current screen when running Microsoft Windows press PRINT SCREEN. This copies a bitmap of the entire screen onto the clipboard. Then open the Paintbrush program which comes with Windows and select Paste to copy the image from the clipboard. The image may now be saved as a BMP file which Alchemy can convert.

On the Macintosh press Command-Shift-3. This will create a file on your hard disk called `Picture n`, where n is a number which starts at 1 and increases by 1 every time you capture another screen. This file can be converted by Alchemy.

Question

Why can't my favorite desktop publishing package read the TIFF file I wrote with Image Alchemy?

Answer

TIFF is an extremely versatile standard; it can handle anything from 1 bit images to full colour images with an alpha channel. Also, TIFF allows many different types of compression. Unfortunately this versatility means that it's difficult for a single piece of software to be able to read in every valid TIFF file.

If the software specifies the classes of TIFF it can read, you can force Alchemy to write out a specific TIFF class by using the following options:

class B:-8 -b -c2 -t2
class G:-8 -b -t1
class P:-8 -t1
class R:-24 -t1

Class B is black and white, Class G is gray-scale, Class P is paletted, and Class R is true colour.

If the supported classes are not specified, experiment with various combinations of -24, -8, -b, and -c. In this case it is usually best to use no compression (-t0) while experimenting with the other options, as many TIFF readers have difficulty with compressed files. When you find a set of options that work, then you can try various compression modes to save space. Be aware that using the -b option will force the output file to be gray-scale and you will lose the colour information in the file (most desktop publishing programs only have support for gray-scale TIFF files).

You may also have to use the -Dn n option to specify the resolution of the image (this is especially true when converting from a file format which does not have a value for image resolution). You can generally tell if this is necessary because the program you are using to read in the TIFF file will claim that the file is unreasonably large or small. Usually, if you are using a 300 DPI Laser Printer you want to make the TIFF file 300 DPI x 300 DPI (-D 300 300).

If you would like further information specific to using Image Alchemy with your word processor or desktop publishing program please contact us; we will be maintaining a list of how to make Alchemy work with other software packages. Similarly if you figure out how to import files into a specific package let us know and we will add your tips to our documentation.

Question

Why can't my paint package read the Targa file I wrote with Image Alchemy?

Answer

Some software which reads Targa files cannot handle compressed files. In addition, some software can read true colour Targa files, but cannot read paletted or gray-scale files. Image Alchemy can be forced to write out a true colour file by using the -24 option.

Question

When I convert a GIF file to a JPEG file and then back to a GIF file the final GIF file is twice the size of the original. Why is this?

Answer

There are two things which might cause this to happen:

JPEG compression doesn't really work well for images which have large areas which are all the same colour. The reason for this is that JPEG is a lossy compression technique. Therefore you are not going to get back exactly the same values for each pixel in an area that was one solid colour before being JPEG compressed. But GIF compression works much better on areas which are one solid colour, so, when you GIF compress these areas, they are quite a bit larger than they were before. The solution to this problem is to use HSI JPEG compression, which automatically detects large areas of solid colours and does not JPEG compress them. The problem with HSI JPEG compression is that it isn't compatible with JPEG or JFIF.

The other possibility is that the input GIF file didn't have very many different colours. When you converted it to a JPEG file the number of colours in the file was lost (JPEG gray-scale files always use 256 shades, and JPEG colour files are always true colour). When the JPEG file was converted back to a GIF file Alchemy assumed you wanted 256 colours in the file, and a 256 colour GIF file is bigger than a 16 colour GIF file. To prevent this you can use a -c32 (or however many colours the original had) option in the command line; this forces Image Alchemy to use that many colours for the output file.

Question

I keep getting "Out of Memory trying to …" messages. Help!

Answer

Image Alchemy is running out of memory. If you are running on an IBM PC and you have Alchemy/386 you can use `alch386` instead of `alchemy` to do the conversion (if you were running `alch386` when you received this error please contact us). If you don't have Alchemy/386 please contact us for information on how to upgrade.

If you are running one of the UNIX versions of Alchemy this message indicates that you are running out of swap space. Contact your system administrator to find out how you can increase the size of your swap space.

Question

I am using Alchemy to display a 320x400 IFF image created by an Amiga. When I use just the -v option the image comes out tall and skinny. When I use the -V option, which is supposed to correct the aspect ratio, things get worse instead of better (the image is even skinnier). What's going on?

Answer

As near as we can tell, some Amiga software has a different idea of what aspect ratio is than the rest of the world.

For displays, aspect ratio is defined as the ratio of the width of a single pixel to the height of a single pixel. So if you have square pixels (which you do on a standard monitor in 640x480 mode) the aspect ratio is 1 to 1 (commonly written as 1:1). When you change display modes the height and width of the total display area does not change; what is changing is the width and height of each pixel, which means that the aspect ratio changes. For example, a 640x400 display has an aspect ratio of 1:1.2 (that means each pixel is 1.2 times as tall as it is wide (which makes sense since 480/400 equals 1.2)). A 640x200 display has an aspect ratio of 1:2.4.

Now this is where it gets interesting in terms of IFF files. The aspect ratio number stored in Amiga IFF files for 320x400 images is 1:1.1, meaning pixels are 1.1 times as tall as they are wide, so therefore the actual image should be the equivalent size of a 320x440 image with square pixels. And this is what Alchemy will attempt to display when you use the -V option (Alchemy never makes any dimension larger, so the actual image Alchemy displays is 291x400, which is the same ratio as 320x440). However this is obviously wrong, as you can tell when you examine an image. As near as we can tell the correct aspect ratio of these images is 5:3 (the math we used to come up with this number is 640/320:480/400). And if you tell Alchemy to override the aspect ratio by using a -D 167 option (167 because 5/3*100 is 166.6666) the image displays correctly. Why Amigas create images which claim they are 1:1.1 remains a mystery.

Question

I told Alchemy to convert a PCX file to an 8 bit GIF file (using the -8 option). Yet when I get statistics on the file (using -x) Alchemy reports the file only has 16 colours.

Answer

Alchemy will always store the file using the smallest bits-per-pixel allowable for the given image (this results in the smallest possible file). In this case the input file only had 16 colours in it.

Things get more unpredictable with formats such as Sun Raster (which requires 1 bit files to be black and white) and SGI (which requires 8 bit files to be gray-scale). In these cases Alchemy will always do the best it can (giving you a warning message if it does something which may surprise you later).

Question

I've converted a Mac PICT file to a GIF file, but the GIF file is missing some or all of the information that was in the PICT file. What happened to it?

Answer

PICT files are a combination of drawing commands (such as lines, rectangles, and circles) and raster areas (called pixMaps). Alchemy can only read the raster portions of the files. Programs such as MacDraw and MacDraft write out files with drawing commands, programs such as MacPaint write out files which are entirely raster areas (pixMaps), and some programs, such as SuperPaint can write out files which are either, or a combination of both. If you are using such a program check the documentation on how to write out files in "paint" mode.

Question

Why can't Image Alchemy read in JPEG files produced by Kodak's ColorSqueeze (or Sun's VFCtool)?

Answer

Some software packages support an obsolete version of JPEG. Image Alchemy supports the JFIF format and should work with any other JPEG software which also claims JFIF compatibility. If other software you are using claims to support the JFIF format and you are having trouble, please contact us. If the other software does not support JFIF, contact the manufacturer and tell them they should send you an update which does (you can tell them to contact us if they need a copy of the JFIF standard).

Question

When I convert a 32 bit Targa file to a GIF file and then to a JPEG file it doesn't look nearly as good as if I convert the Targa File directly to the JPEG file. What can I do to maintain high quality in JPEG compressed files?

Answer

When the Targa file was converted to the GIF file Image Alchemy had to reduce the number of colours in the file (the original Targa File had up to 16 million colours, GIF files are limited to 256 colours). This step is known as colour quantization (Image Alchemy uses the Heckbert Median Cut method for quantization; see Appendix B, Colour and Dithering, for more information). The difficulty with colour quantization is that it leaves artifacts known as colour banding. To reduce this phenomenon Image Alchemy dithers the image (you can see the effect of colour banding by turning off dithering by using the -d0 option). Unfortunately a dithered image does not JPEG compress very well (dithering adds a lot of high-frequency information to an image; JPEG compression attempts to remove much of that information). In addition JPEG images are always continuous colour images, so when the JPEG file is decompressed it has to be colour quantized and dithered again. Dithering a previously dithered image reduces the quality even more. The solution is to use the best starting quality you can for JPEG compression, ideally a continuous tone image. The compressed image size will be smaller than if you had started with a paletted image and the quality will be better.

Question

I've converted an HP PCL file to a GIF file, but the GIF file is missing some or all of the information that was in the PCL file. What happened to it?

Answer

PCL files have the same problem as PICT files (see above); they are a combination of text, fonts, drawing commands (such as lines and rectangles), and graphics (also called rasters). Alchemy can only convert the raster areas in PCL files. Unfortunately there isn't any general way to preserve the rest of the data with Alchemy.

If you are using Windows 3.1 and printing using TrueType fonts you can select the Print TrueType As Graphics check box in the printer setup dialog box under the Options choice. This will cause Windows to print all information as graphics which Alchemy can then successfully convert.

If you are running Microsoft Windows 3.x you can also install Adobe Type Manager (ATM). ATM automatically intercepts any text commands and converts them to rasters. In addition, the standard Windows 3.x HP PCL driver only generates rasters, not vectors. So the file will appear in its entirety when converted by Alchemy.

Contact us if you want further information on using Alchemy with Windows.

Question

I converted a PCX file with 16 colours to a 16 shades of gray TIFF file using the -b and -t options. The 16 colour PCX file had some shades of gray in it which were changed in the TIFF file. How can I prevent this?

Answer

The problem is that gray-scale TIFF files have a uniformly spaced gray palette. If you create a TIFF file with 16 shades of gray it will have the following shades in it: 0, 17, 34, 51, 68, 85, 102, 119, 136, 153, 170, 187, 204, 221, 238, and 255. However the 16 colour PCX file you started with probably didn't have those exact colours in it (for example, PCX files written out by Windows 3.0 Paint have shades of gray which correspond to 0, 128, 192, and 255). So Alchemy did the best it could and matched the input colours to the output colours (and depending on the other options that you specified may also have dithered the image).

The solution is to tell Alchemy to write out a 256 colour gray-scale TIFF file (which you do by adding a -c256 to the -b and -t options). This file still has a uniform gray palette; but that palette now contains every colour: 0, 1, 2, 3, …, 255. Therefore Alchemy can map, for example, the colours 128 and 192 to their exact match. This does have the disadvantage of making the resulting 256 colour TIFF file twice as large as the 16 colour TIFF file, but this is the only way to guarantee that Alchemy can find an exact match for all the shades of gray in the input file.

Question

How do I get a copy of the JPEG standard?

Answer

The JPEG standard is an ISO/IEC standard and you should contact your local ISO/IEC office to get a copy. The document number is ISO IS 10918-1.

In the United States you can contact ANSI at:

ANSI
11 West 42nd St.
New York, NY 10036
(212) 642-4900

Question

Do you give multiple copy discounts? Do you have site licenses? Are you interested in licensing the source code?

Answer

Yes. Yes. Yes. Contact us for more information.

B

Colour and Dithering

Paletted vs. true colour

Colour images are usually stored in one of two ways: as an array of direct colour values (usually red, green, and blue) (referred to as a true colour file in this document) or as an array of indices into a colour-map which contains red, green, and blue colour values (referred to as a paletted file in this document).

Paletted images exist because they take less memory, so the hardware to display them is less expensive. The dominance of paletted hardware is changing as the price of memory and the processing power it takes to update large amounts of memory at a reasonable speed drops.

Until true colour graphics devices become the norm, there is a need to convert images from true colour to paletted. This conversion is done in two steps: the first is to generate a palette for use by the image; the second is to map the image to the new palette.

Colour cube

The colour model generally used by computers is a cube with red, green, and blue as the axes (this is known as a colour cube or RGB cube). Each point inside the cube is a different colour, depending on the amount of red, green, and blue used. In nature each of the three axes is nearly continuous, therefore there are a nearly infinite number of colours available. Computer hardware and software represent colours in a discrete fashion.

For true colour displays or file formats the number of discrete positions along each axis of the colour cube gives the colour resolution of the output device. For example, a Targa 24 board for an IBM PC has 8 bits per red, green, and blue channel for a total of 24 bits (or 256 discrete shades of each colour, for a total of 16 million colours (256x256x256)). This is also the colour resolution of most true colour file formats.

A 15 bit SVGA boards has 5 bits per channel, for a total of 32x32x32 different colours (32,768). This is the same colour resolution as a Targa 15 file.

A paletted display or image file has the same colour resolution limit as a true colour display or image file, but in addition there is a limit on how many points inside the cube can be used at the same time. An 8 bit file format, such as GIF, allows 256 different colours out of 16 million. A non-true-colour SVGA board also only allows 256 different colours at one time.

So, converting a true colour file to a paletted file involves reducing the number of occupied points in the colour cube. There are several ways this can be done.

Generating a palette

Image Alchemy supports two methods of generating a palette:

Uniform palettes

The simplest and fastest method is to use a palette containing colours which are uniformly distributed in the RGB cube, this is referred to as a uniform palette. This has the advantage that it's fast and the same palette can be used for any image; the primary disadvantage is that most images don't contain colours from everywhere in the RGB cube, so palette entries are wasted representing colours that aren't needed for the particular image being converted.

Optimal palettes

To generate a palette which is better for representing a particular image, Image Alchemy supports Heckbert's median cut algorithm. This algorithm first builds a three dimensional table (a histogram cube) indicating how popular any given colour in the RGB cube is in the image being converted. It then proceeds to subdivide this histogram cube (by dividing boxes in half) until it has created as many boxes as there are palette entries. The default Heckbert method bases this decision as to where to divide a box is based on the distribution of colours within the box. This will create boxes which have approximately equal popularity in the image. Using the -zh 1 option changes the algorithm to instead divide the boxes in half, creating boxes which are therefore equal in size.

Assigning colours

Palette entries are then assigned to represent each box using one of several different methods. You can change the method used to select a colour to represent each box by using the -zs option (see chapter 6, for more information).

The default method is to use the mean of all the colours in the box. However for some images slightly better results can be obtained by using the center of the box (without regard to where the pixels are in the box).

For images being reduced to a very small number of colours (less than 16) better results can be obtained by using a corner of the box (the boxes tend to be large when reducing an image to a small number of colours; therefore picking colours near the centers of the boxes will give you muddy colours, while using corners of the boxes will give you saturated colours). And having saturated colours allows the dithering algorithms to generate better looking images.

There are other methods of generating a palette from an image, but Heckbert's algorithm is generally regarded as the best tradeoff between speed and quality.

Mapping the image to the palette

The next step is to map the image to the new palette; this is where dithering becomes important.

No dithering

The simplest approach is to map every colour in the original image to the palette entry which is closest to it (this is what Image Alchemy does if you specify no dithering).

However, since the palette entries generally represent several different colours in the original image, this results in colour banding where areas of smooth colour changes in the original become areas of one solid colour in the paletted version.

Advantages of dithering

This can be alleviated by dithering the image data such that any given pixel might not be mapped to its closest palette entry, but the average over some area of the image will be closer to the correct colour than it would otherwise be. Image Alchemy uses a class of algorithms called "error-diffusion" to do dithering.

Error diffusion dithering

These algorithms work by using the closest palette entry to a colour and then distributing the error (the difference between the desired colour and the chosen palette entry) to the nearby pixels. This process is repeated for every pixel in the image, using the colour values which have been modified due to the error from previous pixels. The different dithering algorithms spread the error over a different area or use a different weighting within the same area.

Serpentine raster

Error diffusion can be done as a normal raster (left to right, top to bottom) or as a serpentine raster (alternating left to right and right to left, top to bottom). A serpentine raster tends to break up visible patterns introduced by dithering.

Noise

Random noise can also be added to help break up visible patterns in the resulting image.

Further information

For more information on Heckbert's median cut and dithering see the appropriate reference listed in the References section below.

C

What is JPEG Compression?

Who are those JPEG guys?

JPEG stands for the "Joint Photographic Experts Group". This is a group of experts who defined a standard compression scheme for still images, commonly called JPEG Compression. The JPEG compression standard is an ISO standard.

Overview

JPEG Compression consists of a series of complex mathematical operations; including: colour space conversion, discrete cosine transforms, quantization, and entropy coding. After these steps you end up with an image which takes fewer bits to store than you started out with.

However, when you decompress a JPEG compressed image you end up with an image that is not quite the same as the original (which is why JPEG Compression is referred to as "lossy").

Is lossy compression bad?

You might well ask why anyone would want to compress an image using a lossy technique. Compression ratios for lossy compression are much better than for lossless compression and the loss is generally very small. And, in fact, every operation of converting an image is lossy (the original photographic or electronic process which captured the image was lossy, scanning or digitizing the image was lossy, displaying the image on a monitor is lossy, and printing the image is lossy).

Details

JPEG compression involves the following steps:

Step 1 The image is converted to a colour space with separate luminance and chrominance channels. This is done because the human eye is far more sensitive to the luminance information (Y) than it is to the chrominance information (Cb and Cr); by separating them, it's possible to compress the chrominance information more than the luminance before the perceived image quality suffers.

This step isn't specified in the JPEG standard (it doesn't discuss colour space at all), but is standard practice. Image Alchemy uses CCIR-601 YCbCr, which is the colour space specified by the JFIF standard.

Step 2 The luminance and chrominance information are separately transformed to the frequency domain using a discrete cosine transform acting on 8x8 pixel blocks.

To reduce the amount of data which needs to be compressed the chrominance information may be sub-sampled first. Alchemy uses 2h:1v:1h:1v:1h:1v sub-sampling when writing JPEG files, which means that the first component (luminance) has twice as many samples horizontally as the other two components (chrominance), and the same number of samples vertically. Alchemy can read JPEG files with any sub-sampling allowed by the standard.

Step 3 The transformed data is quantized (so some information is thrown away). The samples representing higher frequencies are generally quantized using larger steps than those representing low frequencies.

The quality level you specify is used to scale a set of quantization values which have been found to cause the quantized data to all have approximately equal importance visually. A lower quality number will cause larger quantization steps to be used, and hence increase the compression ratio and decrease the image quality.

Step 4

The quantized data is compressed using an entropy coder. Huffman and Arithmetic coding are allowed by the JPEG standard; only Huffman coding is allowed by the JFIF standard. Huffman coding can either be done with a set of fixed tables or custom tables can be generated for an image. Alchemy, by default, uses a fixed set of tables, but can also generate custom tables which usually produce 5-20% (depending on the image and quality setting) better compression. However, producing custom tables requires an additional pass over the image data and therefore takes a little longer.

JPEG Interchange Format

This data corresponds to the JPEG Interchange Format and is ready to be stored in a file. Unfortunately the JPEG Interchange Format does not include enough information to actually be able to convert the file back to an image. Specifically the colour space used and the aspect ratio or resolution of the image are not included. Until recently there was no standard way of putting this information in a JPEG file.

JFIF

On March 1, 1991 representatives of several JPEG hardware and software developers (including C-Cube, Radius, NeXT, Storm Tech., the PD JPEG group, Sun, and Handmade Software) met at C-Cube and established the JPEG File Interchange Format (JFIF). JFIF allows for the standardization of those pieces of information missing from the JPEG Interchange Format and therefore allows various software packages, by different vendors, to produce compatible JPEG files. If you would like more information on the JFIF standard please contact us.

D

Customer Support

Why might Alchemy mess up?

We have made every effort to insure that Image Alchemy can read all files in its supported formats. However, because of poorly written standards and non-adherence to standards there are undoubtedly certain files that Image Alchemy does not read correctly.

What we need to help you

If you come across any files which Image Alchemy has trouble with, please contact us with as much of the following information as you have: version of Image Alchemy you are using, type of file, type of computer which generated it, name and version of software which wrote the file, size of image, and the number of colours in image. We may ask you to send us the file so that we can figure out what went wrong. If you send us a file we will attempt to modify Image Alchemy so that it can read the file. Once Alchemy is modified, we will send you an updated copy of it.

Similarly, if any files that Image Alchemy writes cannot be read by other software please contact us. We may ask you to send us a copy of a file that can be read by that software package for comparison.

Please contact us even if you are just using a demo copy of Alchemy. In addition to helping fix a bug, we feel the best way to get you to purchase a copy of Alchemy is to demonstrate how committed we are to customer support.

How to contact us

Our address and phone numbers are:

Handmade Software, Inc.
48860 Milmont Drive, Suite 106
Fremont, CA 94538

1 800 252 0101 (Toll-free from within the U.S.)
+1 510 252 0101 (Voice)
+1 510 252 0909 (Fax)

The most efficient way to contact us is by e-mail; this is especially true if you can send us a sample file which demonstrates the problem you are having. Please enclose a short note with your name and phone number so that we may call you if we need further information. Our e-mail address is:

Internet: support@handmadesw.com

If you have a CompuServe account you can leave messages for us in the Graph Support Forum. Type `GO HANDMADE` to go the appropriate forum.

We also have a 24 hour bulletin board where you can upload and download files. It speaks 2400 baud, 9600 baud (v32, v42, and v42.bis), and PEP; its number is:

+1 510 252 0929 (BBS)

If you upload a file to our BBS please leave a short note to the SYSOP so that we know what the problem you are having is.

We also have a fax-on-demand system which allows you to request and automatically receive faxes from your fax machine. Its phone number is:

+1 510 252 0303 (fax-on-demand)

E

Binary Information Files (BIF)

Overview

Binary files are files which are just image data. In other words, they do not contain any information other than the actual pixels in the image file. In order to read these files you must create a file using a text editor which describes to Alchemy the format of the file you are trying to read. This is called a BIF file (and typically has the extension .bif).

Required information

At the minimum a BIF file needs to contain the name of the image data file and either the height or the width of the image. Alchemy will make assumptions about the other characteristics of the image based on the information that it is given and the total length of the image file.

BIF file format

The first line contains the letters BIF, which identifies the file as a BIF file.

Each of the rest of the lines in the BIF file consist of an information tag followed by the information. The spelling of the tags must be exact or Alchemy will report an unknown tag error. The usage of many of the tags may not be entirely clear from the description, please see the examples section if the usage of a tag needs more explanation.

Tags

Tag	Description
filename	The name of the file containing the image data. To read images that consist of separate files for the red, green, and blue data, repeat the filename tag three times. The first filename tag specifies the red data file, the second blue, and the third green. You must also specify both the height and width and the number of planes in the image (which must be three) when using three filename tags (ordinarily Alchemy can calculate one tag from the others). See below for an example.
width	The width of the image data, in pixels.
height	The height of the image data, in pixels.
planes	The number of planes of image data: 1: gray-scale 2: gray-scale with an alpha channel 3: RGB 4: RGB with an alpha channel. You can read a black and white image which consists of packed data (i.e. 8 pixels per byte) by specifying 1 bitspersample (see below for more information on the bitspersample). In this case you must also specify both the height and width of the image (ordinarily Alchemy can calculate one from the other). See below for an example.
header	The size of the header, in bytes. This many bytes are skipped when reading the file.
leftpadding	The number of bytes to remove from the beginning of each scan line.
rightpadding	The number of bytes to remove from the end of each scan line.

order The order of the pixels:
For 1 channel g (g=gray).
For 2 channel images either ga or ag (a=alpha).
For 3 channel images, any sequence of r, g, and b: rgb, rbg, grb, gbr, brg, or bgr (r=red, g=green, b=blue).
For 4 channel images, any sequence of a, r, g, and b (a=alpha).

The defaults are g, ga, rgb, and rgba, depending on the number of planes.

interleave The type of interleaving of the pixel data:

0: Byte interleave	RGBRGBRGBRGBRGBRGB...
1: Line interleave	RRR...GGG...BBB...RRR...GGG...BBB...
2: Plane interleave	RRRRRR...GGGGGG...BBBBBB...

The default is 0, Byte interleave.

upsidedown The presence of this tag indicates that the data in the file is recorded from the bottom of the screen up to the top of the screen.

format The format of the data:
group4: use Group IV Fax decompression

Currently the only format tag supported is Group IV Fax compressed data (other standard formats will be added in future versions of Alchemy). See below for an example of reading a Group IV compressed data file using a BIF file.

faxoptions Options which affect decompressing fax compressed data:
bitreversal: most significant bit first

This tag allows you to specify various fax options when reading Group IV Fax compressed data. Currently the only faxoptions tag supported is bitreversal (other options will be added in future versions of Alchemy).

bitspersample

The size of the data, in bits per sample:

1: 1 bit per sample (8 pixels per byte)
8: 8 bits (one byte) per sample
16: 16 bits (two bytes) per sample

The default is 8 bits per sample.

In the case of 1 bit per sample, it indicates that data is packed, 8 pixels being stored per byte (in which case the bitorder tag determines whether the data is MSB to LSB or LSB to MSB (see bitorder, below)).

8 bits per sample is the standard way of storing data, with one byte storing one pixel.

16 bits per sample is used when reading data which is stored as two bytes per pixel. In this case Alchemy automatically scans the data to determine the minimum and maximum values. Then, when the image is being read, the data is scaled to 8 bits. The 16 bits per sample value can be used for 2-bit to 16-bit data, as long as the data is padded to 2 bytes. By default, 16-bit data is presumed to be unsigned and Motorola byte ordered (see signed and byteorder, respectively, below).

bitorder

The bit ordering in a 1 bit per sample (packed) image:

msblsb: Most significant byte first
lsbmsb: Least significant bit first

The default is msblsb (most significant byte first).

This option lets you specify the bit ordering when reading 1 bit per sample data.

byteorder — The byte ordering in a 16 bits per sample image:
motorola:Motorola byte ordered (most significant byte first)
intel:Intel byte ordered (least significant byte first)

The default is Motorola byte ordered.

This option lets you specify the byte ordering when working with 16 bit per sample data.

signed — The presence of this tag indicates that the data is signed. By default, it is assumed that 16 bit per sample data is unsigned.

Comments

Lines beginning with a # are treated as comments. Comments and blank lines are ignored when processing the BIF file.

Palette files

If the binary file has a palette available, you can use that palette by writing your own software to convert it to a .PAL file and using the -F option while reading the BIF file.

Examples

Using a BIF file

Assuming the BIF file is called sample.bif, the following Alchemy command can be used to convert the image to a GIF file:

```
alchemy sample.bif -g
```

A BIF file is treated as an ordinary file, so all the standard Alchemy commands may be used with it.

Standard BIF files

This is an example BIF file which can be used to read a 640 pixel wide, true colour HSI Raw file. Note that HSI raw files have a 32 byte header which is being skipped. Also note that the height tag is not needed. Alchemy will automatically calculate the height based on the length of the file and the other tags.

Of course you could read the Raw file directly using Alchemy, but this is after all an example of a BIF file.

```
BIF
width    640
#skip past header
header    32

filename  sample.raw
planes     3

#the tags below aren't actually needed,
#since rgb and non-interleave are
#the default, but they are included
#here to give an example of what those
#tags look like

order       rgb

interleave    0
```

Plane Interleaved

This example shows how to read an image which is plane interleaved (i.e. all of the blue pixels are first, followed by the green, and finally the red).

```
BIF
filename  planar.img
width     1024
height    1024
channels     3
interleave   2
order      bgr
```

Separate RGB files

This is an example BIF file which would be used to read a 512x512 RGB file which has each of the different colour pixels in a separate file. Note that the width, height, and planes tags must all be present to read a file of this type:

```
BIF
filename  image.red
filename  image.grn
filename  image.blu

width    512
height   512
planes     3
```

Packed black and white data

This is an example BIF file which would be used to read a black and white image which is packed at 8 pixels per byte. Note that the width, height, and bitspersample tags must all be present to read a file of this type (the bitorder tag isn't necessary in this case, since msb-lsb is the default order, but it is included because we figured you were curious what that tagged looked like):

```
BIF
filename  scan.img

width         2700
height        3300
bitspersample    1
bitorder    msblsb
```

Group IV Fax compressed

This BIF file can be used to read a page of Group IV compressed patent data as distributed by the United States Patent and Trademark Office:

```
BIF
filename  4456956.001
width     2320
height    3408
channels     1
format       group4
faxoptions   bitreversal
```

16 Bit Data

You can use BIF files to read 16 bit data; only 8 bits of data will actually be read, but Alchemy will automatically scale the data to preserve the most information possible. This BIF file can be used to read a 1024 x 1024 image which is 16 bit, Intel byte ordered:

```
BIF
filename      lunar.dat
width         1024
height        1024
channels         1
bitspersample   16
byteorder    intel
```

F

HSI Raw Files

History

The HSI Raw format was originally an internal format to Image Alchemy. Because of user demand the format has been documented to allow others to read and write HSI Raw files.

Overview

HSI Raw files are completely uncompressed, unpacked, and unpadded image data files. Therefore they tend to be larger than almost any compressed file format. However, they have the advantage, as far as Alchemy is concerned, that they are very fast to read and write and the location of any pixel in the image may be found by simple calculations.

If you need to convert custom files to a format that Alchemy can read we recommend using a Raw file; it is the simplest format to write and the fastest for Alchemy to read.

Variations

There are two types of HSI Raw Files: paletted and true colour. Paletted images are stored one byte per pixel with a palette at the beginning of the file. True colour files are stored three bytes per pixel.

Gray-scale

Gray scale files are stored as paletted files with a palette that contains all gray values. Alchemy automatically recognizes such files during reading and will treat them appropriately.

Black and white

Black and White files are stored as paletted files with a palette that contains two values, black and white. Alchemy automatically recognizes such files during reading and will treat them appropriately.

Warning

Note that Handmade Software, Inc. reserves the right to make changes to this format at any time and without notice. And while it is unlikely, it is possible that future versions of Image Alchemy will not support this format.

Old version files

This appendix describes version 4 Raw files. This is the version that Image Alchemy has written since March 1991. Before this Alchemy wrote version 2 and 3 raw files (version 2 were 8 bit files, version 3 were 24 bit files). Those raw files can be read by current versions of Image Alchemy but are not otherwise supported. If you run across any of these raw files the easiest thing to do is to use a current copy of Alchemy to convert them to a version 4 raw file.

Details

Word size

All values which are not otherwise identified are two byte integers (16 bits). This is the native integer size of most IBM PC C-compilers but not Macintosh and UNIX C-compilers.

Byte order

All integers are stored high byte first (big-endian order). This is the native mode for Macintosh's and Sun's but not the native mode for IBM PC's.

See below for a CPU independent method to read and write 2-byte integers.

Pixel format

Paletted files are stored one byte per pixel.

True colour files are stored as three bytes per pixel in red, green, blue order.

Padding
: Neither the palette information nor the pixel data is padded to anything other than a byte boundary. This means that if you store a file which is 13 by 11 pixels it will occupy 429 bytes if stored as a true colour file (not including the header), or 143 bytes if stored as a paletted file (not including the header and palette data).

Hex
: Numbers including a `0x` prefix are hex; all other numbers are decimal.

File format

The header for a paletted file is 32 bytes plus the size of the palette. The header for a true colour file is exactly 32 bytes (a true colour file contains no palette).

Magic number
: Six bytes used to identify the file as an HSI Raw file:

```
0x6d 0x68 0x77 0x61 0x6e 0x68
```

Version
: An integer used to identify the version HSI file:

```
0x0004
```

Width
: An integer indicating the width of the image (in pixels).

Height
: An integer indicating the height of the image (in pixels).

Palette size
: An integer indicating the number of entries in the palette. Range is 2 to 256. A 0 or -24 indicates a true colour image (which has no palette data).

Horizontal DPI
: An integer indicating the horizontal resolution of the image, in dots per inch. A zero indicates that the resolution is unknown. A negative number is used if only the aspect ratio is known.

Vertical DPI
: An integer indicating the vertical resolution of the image, in dots per inch. A zero indicates that the resolution is unknown. A negative number is used if only the aspect ratio is known.

Gamma
: An integer indicating the gamma of the image, scaled by 100 (a gamma of 2.2 is stored as 220). A zero indicates that the gamma is not known.

Compression
: An integer indicating the compression mode used to write the file. Currently only compression mode 0 is supported, but you should check this value when reading a HSI Raw to make sure that we haven't added any compression modes.

Reserved
: Ten bytes reserved for future use. Should be set to zero when writing.

Palette
: The palette data is stored as 3 bytes per palette entry. The bytes are in red, green, blue order; 0 is black, 0xff is full intensity.

  True colour raw files have no palette.

Image data
: The image data.

Example files

8 bit paletted, 320 x 200:

```
6D 68 77 61 6E 68 00 04  01 40 00 C8 01 00 00 00
00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
49 24 24 24 00 00 00 00  00 DB 6D 6D FF 92 92 FF
B6 B6 92 49 49 FF DB DB  FF B6 92 FF FF DB FF DB
B6 FF FF FF B6 6D 6D 6D  24 24 DB 92 6D 6D 49 49
…
```

24 bit true colour, 320 x 200:

```
6D 68 77 61 6E 68 00 04  01 40 00 C8 00 00 00 00
00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00
49 24 24 49 24 24 49 24  24 49 24 24 49 24 24 49
24 24 49 24 24 49 24 24  49 24 24 49 24 24 49 24
24 49 24 24 49 24 24 49  24 24 49 24 24 49 24 24
…
```

Reading a two byte integer

```
int getWord(int i, FILE *stream) {
   register int temp;
   temp=getc(stream)<<8;
   return(getc(stream) | temp);
}
```

Writing a two byte integer

```
int putWord(int i, FILE *stream) {
   putc(i>>8, stream);
   return(putc(i&0xff, stream));
}
```

G

Undercolour Removal Files

Summary

Undercolour removal files are text files which control the conversion from RGB to CMYK colour space.

This conversion consists of four steps.

The first is to convert an RGB value to an ideal CMY value; this simply involves negating the RGB values.

The next step is to determine how much black is in that colour; this is done by finding the minimum of the CMY values and using that as an index into the black removal portion of the Undercolour Removal tables documented below. These tables have independent values for how much black to use for that pixel and how much black to subtract from the CMY values.

Next, a linear transform is optionally applied to the CMY portion of the CMYK pixel.

Finally the CMYK values are optionally translated, independently, through the CMYK density correction tables (this last step is only used if the image is going to be dithered output on a 1 bit per pixel per component device).

File format

Black removal tables

The first 256 non-comment lines contain undercolour removal values corresponding to computed black values of 0 (white) to 255 (black).

Each of these lines has two numbers; the first indicates how much black to use in place of the computed black value corresponding to the line, and the second indicates how much black to subtract from the cyan, magenta, and yellow components (this value must not be greater than the corresponding computed black value).

After the black removal block the remaining blocks may appear in any order.

CMY linear transform

If there is a line which says only "HSI CMY matrix" then the next 3 non-comment lines contain a matrix representing a linear transform which is applied to the cyan, magenta, and yellow components after black removal and before applying the density map. The entries are normalized around 256. The first row and column represent cyan, the second magenta, and the third yellow. The rows are multiplied by the input cyan, magenta, and yellow values to create the corrected values. A matrix of

```
256   0   0
  0 256   0
  0   0 256
```

is equivalent to omitting the matrix and causes no correction to take place. In this case it would be preferable to omit the matrix as the conversion will run slightly faster without it.

CMYK density correction tables

If there is a line which says only "HSI CMYK density map" then the next 256 non-comment lines contain density correction tables, corresponding to cyan, magenta, yellow, and black values of 0 (white) to 255. Each of these lines has four numbers representing, in order, the amount of cyan, magenta, yellow, and black to use in place of the corresponding computed values. These tables are only applied during dithering; they will not be used for those CMYK output formats which are continuous tone, as devices which take continuous tone input data should be doing their own correction.

Comments

Any line beginning with ';' is a comment and is ignored.

Example

The following undercolour removal file has undercolour removal tables, CMYK density correction tables, and a CMY colour correction matrix.

```
; Undercolour removal file
;
  0   0
  1   1
  1   1
  2   2
  3   3
… (256 entries total)
169 169
169 169
170 170
;
```

```
HSI CMY matrix
;the following matrix leaves the
; Cyan and Yellow planes alone, and
; subtracts a bit from the Magenta
; plane when there's Cyan present.
;
256   0   0
-32 256   0
  0   0 256
;
HSI CMYK density map
;
  0   0   0   0
  0   0   0   0
  0   0   0   0
… (256 entries total)
248 248 248 248
251 251 251 251
253 253 253 253
255 255 255 255
```

H

PAL Files

Overview

PAL files are text files which contain a palette in an ASCII form. Alchemy can extract palettes from other file formats and write PAL files. Alchemy can also use PAL files when converting images.

File format

The first line contains the letters "PAL"; this identifies the file as a palette file.

The next line contains an integer indicating the number of palette entries. Valid values are 2 through 256.

The rest of the file consists of lines of 3 numbers, representing the red, green, and blue values for each of the colours. These have a range of 0 (black) to 255 (full intensity). Any information after the 3 numbers is treated as a comment and ignored.

Example

```
PAL
8                ;# colours
  0   0   0      ;black
255   0   0      ;bright red
  0 128   0      ;dark green
255 255   0      ;yellow
  0   0 255      ;blue
255   0 255      ;magenta
 63  63  63      ;gray
255 255 255      ;white
```

Acknowledgments

Summary

Almost all the software which comprises Image Alchemy was written in house. However some of the modules are modifications of software originally written by other people or software that we've licensed.

TIFF

Image Alchemy's TIFF I/O is based on libtiff which is copyright by Sam Leffler and is used with his permission. If you are interested in reading or writing TIFF files we strongly suggest that you start with libtiff.

Libtiff is available by anonymous ftp as ucbvax.berkeley.edu:pub/tiff/*.tar.Z or uunet.uu.net:graphics/tiff.tar.Z.

If you cannot get a copy of libtiff via anonymous ftp please contact us for a free copy.

VGA display

The MS-DOS version of Image Alchemy's 640x400 SVGA display routines are based on VGAKIT, written by John Bridges.

VGAKIT is available free of charge from a variety of bulletin boards

If you cannot find VGAKIT locally please contact us for a free copy.

LZW Compression

The LZW compression method is the subject of United States patent number 4,558,302 and corresponding foreign patents owned by Unisys Corporation and the use of it for TIFF LZW compression is licensed from them.

Further information on licensing this patent can be obtained from:

Unisys Corporation
Welch Licensing Department
Office of the General Counsel
M/S C1SW19
Blue Bell, PA 19424

Spawning

The spawn function used by the MS-DOS GUI uses the SPAWNO routines by Ralf Brown to maximize the available memory while spawning Alchemy.

For more information on SPAWNO contact:

Ralf Brown
813 Copeland Way, Suite 26
Pittsburgh, PA 15232
+1 713 880 3059
internet: ralf+@cs.cmu.edu

Other Useful Software

Summary

There are several image processing packages available for free or as shareware.

Please be aware that we mention these software packages only as a service to Image Alchemy users. We are not endorsing or recommending any particular package. Some of the packages are no longer supported by their authors.

If you have trouble finding any of the listed software please send us a blank tape or diskette and we will send you a copy free of charge (please be aware that the software may be quite large; contact us first if you have any questions).

If you know of any other software which would be appropriate to add to this list please let us know. If you are the author of any of these packages and you would rather not be on this list please let us know that also.

IBM PC

These programs are only available as executable code and can only be run under MS-DOS.

PicLab

A public-domain image file conversion and printing tool. Written by Lee Crocker and the Stone Soup Group. Available via CompuServe.

Cshow

A shareware image viewing program.
Written by Bob Berry.
Available from:

Canyon State Systems and Software
PO Box 86
Sedona, AZ 86336

Vivid

A shareware ray-tracing program.
Written by Stephen B. Coy
Available from:

Stephen Coy
15205 NE 13th Pl., #2904
Bellevue, WA 98007

Workstations

These programs are only available as source code and generally require a workstation running UNIX or one of its variants.

Utah Raster Toolkit (URT)

Written by Spencer W. Thomas, Rod G. Bogart, and James Painter.
Available via anonymous FTP as pub/urt-3.0.tar.Z via anonymous ftp from cs.utah.edu, weedeater.math.yale.edu, or freebie.engin.umich.edu.

Fuzzy Bitmap Manipulation (FBM)

Written by Michael Mauldin
Available by anonymous ftp as nl.cs.cmu.edu:/usr/mlm/ftp/fbm.tar.Z, uunet.uu.net:pub/fbm.tar.Z, or ucsd.edu:graphics/fbm.tar.Z.

Portable BitMap (PBMPLUS)

Written by Jef Poskanzer
Available by anonymous ftp as expo.lcs.mit.edu:contrib/pbmplus.tar.Z or ftp.ee.lbl.gov:pbmplus.tar.Z.

Img Software Set Written by Paul Raveling
Available by anonymous ftp as
expo.lcs.mit.edu:contrib/img_1.3.tar.Z or
venera.isi.edu:pub/img_1.3.tar.Z.

XLI Written by Graeme Gill
(XLI is based on xloadimage,written by Jim Frost)
XLI and XloadImage are vailable by anonymous ftp from a variety of ftp sites.

K

Configuring DOS/4GW

MS-DOS Only

DOS/4GW is the DOS Extender used by Alchemy/386. The DOS Extender is the software that allows protected mode software, such as Alchemy/386, to run under MS-DOS. This chapter explains how to control various operations of the DOS Extender to optimize use of your computer.

The only option you will likely need is virtual memory. Virtual memory uses a swap file on your hard drive to simulate RAM, allowing your computer to process larger images than would otherwise be possible.

This chapter also explains how to use the DOS16M environment variable to select the switch mode setting and how to specify the range of extended memory in which *DOS/4GW* will operate.

Virtual Memory

The Virtual Memory Manager (VMM) uses a swap file on disk to augment RAM. With VMM you can use more memory than your machine actually has. When RAM is not sufficient, a portion of memory is swapped out to disk until it is needed again. The combination of the swap file and available RAM is called *virtual memory*.

Image Alchemy makes use of virtual memory if you set the DOS environment variable, DOS4GVM, appropriately.

To set the DOS4GVM environment variable, use the format shown below.

```
set DOS4GVM=[option [#value]] …
```

(A "#" is used with options that take values instead of "="since the DOS command shell does not allow "=" to appear in environment variables.)

VMM Default Parameters

MINMEM - The minimum amount of RAM managed by VMM. The default is 512KB.

MAXMEM - The maximum amount of RAM managed by VMM. The default is 4MB.

SWAPMIN - The minimum or initial size of the swap file. If this option is not used, the size of the swap file is based on VIRTUALSIZE (see below).

SWAPINC - The size by which the swap file grows.

SWAPNAME - The swap file name. The default name is "DOS4GVM.SWP". By default the file is in the root directory of the current drive. Specify the complete path name if you want to keep the swap file somewhere else.

DELETESWAP - Whether the swap file is deleted when your program exits. By default the file is not deleted. Program startup is quicker if the file is not deleted.

VIRTUALSIZE - The size of the virtual memory space. The default is 16MB.

Changing the Defaults

You can change the defaults in two ways.

1. Specify different parameter values as arguments to the DOS4GVM environment variable. For example:

```
set DOS4GVM=virtualsize#32768 maxmem#32768
   swapmin#64 deleteswap
```

Sets up a swap file up to 32 megabytes in size (after using up to 32 megabytes of RAM), the swap file starts small (64K) and grows as needed, and when Alchemy finishes running the swap file is automatically deleted.

2. You can also create a configuration file with the filetype extension ".VMC", and call that as an argument to the DOS4GVM environment variable. For example:

```
set DOS4GVM=@NEW4G.VMC
```

The .VMC File

A ".VMC" file contains VMM parameters and settings as shown in the example below. Comments are permitted. Comments on lines by themselves are preceded by an exclamation point (!). Comments that follow option settings are preceded by white space. Do not insert blank lines: processing stops at the first blank line.

```
!Sample .VMC file
!This file shows the default parameter values.
minmem = 512      At least 512K byte of RAM is
required
maxmem = 4096     Uses no more than 4MB of RAM
virtualsize = 16384
!Swap file plus allocated memory is 16MB
!To delete the swap file automatically when
!the program exits, add
!deleteswap
!To store the swap file in a directory called
SWAPFILE, !add
!swapname = c:\swapfile\dos4gvm.swp
```

Changing the Switch Mode Setting

The Switch Mode controls how the computer switches between real and protected mode. In almost all cases, *DOS/4GW* can detect the type of machine that is running and automatically choose an appropriate real to protected-mode switch technique. For the few cases in which this default setting does not work, the DOS16M environment variable can be used to override the default setting.

Change the switch mode settings by issuing the following command:

```
set DOS16M=value
```

Do not insert a space between DOS16M and the equal sign. A space to the right of the equal sign is optional.

The table below lists the machines and the settings you would use with them. Some settings have mnemonics, listed in the column "Alternate", that you can use instead of the number. Settings that you must set with the DOS16M variable have the notation *req'd* in the first column. Settings you may use are marked *option*, and settings that will automatically be set are marked *auto*.

Status	Machine	Setting	Alternate	Comment
auto	386/486 w/DPMI	0	None	automatic if DPMI active
req'd	NEC 98-series	1	9801	must be set for NEC 98-series
auto	PS/2	2	None	set automatically for PS/2
auto	386/486	3	386/80386	set automatically for 386/486
auto	386	inboard	None	80386 with Intel Inboard
req'd	Fujitsu FMR-70	5	None	must be set for Fujitsu FMR-70
auto	386/486 w/VCPI	11	None	automatic if VCPI detected
req'd	Hitachi B32	14	None	must be set for Hitachi B32
req'd	OKI if800	15	None	must be set for OKI if800
option	IBM PS/55	16	None	may be needed for some PS/55

The following procedure shows you how to test the switch mode setting.

1. If you have one of the machines listed below, set the DOS16M environment variable to the value shown for that machine and specify a range of extended memory. For example, if your machine is an NEC 98-series, `set DOS16M=1 @2M-4M`. See the section, "Fine Control of Memory Usage" later in this chapter for more information about setting the memory range.

machine	setting
NEC 98-series	1
Fujitsu FMR-60, -70	5
Hitachi B32	14
OKI if800	15

2. Run PMINFO (found in the `\alchemy\samples` directory) and note the switch setting reported on the last line of the display.

If PMINFO runs, the setting is usable on your machine.

3. If you changed the switch setting, add the new string to your AUTOEXEC.BAT file.

Note

PMINFO will run successfully on 80286 machines. If Image Alchemy/386 does not run, and PMINFO does, check the CPU type reported on the first line of the display.

Fine Control of Memory Usage

In addition to setting the switch mode as described above, the DOS16M environment variable enables you to specify which portion of extended memory *DOS/4GW* will use. The variable also allows you to instruct *DOS/4GW* to search for extra memory and use it if it is present.

Specifying a Range of Extended Memory

Normally, you don't need to specify a range of memory with the DOS16M variable. You must use the variable, however, in the following cases:

- You are running on a Fujitsu FMR-series, NEC 98-series, OKI if800-series or Hitachi B-series machine.
- You have older programs that use extended memory but don't follow one of the standard disciplines.
- You want to shell out of DOS/4GW to use another program that requires extended memory.

If none of these conditions applies to you, you can skip this section.

The general syntax is:

```
set DOS16M=[switch mode] [@start_address
[- end_address]] [:size]
```

In the syntax shown above, `start_address`, `end_address` and `size` represent numbers, expressed in decimal or in hexadecimal (hex requires a `0x` prefix). The number may end with a K to indicate an address or size in kilobytes, or an M to indicate megabytes. If no suffix is given, the address or size is assumed to be in kilobytes. If both a size and a range are specified, the more restrictive interpretation is used.

The most flexible strategy is to specify only a size. However, if you are running with other software that does not follow a convention for indicating its use of extended memory, and these other programs start before *DOS/4GW*, you will need to calculate the range of memory used by the other programs and specify a range for *DOS/4GW* programs to use.

DOS/4GW ignores specifications (or parts of specifications) that conflict with other information about extended memory use. Below are some examples of memory usage control:

For NEC 98-series machines, set mode 1 and use extended memory between 2.0 and 4.0MB:

```
set DOS16M=1 @2m-4m
```

Use the last full megabyte of extended memory, or as much as available limited to 1MB:

```
set DOS16M=:1M
```

Use any extended memory available above 2MB:

```
set DOS16M=@2m
```

Use any available extended memory from 0.0 (really 1.0) to 5.0MB:

```
set DOS16M=@0-5m
```

Use no extended memory:

```
set DOS16M=:0
```

As a default condition *DOS/4GW* applications take all extended memory that is not otherwise in use. Multiple *DOS/4GW* programs that execute simultaneously will share the reserved range of extended memory. Any non-*DOS/4GW* programs started while *DOS/4GW* programs are executing will find that extended memory above the start of the *DOS/4GW* range is unavailable, so they may not be able to run. This is very safe. There will be a conflict only if the other program does not check the BIOS configuration call (Interrupt 15H function 88H, get extended memory size).

In a VCPI or DPMI environment, the `start_address` and `end_address` arguments are not meaningful. *DOS/4GW* memory under these protocols is not allocated according to specific addresses because VCPI and DPMI automatically prevent address conflicts between extended memory programs. You can specify a `size` for memory managed through VCPI or DPMI, but *DOS/4GW* will not necessarily allocate this memory from the highest available extended memory address, as it does for memory managed under other protocols.

Using Extra Memory

Some machines contain extra non-extended, non-conventional memory just below 16MB. When *DOS/4GW* runs on a Compaq 386, it automatically uses this memory because the memory is allocated according to a certain protocol, which *DOS/4GW* follows. Other machines have no protocol for allocating this memory. To use the extra memory that may exist on these machines, set DOS16M with the + option.

```
set DOS16M=+
```

Setting the + option causes *DOS/4GW* to search for memory in the range from FA0000 to FFFFFF and determine whether the memory is usable. *DOS/4GW* does this by writing into the extra memory and reading what it has written. In some cases, this memory is mapped for DOS or BIOS usage, or for other system uses. If *DOS/4GW* finds extra memory that is mapped this way, and is not marked read-only, it will write into that memory. This will cause a crash, but won't have any other effect on your system.

Setting Runtime Options

The DOS16M environment variable sets certain runtime options for all *DOS/4GW* programs running on the same system.

To set the environment variable, the syntax is:

```
set DOS16M=[switch_mode_setting]^options.
```

Note: Some command line editing TSRs, such as CED, use the caret (^) as a delimiter. If you want to set DOS16M using the syntax above while one of these TSRs is resident, modify the TSR to use a different delimiter.

These are the options:

0x01 *check A20 line* -- This option forces *DOS/4GW* to wait until the A20 line is enabled before switching to protected mode. When *DOS/4GW* switches to real mode, this option suspends your program's execution until the A20 line is disabled, unless an XMS manager (such as HIMEM.SYS) is active. If an XMS manager is running, your program's execution is suspended until the A20 line is restored to the state it had when the CPU was last in real mode. Specify this option if you have a machine that runs *DOS/4GW* but is not truly AT-compatible. For more information on the A20 line, see the section, "Controlling Address Line A20" in this chapter.

0x02 *prevent initialization of VCPI* -- By default, *DOS/4GW* searches for a VCPI server and, if one is present, forces it on. This option is useful if your application does not use EMS explicitly, is not a resident program, and may be used with 386-based EMS simulator software.

0x04 *directly pass down keyboard status calls* -- When this option is set, status requests are passed down immediately and unconditionally. When disabled, pass-downs are limited so the 8042 auxiliary processor does not become overloaded by keyboard polling loops.

0x10 *restore only changed interrupts* -- Normally, when a *DOS/4GW* program terminates, all interrupts are restored to the values they had at the time of program startup. When you use this option, only the interrupts changed by the *DOS/4GW* program are restored.

0x20 *set new memory to 00* -- When *DOS/4GW* allocates a new segment or increases the size of a segment, the memory is zeroed. This can help you find bugs having to do with uninitialized memory. You can also use it to provide a consistent working environment regardless of what programs were run earlier. This option only affects segment allocations or expansions that are made through the *DOS/4GW* kernel (with DOS function 48H or 4AH). This option does not affect memory allocated with a compiler's `malloc` function.

0x40 *set new memory to FF* -- When *DOS/4GW* allocates a new segment or increases the size of a segment, the memory is set to 0xFF bytes. This is helpful in making reproducible cases of bugs caused by using uninitialized memory. This option only affects segment allocations or expansions that are made through the *DOS/4GW* kernel (with DOS function 48H or 4AH). This option does not affect memory allocated with a compiler's `malloc` function.

0x80 *new selector rotation* -- When *DOS/4GW* allocates a new selector, it usually looks for the first available (unused) selector in numerical order starting with the highest selector used when the program was loaded. When this option is set, the new selector search begins after the last selector that was allocated. This causes new selectors to rotate through the range. Use this option to find references to *stale* selectors, i.e., segments that have been canceled or freed.

Controlling Address Line 20

This section explains how *DOS/4GW* uses address line 20 (A20) and describes the related DOS16M environment variable settings. It is unlikely that you will need to use these settings.

Because the 8086 and 8088 chips have a 20-bit address space, their highest addressable memory location is one byte below 1MB. If you specify an address at 1MB or over, which would require a twenty-first bit to set, the address wraps back to zero. Some parts of DOS depend on this wrap, so on the 80286 and 80386, the twenty-first address bit is disabled. To address extended memory, *DOS/4GW* enables the twenty-first address bit (the A20 line). The A20 line must be enabled for the CPU to run in protected mode, but it may be either enabled or disabled in real mode.

By default, when *DOS/4GW* returns to real mode, it disables the A20 line. Some software depends on the line being enabled. *DOS/4GW* recognizes the most common software in this class, the XMS managers (such as HIMEM.SYS), and enables the A20 line when it returns to real mode if an XMS manager is present. For other software that requires the A20 line to be enabled, use the `A20` option. The `A20` option makes *DOS/4GW* restore the A20 line to the setting it had when *DOS/4GW* switched to protected mode. Set the environment variable as follows:

```
set DOS16M=A20
```

To specify more than one option on a command line, separate the options with spaces.

The DOS16M variable also lets you specify the length of the delay between a *DOS/4GW* instruction to change the status of the A20 line and the next *DOS/4GW* operation. By default, this delay is 1 loop instruction when *DOS/4GW* is running on a 386 machine. In some cases, you may need to specify a longer delay for a machine that will run *DOS/4GW* but is not truly AT-compatible. To change the delay, set DOS16M to the desired number of loop instructions, preceded by a comma:

```
set DOS16M=,loops
```

Glossary

Anonymous FTP An easy way to transfer files via the Internet. If you don't have Internet access you can't use anonymous FTP; if you do have Internet access you probably already know about it (if you don't, ask your system administrator or local network guru).

Black and white An image which contains just two colours, black and white. Many file formats, such as TIFF and Sun Raster, have special variations for black and white images. You can force Alchemy to write a black and white image by specifying -b -c2 as options.

Dithering A technique for reducing the amount of colour banding in an image when converting from a large number of different colours to a small number of different colours. Different dithering techniques are usually named after the person or persons who first invented them. Alchemy supports Floyd-Steinberg, Stucki, and JJN dithering; these are further described in "Digital Halftoning", by Robert Ulichney, MIT Press.

Gray-scale An image which contains just shades of gray. Many file formats, such as TIFF and Silicon Graphics, have special variations for gray-scale images. You can force Alchemy to write a gray-scale image by specifying -b -8 as options.

Header The portion of an image file that is not the actual image data. The data in a header generally includes the image size (in pixels), the image depth (in number of bits per pixel or number of colours), and the palette (if the image has a palette). Some file formats include quite a bit of additional data in the header, such as: the name of the image or the date and time the image was created. Some file formats store information which is usually found in the header in a separate file.

Heckbert colour quantization A technique for reducing the number of colours needed by an image, typically used to convert a true colour image to a paletted image. Named after Paul Heckbert who originally described the technique in "Color Image Quantization for Frame Buffer Display", SIGGRAPH '82 Proceedings, p. 297.

Magic Number A number or sequence of numbers that is found at or near the start of an image file so that software may determine what type of format the file is. Most formats have a well defined magic number; some formats do not, in which case Alchemy examines various parameters in the header of the file and guesses what format the image is.

Paletted An image which isn't true colour. Each pixel in the image is an index into a table of values (typically red, green, and blue) which describe the colour of that pixel. Most paletted images are limited to 8 bits of information, which allows 256 unique colours. Most display adapters only allow the display of paletted images (Alchemy can display true colour images on those display adapters by using a uniform palette).

True colour An image which does not contain a palette. Each pixel in the image is represented by at least three values, typically red, green, and blue. True colour images are generally produced by scanners and digitizers and are better quality and much larger than paletted images. Most display systems cannot display true colour images.

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Colophon

This manual was created using Microsoft Word 5.1a on a bizarre collection of computers consisting of a Macintosh IIfx, a Macintosh Quadra 840AV, and a Power Macintosh 7100/66. The body text is set in Times Roman and the chapter and section headings are set in Gill Sans. The examples and such are set in Courier.

Camera-ready copy was produced by an HP LaserJet 4M Plus printer onto Hammermill Laser Plus® paper. The manual was then printed using standard offset printing techniques.

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