

Mirage

free 3D modeling and rendering

This is the second release of Mirage, but the first version that I would consider complete. Mirage is a free 3D modeling and rendering program, so I'm asking nothing in return for it, but I would appreciate everyone who likes it to help distribute it (keeping all the files grouped and intact) and to send me any comments you may have or cool pictures you make. My

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I've been working to speed up Mirage and improve it overall. Some of these changes have restricted which computers are capable of running Mirage. This program requires a color Macintosh running System 7 or later. 32-Bit QuickDraw is

required for off screen processing of images.

There have been several improvements since the last version of Mirage that I feel make the program more complete and usable. The most important of these are:

- wireframe drawing speed has been increased for curved surfaces
- rendering speed has been increased
- texture previews and final renderings are now

processed off screen, allowing for 32 bit color on all machines and preventing images from disappearing after screen savers take over the monitor

- dithering is now used to create good images even in 8-bit (256 Color) mode (In the previous version, 16 bit color was almost a requirement for decent results)
- the smoothing effect on objects uses a dialog that gives more predictable

results

- previously, “cracks” sometimes appeared in surfaces, especially around the edges of a scene. This has been fixed.
- double-clicking on an object’s name now allows you to change the name
- 3D objects and Mirage files now occupy less memory, so more objects can be used in a scene
- copy / paste commands are available in the material editor, making it easier to

use the same texture on multiple objects

- the print command now prints the current modeling window views to whatever printer you may be using
- Mirage will save to a PICT file either the wireframe views or a rendered image - your choice
- saving a rendered image to a PICT file is no longer an awkward procedure. It works quickly and cleanly.
- pressing the mouse button during a rendering cancels

the operation

- when rendering a scene, the user doesn't have to specify the z-buffer depth
- temporary files generated by Mirage are much smaller and Mirage cleans them out when it's through with them

Known bugs:

- PICT files created by Mirage are not compatible with Photoshop. They can be read by every other PICT-reading program I've tried, but Photoshop seems picky about it.
- ***IMPORTANT!*** This version of Mirage is not capable of reading files created by the previous Mirage and vice versa. If you try it, it may crash. From now on, I will ensure compatibility between releases, but the first version

of Mirage was actually a kind of pre-release. If you want to use an old file with this version of Mirage, export the file as text in the old program and import the text file into this one. The text format files are compatible.










The menu commands and controls for Mirage are basically the same as before, so if you've used them, you can skip this section. (Then again, I never typed up a manual before,

so you might not know this anyhow.)

Main Window

There are three areas of interest in the main window. The top left corner shows a scrolling list. This is where you see your objects' names and select them. The first six objects - Eye, Lookat, Light 1, Light 2, Light 3, and Light 4 are always in every Mirage document. Below these you will see the names of objects you create. To

select the object you want to work with, click on its name in the list. To change an object's name, double-click on it.

Below the object list are nine buttons. The top three let you select the current modeling operation: translation () , scaling () , or rotation () . The next five buttons select the current view: four-way () , front () , top () , right () , or perspective () . The final button lets you toggle the grid feature on and off () , making it easier to align objects.

The rest of the main window consists of the modeling views. In the four-way view, the top left box is the top view, bottom left is front, top right is perspective, and bottom right is the right view. The perspective view is normally not updated so that it won't slow thing down. Periodically you will want to update the perspective view to see the scene through the camera. To update it, just click the mouse in the perspective view. The perspective view is where all final rendering takes

place, so it will either be the top right corner in the four-way view or the entire window in the perspective view.

Transforming objects: select the object you want to transform and the button corresponding to the selected transformation. Press and move the mouse in one of the modeling views. The view you choose will affect the transformation. Translation moves the object in the view you click in. Scaling scales the object relative to its *original*

orientation in that view. Rotation also works based on an object's *original orientation*. The shift key can be used during a transformation. For translation, it limits motion to either horizontal or vertical. For scaling, the object is scaled proportionately in all dimensions. For rotation, the angle is limited to 15-degree increments.

Menus

The File menu works basically

as expected. Three commands to note are: Import, Export, and Save as PICT. Normally, Mirage files should be saved in the native Mirage format with the standard Save As and Open commands. However, they can also be saved in a text format. Export will save a file in text format and Import will read in a text file. The exact format for these text files is described later in this document. The reason Mirage has this capability is because I do a lot of work on Silicon Graphics computers and

I wanted to create a simple, portable 3D file format that could be used on both SGI's and Macs. You

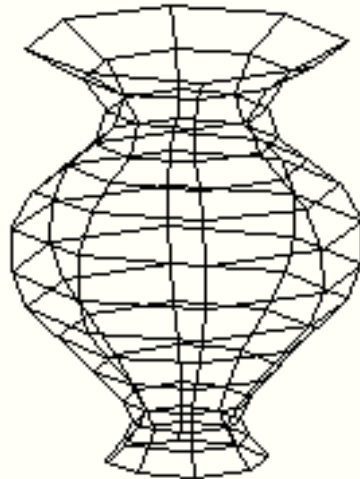
can use this file format if you're doing your own graphics programming and you want to generate models in Mirage and easily read them into your program or if you create a program that builds models that you want to load into Mirage. Finally, the Save as PICT command allows you to save a wireframe drawing or a rendered image as a picture. Whichever you choose to save to a PICT file, only what is currently in view in the main window will be saved.

The Edit menu currently doesn't have any working commands. Sorry. If you want to copy and paste, here's what to do: select the object you wish to copy. Choose the Export Object command in the Object menu. This will save the object in a file by itself. Now create a new object of the type "Imported Text" (see the New Object command below). Mirage will ask you which file you want to import. Select the file that you just exported. You will now have two identical

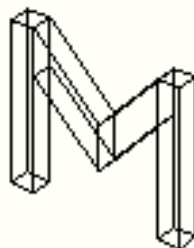
objects right on top of each other, so just move one of them off to the side.

The Object menu has commands for manipulating 3D objects. New object will bring up a dialog letting you name a new object and choose what type of object it will be. The current options are Lathe, Extrusion, and Imported Text. Choose the type you want and hit OK. Lathe and extrude will open a window letting you draw the outline curves, while import text will ask you to choose the

file you want to import. Lathe objects are made by revolving a profile around an axis like this:



Extrusion objects are made by stretching out a 2D outline into three dimensions. Note that for extruded objects, you should only use polygons that are convex, not concave.



The Edit Object command lets you modify an object by editing or adding to its outline curves. For imported text objects it asks you to choose another text file. (If the whole document is an imported text file, all objects in it are considered to be imported and cannot have their curves edited.) Remove removes an object from the scene. The object is deleted and gone forever. Redraw redraws the selected object. You should never need this command, but it's there in case an object

becomes somehow corrupted-looking. The last command is Export. This lets you save an object in a text format that is described later in this document. This can be used to simulate a copy / paste operation or to use an object in

another program that you wrote yourself. (I use it to create objects that can be transferred to Silicon Graphics computers)

Next is the Effects menu. This menu is used to apply various effects to objects. The Noise command will add “noise” to an object’s surface, in effect making an object lumpy, jagged, or just slightly warped, depending on the settings you provide. The Smooth command lets you set how smooth an object will be rendered. Just

choose the picture you like. The default smoothness of 1 is good for most purposes. A high smoothness doesn't add to the amount of memory an object occupies, but will increase the rendering time, so don't just make everything as smooth as possible. The Regenerate will undo any noise or smoothing effects you've applied to an object, returning it to its original state. The Material command is one of the most fun commands in Mirage and will be described later.

Finally, the Render menu. The Wireframe, Flat, Smooth, and Textured commands render the scene in the perspective view or the top right corner in four-way view. Wireframe renders the scene just as outlines. Flat draws objects with a faceted appearance and tries to go fast by guessing which surfaces aren't visible, but sometimes it misjudges. Its benefit is that it is the fastest way of generating a shaded image with hidden surfaces removed. Smooth will do a good, smooth rendering but

without all the texture detail on surfaces. In some cases where you are using many complex textures, this can speed things up a bit. Textured goes a step beyond Smooth by adding in textured surfaces. The Camera command lets you adjust the camera's view angle. Usually, you can just leave it alone. The Lights command lets you turn light sources on and off and adjust their properties. Choose a color for a light by clicking in the color box. By default, light sources are at an infinite

distance (like the sun). By unchecking this option, you can make local light sources like candles. To make a light more like a candle, increase one or both of the falloff sliders slightly. Press the preview button to see the effect.

IMPORTANT! When a scene is rendered using Flat, Smooth, or Textured, Mirage tries to do the drawing in an off screen buffer. This allows for dithering and for saving the image later. Also, if a screen saver comes on, the image will

stay in memory and can be quickly recalled. After the rendering is complete, the image will stay in the window until the current view is changed or another rendering is started. As long as the image is still there, it can be saved to a PICT file, but when you see the picture disappear, it's gone for good. Sometimes, if there's not enough memory, the scene cannot be rendered off screen. In these cases, you will see the scene being drawn dot by dot instead of in triangular chunks.

If this happens, the picture will only be in memory as long as the screen goes unchanged. This is not a very desirable situation, so you can cancel the rendering by pressing the mouse button. If you choose to let it continue, the image will not be dithered and will not look too good on machines with only 8 bit color. Also, saving it to a PICT file will not succeed, but you can still take a snapshot of the screen by pressing Shift-Command-3. Also if Mirage is drawing straight to the screen,

watch out for those screen savers!

You may notice file(s) called “zbuf.00.temp”. This file is generated by Mirage when a rendering is taking place. It may require disk space in the range of 400 - 1600K while rendering, but after the rendering is finished, Mirage will empty this file, making its size 0 bytes. You can delete it if you want, but Mirage will just have to re-create it the next time a rendering is performed.

TIP: To speed up the

rendering process, you can shrink the main window down to a much smaller size if you're just doing a test rendering. Then, for the final rendering, make the window the size that you want the final result to be.

Setting Lights and Camera

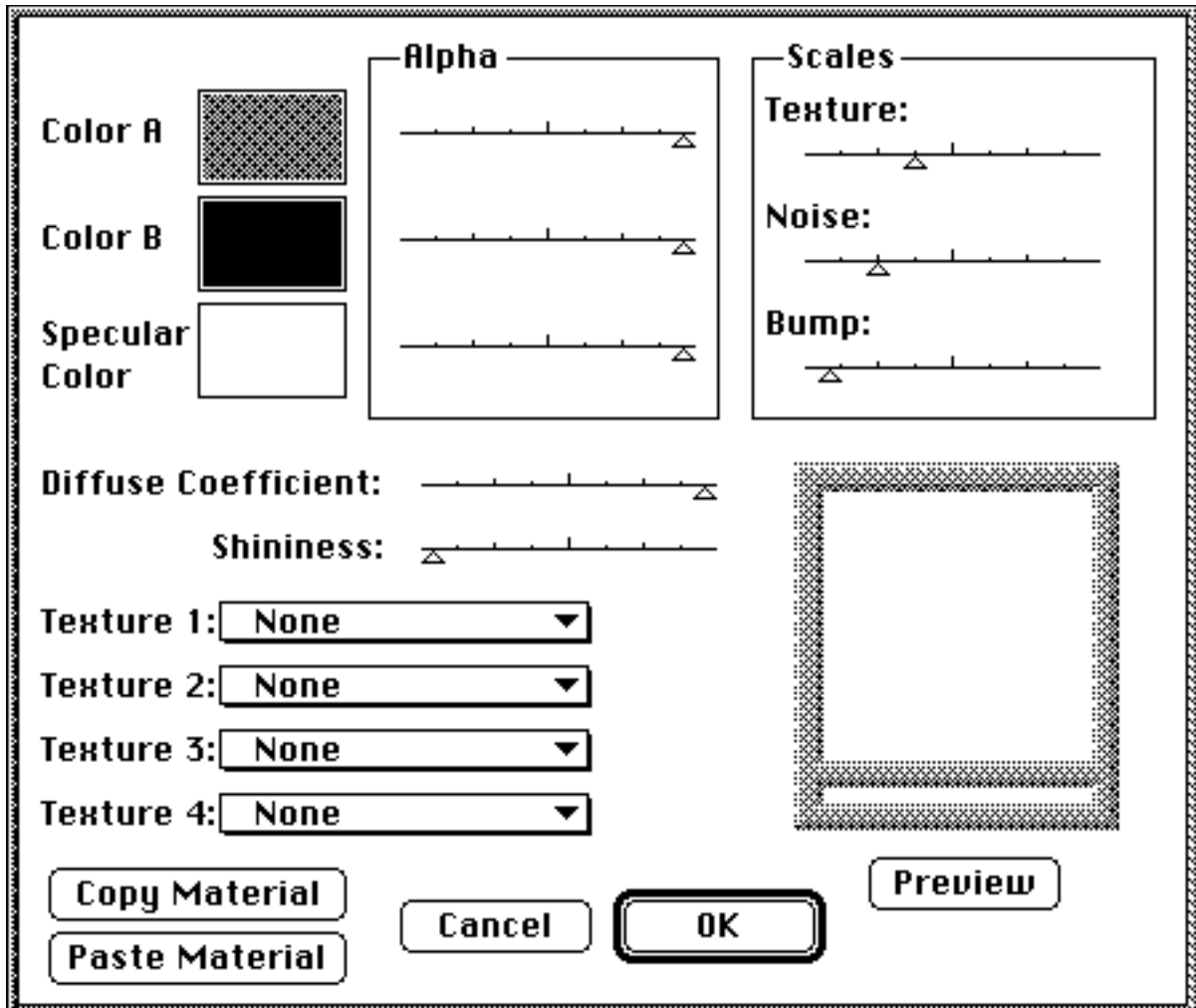
When you choose Eye, Lookat, or one of the lights in the object list, a small X will be drawn in the scene indicating the position of that object. For light sources, this X indicates

their location. Click in the window to move them. The X for Lookat indicates the center of attention, so place this where you want the camera to point at. For Eye, the X indicates

where your camera is. Use Eye and Lookat together to set up the camera position, where the camera is and what it's pointing at.

The Material Editor

The material editor is brought up by selecting an object from the list and choosing Material in the Effects menu.



Choose colors for Color A, Color B, and Specular Color by clicking on the color boxes next to them. The three alpha sliders correspond to the three colors. If a slider is all the way to the right, the color is completely

opaque. If the slider is to the left, that color is transparent. Color A represents the main color for a material. Specular Color is the color of the shiny highlights on an object. You should usually leave this white and opaque, but it can be adjusted if desired. Color B is a secondary color used when a texture is applied. For example, in a marble texture, Color A will be the main color and Color B will be the color of the veins in the marble. The Diffuse Coefficient slider controls how

shiny an object is. To the right, the object gives only diffuse reflections (it's not shiny at all) and to the left, the object is only shiny and may appear very bright. The shininess slider controls the size of the highlights on the object. Moving the slider to the right gives a smaller, sharper highlight. The Copy Material button copies the current material into memory and the Paste Material button pastes the previously copied material, allowing you to copy a material

from one object and apply it to others. The preview button will generate a preview of how the

current texture settings will appear on an object. Press the mouse button to cancel a preview in progress.

Now to textures. To create interesting objects, there are a variety of textures that can be applied. There are three categories of textures: color, turbulence, and bump. The color textures are Wood, Marble, Marble 2, Checkerboard, Swiss Cheese, Swirl, Camouflage, Colored Noise, Puffballs, and Noise Blend. Turbulence textures are

X, Y, and Z Turbulence. Bump textures are Bumps, Veins, and Snow. To make the effect of bump textures more apparent, make the object shiny by lowering the diffuse slider and raising the shininess slider. The material editor allows you to assign any four textures to an object, but there are restrictions on what combinations work. You can only use one color texture, but any number of turbulence and/or bump textures. Also, any turbulence textures must come before the

color texture. Turbulence textures use fractals to “scramble” whatever color texture comes after them, so the Marble texture by itself looks like a bar of color, but when used in conjunction with the X Turbulence texture, the Marble looks like marble. The more textures you use, the longer it will take to render, so if you want to use turbulence, one turbulence texture should be sufficient.

Note that the Veins texture is a special case. It is both a color

texture and a bump texture. It tries to create raised veins on a surface whose color is Color B. In between the veins, however, another color texture can be used as long it is set before the Veins texture.

An interesting effect that is provided by textures is transparency. Most of the color textures use two colors (A and B), except Swirl and Camouflage. By making one of these colors partially or completely transparent, you can make an object appear to have

holes in it. By combining various textures and transparency, very interesting effects can be achieved. Idea: using X Turbulence and Noise Blend, make one color transparent and you can create smoke and cloud effects by applying the material to a large background plane.

The three sliders on the upper right modify the active textures. The Texture slider makes the color texture being used smaller or larger, the Noise slider makes any turbulence textures create

smaller or larger amounts of turbulence, and the Bump slider makes bump textures bring their bumps closer together or farther apart.

Making up texture combinations is pretty fun, but can take some playing around with. Look at the examples included with the program, the settings of the sliders and the textures used and try modifying them to see what happens.

Grouping Objects

Grouping objects is not a feature of Mirage, but there is a way to do it. First, in a scene by itself, create the object that you want to group together. For example, make a chair out of four legs, a seat, and a back. Now use the Export command in the File menu to export the scene to a text file. In a word processor you can modify this text file. First, delete everything up to the first appearance of the word “Object”. Next, delete every occurrence of the words “Object” and “End” in the file.

Finally, on the first line of the file, by itself, type the number 2721. You have now grouped the object. To use the grouped object, open a Mirage document that you want to use it in, for example a room scene. Choose New Object under the Objects menu and set the object type to Imported Text and open the file you just modified in the word processor. The chair will appear as a single, grouped object.

3D Text File Formats

This last section describes the format of the 3D text files created and used by Mirage. This section can be completely ignored unless you are interested in using Mirage-generated models in your own programs or creating objects for use by Mirage without using Mirage's tools.

There are two types of text files Mirage creates, one for single objects and one for complete scenes. The object format is basically a subset of the scene format, which is

described first. In the examples below, any numbers are examples unless stated otherwise, anything enclosed by brackets {like this} will be described later, anything preceded by a

* symbol is a comment and should not appear in a real file, and everything else appears exactly as in a Mirage text file. It will probably help if you compare these descriptions with actual Mirage text files you export from the program.

Scene file:

```

1272          *ID number used to identify a scene file (use this exact #)
c          *camera data
  80 30 100  *camera eye position
  0 0 0      *camera lookat position
  45         *camera viewing angle
1          *light source 1
  100 100 0  *light position
  1 1        *on and infinite settings, respectively (1=checked, 0=unchecked)
  1 1 1      *rgb value of light source (range 0-1)
  0 0        *falloff 1 and 2 values, respectively
1          *light source 2
  -100 100 0
  0 1
  1 1 1
  0 0
1          *light source 3
  0 100 100
  0 1
  1 1 1
  0 0
1          *light source 4
  0 100 -100
  0 1
  1 1 1
  0 0
Object      *one Object, End pair appears for each object in the scene
{object data - described below (brackets don't appear in actual file)}
End
Object      *the second object appears here
{object data - described below (brackets don't appear in actual file)}
End*third object after this, etc.

```

Object file:

2721 *ID number used to identify a scene file (use this exact #)
{object data - described below (brackets don't appear in actual file)}

Object data: (used in both scene and object files)

m *material specification
0.5 0.5 0.5 1 *r,g,b, and alpha of Color A (range 0-1)
0 0 0 1 *r,g,b, and alpha of Color B (range 0-1)
1 1 1 1 *r,g,b, and alpha of Specular Color (range 0-1)
1 0 *Diffuse and Shininess slider values
24 37 6 *Noise, Texture, and Bump slider values
2 *number of textures used (up to 4)
TRBX *a 4-character code for each texture used
MRBL

*Geometry data now follows. An object can have any combination
*of polygons, polygonal patches, and bezier patches. This
*example illustrates one of each
*Note: a polygon should always have at least 3 vertices,
*should always be convex, and should be defined counter-
*clockwise from the outside if Flat rendering is to have a good
*guess of whether it should be visible.


```

p 4 *polygon with 4 vertices
  -60 25 -30      *x,y,z position of each vertex
  -10 25 -30
  -10 -25 -30
  -60 -25 -30
pp 3                *polygonal patch with 3 vertices
                   *the next three lines each contain the x,y,z position of a
                   *vertex, followed by the x,y,z values of the normal vector at
                   *that vertex
  -60 25 -30 10 10 10
  -10 25 -30 -10 10 10
  -10 -25 -30 10 10 -10
bp 1                *bezier patch with smoothness level of 1 (max smoothness of 2)
                   *x,y,z position of each of the 16 control points
  -10 25 50
  -10 8.333333 50
  -10 -8.333333 50
  -10 -25 50
  35 25 42.5
  35 8.333333 42.5
  35 -8.333333 42.5
  35 -25 42.5
  42.5 25 25
  42.5 8.333333 25
  42.5 -8.333333 25
  42.5 -25 25
  20 25 -20
  20 8.333333 -20
  20 -8.333333 -20
  20 -25 -20

```

Note that comments are not permitted in Mirage text files. The comments above are only used to describe the format of the files.

3/13/94