



Defining Materials and Textures

A Comprehensive User's Guide

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C H A P T E R O N E

Introduction

Introduction

An important part of the process of creating a 3D image in SOFTIMAGE 3D is the lighting of the scene, the material definition of the object's surface, and any textures that are added to complete the definition. These are the tools designed to accomplish all these tasks:

Light

A basic element you will work with is *light*. Lights affect the way all objects' surfaces appear in the scene. You can dramatically change the nature and mood of your scene by changing light types, as well as their parameters.

For more information on light, see *Light* on page 7.

Materials

Material definition in SOFTIMAGE 3D is achieved by applying material properties to the object's surface. These are properties such as colour, the shading modes, reflectivity, transparency, and refraction.

For more information on material, see *Material* on page 23.

2D and 3D Textures

In addition to material, you can also add texture to an object to enhance its appearance. When you add a new texture without selecting a material, SOFTIMAGE 3D automatically assigns a default material. Applying textures to your objects can give them an increased sense of realism. Textures can be used to create an endless variety of colour patterns, surface roughness, transparency, and reflectivity.

The 3D textures are solid procedural textures can be used to create an infinite variety of effects starting with three basic pattern types: wood, marble, or clouds.

2D textures are created using source picture files, which you can then manipulate. There are a number of mapping effects available with 2D textures to give you a great amount of flexibility.

For more information on 3D textures, see *3D Textures* on page 111; for information on 2D textures, see *2D Textures* on page 53.

Atmosphere

You can add atmospheric effects such as fog, illumination, and depth-fading to your scene. These effects work in conjunction with the currently selected lights that are in the scene.

For more information on atmosphere, see *Atmosphere* on page 133.

Colour Reduction

For various reasons, including output to a lower-resolution platform, you can create a reduced palette that is representative of the colours present in the image.

For more information on reducing colours, see *Reducing the Number of Palette Colours* on page 145.

What's a Surface?

An object is defined by points in space that are connected together to create a surface of polygons or patches. This is the surface that receives all material and texture attributes. For the purpose of rendering, SOFTIMAGE 3D divides a surface into triangles, which is a process known as *tessellation*.

Each triangle is a planar surface with its front face oriented in one direction. The orientation of this surface is shown by a vector (direction line) called a *normal*, located on the points (vertices) of each triangle. Since a polygon has only one side visible to the camera, the normal always needs to be oriented in the direction of the camera to make that surface visible (you can, however, make all surfaces visible to the camera – see the **Render** menu cell for more information).

When the surface has been defined using a combination of lights, materials, and textures, the rendering process calculates all these attributes to create a final image. SOFTIMAGE 3D calculates the relation between the orientation of normals and the light source to determine the surface attributes of each triangle.

C H A P T E R T W O

Light

Introduction



A basic element you will work with is *light*. Lights affect the way all objects' surfaces appear in the scene. You can dramatically change the nature and mood of your scene by changing light types, as well as their parameters.

You should always define material and texture attributes after defining your light sources since parameters associated with light (such as falloff, colour, and shadow) affect the surface attributes of the object.

Types of Light

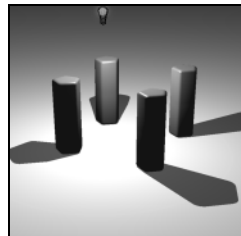
There are four kinds of light sources you will use in your scenes. If you render an object without defining a light source, the software automatically creates a light. The default light is a white point light positioned at 100, 100, 100, and does not cast shadows.

The types of light sources include an infinite light, a point light, a spotlight, and the sun.

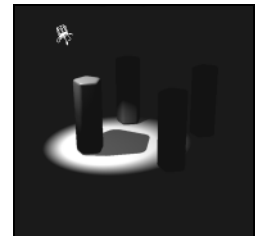
- **Infinite** lighting sets a light source that is infinitely far from objects in the scene. There is no position associated with the light, only a direction. Since the light is infinitely far away, all objects are lit at the same angle.
- **Point** lighting sets an omnidirectional light. Light rays travel in all directions from the position of the light. This type of light is similar to a light bulb where there are light rays emanating in all directions from a single position. Depending on the position of objects in relation to the light, the light hits them at different angles.
- **Spot** lighting sets a unidirectional light. This is useful for lighting a specific object or area. Light rays travel in a cone from the position



Infinite light
All light travels in same direction.



Point light
Light radiates outward from source in all directions.



Spot light
Light radiates outward from source along a conic path.

of the light toward the light interest. The light interest is like a camera's interest: the spot light always points in its direction. This is useful for animating an object with a spot light following it: just constrain the spot's interest to that object and the spot light follows.

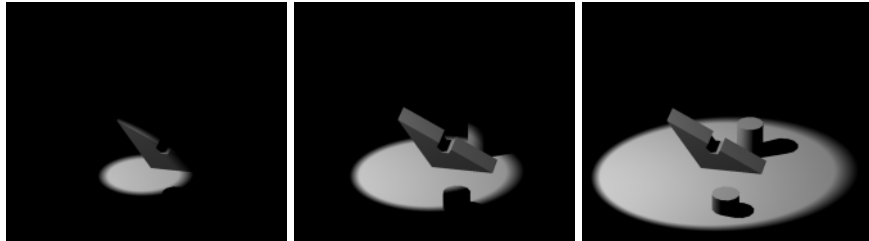
- **Sun** lighting is an infinite light whose direction vector is derived from a physical simulation based on the latitude and longitude of the scene location and the specified time, date, month, and year.

All of these lights and their parameters can be animated. For more information on light parameters, see the **Light** → **Define** command on page 939 in the *Reference Guide*.

What Can You Do With Lights?

You can use as many lights in a scene as you wish, but each light you add slows down the rendering slightly. As mentioned before, all light parameters can be animated. You can, for example, change a light's colour over time, or its intensity. You can animate hiding and displaying a light to create a "lights on/lights off" effect. If you're using mental ray, you can use area lights to create soft shadows in your scene.

You can also change the cone and spread angle of a spot light over time to light a "theatre" production or Broadway show!



Animate the cone angle of a spotlight from 15 degrees to 30 to 45.

Helpful Tools

There are two viewing modes that can assist you while defining lights: the Shade view mode in most windows, and the Light mode in the Schematic window.

Using the Shade View Mode

A tool that is useful during the process of colouring objects and positioning lights is the Shade view mode in the title bar of most windows (see *Shade View Mode* on page 34 in the *Reference Guide*).

This provides you with a quickly shaded view using a hardware-rendering that allows you to view an approximation of the objects' final appearance. Depending on the hardware your machine is running, it may be a software emulation of true hardware acceleration. However, the Shade view does not distinguish between point or spot lights. Also, some specific material attributes such as transparency, reflectivity, shadows, and refraction can only be viewed using the **Preview** menu cell or in the final rendered picture.

Using the Light Mode

The Light mode in the Schematic window displays the lights and their links such as constraints, path animation, and selective lights. Links are labelled with the relation name. You can use this view on its own or cumulatively with other Schematic view modes (such as Model or Matter) to see lights on their own, or to see the relationships between lights and other elements in your scene. For more information, see *Modes* on page 66 in the *Reference Guide*.

Creating a Light

The process of creating a default light is very simple: choose **Light → Define**, click Ok, and accept the default parameters.

To create a more specific light, choose the **Light → Define** command to define all settings for your new light.

The following example shows how to put a light in a scene.

1. Create or select any scene that has no light defined.
2. Choose the **Light → Define** command.
3. The Create Light dialogue box is displayed.
4. Choose a light type: **Point**, **Spot**, **Infinite**, or **Sun** and click Ok.
5. Move the light around to see how it illuminates the objects in the scene. If you chose a Point or Spot light type, position it according to the objects in your scene. Move the Spot light's interest around and watch the spot light follow it.
6. To get an approximate indication of the spot light's angle, choose **Show → Cone**.
7. If you want to go back and edit the light's parameters, select the light and choose **Light → Edit**. The same dialogue box is displayed as when you created the light and you can set all parameters, except the light's type (Spot, Point, etc.).



Light → Define always creates a new light, but **Light → Edit** lets you edit an existing light.

Changing the Light's Colour

Changing a light's colour uses the same principles and basic tools as changing the colour of an object's material.

1. Select the light whose colour you want to edit.
2. Choose **Light → Edit**.
3. In the dialogue box that appears, drag the slider for each colour component (range is from 0 to 1) or type the value in the text boxes beside the sliders.
4. By default the colour model is RGB, but you can click the **RGB** button to change between RGB, HSL, and HSV colour models.

You can also click the **Palette** button to create, save, or use your own defined colours. See *Using the Palette* on page 34 for more information on using the palette.

5. Click **Ok** to save the parameters.

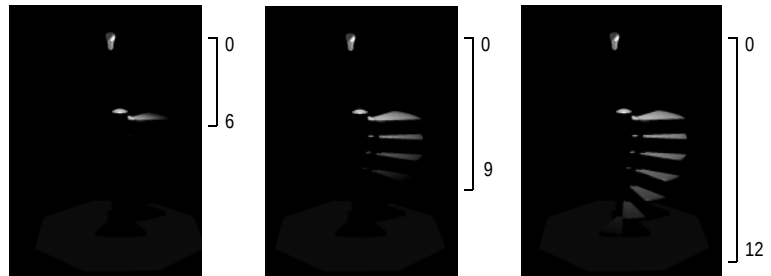
In **HLS**, the hue refers to the colours red, green, and blue; the lightness is the amount of white mixed in a colour, such as the difference between a pure red and pink. The saturation is the intensity or purity of the colour such as the difference between a pure red and a dusty rose.

In **HSV** the colour model defines the hue and saturation, like the **HLS** model. Value is almost identical to lightness, as in **HLS**, however, a Value of 1 represents a pure colour, while for Lightness it is white.

Changing the Light's Intensity

You can change the light's intensity over distance by setting the light's start and end falloff. This is usually done in relation to an object. The **Start** and **End Falloff** parameters are available only for **Point** and **Spot** light types.

Start Falloff specifies the point at which the light intensity starts to decrease in all directions. **End Falloff** specifies the point at which the light intensity has dimmed completely. The distance for the **Falloff** parameters are measured in **SOFTIMAGE** units.



Falloff

Start and End Falloff values are shown.

(Used a point light, umbra = 0; top of staircase is 5 units from the light, bottom is 12 units).

To set the falloff values, follow these steps:

1. Choose **Light** → **Define** and create a **Point** or **Spot** type light. Click **Ok** to close the dialogue box.

2. Figure out the distance over which you want the light to dim in SOFTIMAGE units. You can do this by counting the units between the light and the object if the light is at a direct angle to an object, such as directly above, below, beside, etc.

If the light is at an angle to the object, follow these steps to use the **Info → Distance** command, which calculates the distance between the light and an object's centre (see page 905 in the *Reference Guide* for more information).

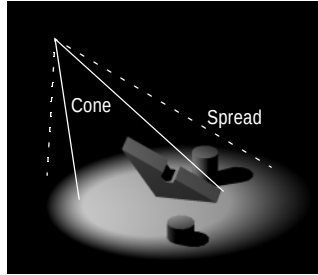
3. Choose the **Info → Distance** command. Middle-click near the light and then your object. To use the object's centre as a reference point, press the Shift key and then pick the object.
4. The points are highlighted and a yellow line is drawn between the light and the object's centre. The distance (in SOFTIMAGE units) between the two is displayed in the status line at the bottom of the display. Take note of this number.
5. Select the light again and choose **Light → Edit**.
6. Using the distance values you figured out, set the **Start Falloff** and **End Falloff** values. For example, set **Start Falloff** to 0 and **End Falloff** to 120.
7. Click Ok to accept the values.



A light's falloff parameters are often defined in conjunction with depth-fading or atmosphere, such as in a smoky bar room or heavy fog. See *Atmosphere* on page 133 for more information on these features.

Changing the Light's Area of Influence

You can change a spot light's area of influence by setting parameters for the cone and spread angles. The **Cone angle** sets the angle in degrees the cone for the Spot type of light. The **Spread angle** sets the angle in degrees the decreasing light around the spot light cone.



Follow these steps to adjust the cone and spread angle of a spot light:

1. Choose the **Light → Define** command and choose a Spot light type.
2. Change the values for the **Cone angle**. Use 10 for this example, but play around with them
3. Change the **Spread angle** to 30 for this example, but vary its value to see how it behaves in relation to the Cone Angle.
4. Click Ok to accept the values and exit the Create Light dialogue box.
5. Make sure that the camera is placed above the light in the Perspective window.
6. Choose **Preview → All** to see the cone and spread angles of the spot light.

Including or Excluding Objects from a Light

You can have certain objects affected by, or excluded from, a particular light source in your scene. This can be useful if you're using a number of lights in a scene, but want to reduce the rendering time (the more lights there are in scene, the longer it takes to render). Only the objects that are affected by the light source are rendered with its effect.

1. Choose **Light → Define** and select the **Selective Light** option to define the light as selective. You can then choose whether the light affects an object or not by selecting either **Include** or **Exclude**.
 - If you select **Include**, only objects associated with the light are illuminated.
 - If you select **Exclude**, objects associated with the light are the only objects in the scene that are not illuminated.
2. Click **Ok** to exit the dialogue box.
3. Select the object (or objects) in the scene that you want to include with or exclude from the light.
4. Choose **Light → Associate** and pick the light that you set as **Selective**.



In the Schematic window, choose the Light mode to see the inclusions or exclusions for the light.

Creating Shadows

If you want your scene to have a more realistic look, you can create shadows that appear to be cast by the objects in your scene. Shadows serve two purposes: they create more realism in your scene and they create a sense of depth.

To create a shadow, you need a main light source, an object (or objects) in the light's path, and an object or surface onto which a shadow is cast.

Shadows are affected by several attributes in a scene. Its colour and values are affected by the light's umbra value, the material's ambience and colour, the texture's binding factor with the material, and the global ambience setting. For example, if any of these values are set to 0,0,0, the object's shadow is completely black.

There are several ways to create shadows:

- Create a depth map.
- Create raytraced shadows.
- Create soft shadows.
- Use area lights to create soft shadows.
- Create shadows from objects that are not visible.

Creating a Depth Map

A depth map uses a modified z-buffer algorithm to create shadows more quickly than with raytracing, but not as precisely. This algorithm calculates colour and depth (z) information for each pixel based on its surface and distance from the camera.

Before rendering starts, a depth map is generated for the light. This map contains information about the scene from the perspective of the light origin; this information describes the distance from the light to objects in the scene and the colour of the shadow on that object. During the rendering process, the map is used to determine if an object is in a shadow.

1. Choose **Light** → **Define**.
2. Select a Spot type of light.
3. Select the **Depth Map** option.

4. You can then set the **Map Resolution** factor, which determines the resolution of the shadow map computed.
5. Click Ok to accept the values.

Creating Raytraced Shadows

Raytracing involves calculating light rays that are reflected, refracted, and obstructed onto surfaces. Although it gives very realistic results, it can be a time-consuming process.

With raytraced shadows, you can also set the umbra intensity to apply a transparency factor on the umbra (main) area of the shadow. This defines how the shadow blends with the material's colour on which it is cast, which makes for a more realistic looking shadow.

1. Choose **Light → Define**.
2. Select any type of light.
3. Select the **Raytraced** option.
4. Select **Umbra Intensity** to apply a transparency factor on the umbra shadow area's range (0 = black shadow, 1 = no shadow).

Creating Soft Shadows

You can create softer shadows if you choose a spot light and set the **Soft** parameters. You can also use mental ray area lights to create a soft shadow (see *Creating Soft Shadows with Area Lights* on page 19).

Using the **Soft** parameters, you can make soft shadows by creating a penumbra area. The penumbra part of a shadow is considered the “secondary” shadow which is cast when only part of the light is blocked by the object. You can then set the shadow's **Penumbra Factor**, **Umbra Intensity**, **Map Resolution**, **Filter Size**, and **Filter Step** factors.

1. Choose **Light → Define**.
2. Select a Spot type of light.
3. Select the **Soft** option.
4. Select **Umbra Intensity** to apply a transparency factor on the umbra shadow area's range (0 = black shadow, 1 = no shadow). The umbra shadow area is considered the “main” shadow that an object casts when it blocks the light source completely.

5. If you choose **Penumbra Factor**, it creates a “fringe” area of shadow at the edge of the umbra shadow area. You can change the transparency of this area by changing the factor from 0 (black) to 1 (no shadow).
6. Set the **Map Resolution** factor, which determines the resolution of the shadow map computed.
7. Specify the **Filter Size**, which is the size in pixels of a box filter used to soften the penumbra shadow edges.
8. Specify the **Filter Step**, which is the pixel offset used to apply the filter at a specific number of pixels from the previous application.
9. Click Ok to accept the settings and create the shadow.

Creating Soft Shadows with Area Lights

Area lights are used only with the mental ray renderer (see *Rendering with mental ray* on page 55 of the *Rendering User's Guide*). As well, only the Point or Spot light types can be used with area lights.

Area lights bring more realistic effects to light sources by modelling them as pieces of geometry, which allows soft shadows to be created.



Normal point source light has sharp shadow edges.



Area light creates blurred shadows.

You can choose from three shapes of geometry areas (rectangle, sphere, and disk) to create around the light source that influences the resulting form of the shadows. The shadow's relative softness (the relation between the shadow's umbra and penumbra areas) is also affected by the shape and size of the geometry area.

To determine the amount of illumination on an object, the area light is sampled many times. Each sample is distributed over the area light geometry. Using this method, any number of samples may be blocked, resulting in a smooth “falloff” from the umbra to penumbra part of the shadow. The shape and size of the geometry

affects the percentage of samples that hit the light from any point in the scene.

Note You cannot have the geometry area defined anywhere except centered around the spot light because the translation of the light is applied equally to the geometry area.

After the area light's parameters have been defined, you can scale or rotate the geometry area icon:

- To scale, use the **Scale** menu cells as you would with any object.
- To rotate, select the geometry area icon by middle-clicking it. The geometry area icon turns red indicating that you can apply a rotation to it using the **Rotation** menu cells as usual. If the **Relative Orientation** option is not selected, the rotation is performed relative to the global coordinate system; if this option is selected, rotation is relative to the spotlight's local coordinates. The z-axis of the local coordinates is defined by the spotlight's position and its interest's position.

Note The effect of rotation has no effect on a **Sphere** geometry area type.

Example

The following example illustrates how to create soft shadows with area lights.

1. Choose **Get → Primitive → Cube**. Duplicate the cube twice and scale each one so that there are three cubes with different heights.
2. Choose **Light → Define**, select the Point type light, and click Ok. This gives some ambient light to the scene.
3. Define another light, but make this one a Spot light, and select the **Area Light** option.
4. Select **Raytraced** as the shadow type, and then set a low **Umbra Intensity** value of 0.1. This creates a very dark shadow.
5. Set the **Area Sampling** to 3 for both **u** (longitude) and **v** (latitude). Area sampling controls the number of times the light is sampled to determine the illumination for a point in the scene.
6. Click Ok to accept these settings.

7. Move the spot light's interest to the location of the cubes, but try to have an oblique angle to exemplify the effect of the soft edges.
8. Orient the point light off to the left, opposite the spot light to give some ambient light to the rest of the scene.

The area light sources create separate sampling values, so the sampling level of the whole scene doesn't need to be as high for high-quality renders.

Render this scene using the mental ray renderer.

Creating Shadow Objects

Besides creating shadows from an object, you can also create shadows without an object being there! There are two ways to do this:

- Set a shadow as an object's material attribute.
- Set an object to cast only a shadow with the mental ray renderer.

To create the shadow as the object's material attribute:

1. Select the object you want to be only a shadow.
2. Choose the **Material** menu cell in the Matter module.
3. Select **Shadow** as the Shading Model type.
4. Click Ok to save.

To create a shadow object using mental ray:

1. Select the object you want to be only a shadow (this has to be a 3D object).
2. Choose **Info → Selection**. In the dialogue box that is displayed, click the **Render Setup** button.
3. In the mental ray Render Setup dialogue box that is displayed, deselect the **Primary** and **Secondary** options for the Object Visibility, and select only **Shadow**.
4. Click Ok in the Render Setup dialogue box, then in the Info Selection dialogue box.
5. Choose **Preview → Setup** and select mental ray as the preview renderer. Then choose **Preview → All** to see the whole scene.

Render the final scene with the mental ray renderer.

Using Light Shaders

If you want to add certain effects to an object, you can apply light shaders. Light shaders are special effects you can add to your light's definition during the rendering process using the mental ray renderer. For example, the Slider shader lets you simulate light coming in through a window. Shaders are flexible and you can create and manipulate them to meet your specific needs.

The options in the **mental ray** area of the Create Light dialogue box let you define light shaders for one or more selected objects used when rendering with mental ray.

1. Select **mental ray** as the preview renderer when you choose the **Preview → Setup** command.
2. Choose **Light → Define**. The Create Light dialogue box appears.
3. Select **Shader** to open the browser in which you can select the light shader. The browser opens to the current light shader chapter.
4. Select the shader from the database and then click **Load**. This shader name appears in the text box below the **Shader** option.
5. Preview the effects by clicking the **Preview** button in the Create Light dialogue box.
6. If you want to edit the shader's parameters, click the **Edit** button in the mental ray area, which displays the dialogue box containing the shader's parameters.

Render the final scene with the mental ray renderer.

C H A P T E R T H R E E

Material

Introduction

Material definition in SOFTIMAGE 3D is achieved by applying material properties to the object's surface. Material properties include such things as colour, the shading model, transparency, reflectivity, refraction, and shaders. All these attributes are discussed in this chapter.

Lighting plays a key role in material definition because the interaction between material properties and the light source creates the visual characteristics of the object. Create your light sources before the material for the best results.

After you apply a material, you can then apply 2D texture maps and/or 3D solid procedural textures to create patterns of colour, surface roughness, reflectivity, transparency, and other effects.

Helpful Tools

There are two viewing modes that can assist you while defining materials: the Shade view mode in most windows, and the Matter mode in the Schematic window.

Using the Shade View Mode

A tool that is useful during the process of creating material is the Shade view mode in the title bar of most windows (see *Shade View Mode* on page 34 in the *Reference Guide*).

This provides you with a quickly shaded view using a hardware-rendering that allows you to view an approximation of the objects' final appearance. Depending on the hardware your machine is running, it may be a software emulation of true hardware acceleration. However, the Shade view does not distinguish between point or spot lights. Also, some specific material attributes such as transparency, reflectivity, shadows, and refraction can only be viewed using the **Preview** menu cell or in the final rendered picture.

Using the Matter Mode

The Matter Mode in the Schematic window displays links to material and texture files (shown as parallelograms leaning right). You can associate material and texture elements to objects in the Schematic window by using the **Mat_Oper** and **Txt_Oper** menu cells. You can use this view on its own or cumulatively with other Schematic view

modes (such as Model or Light) to see materials on their own, or to see the relationships between them and other elements in your scene. For more information, see *Modes* on page 66 in the *Reference Guide*.

Defining a Material

All material attributes can be defined in the Material Editor dialogue box that is displayed when you choose the **Material** menu cell in the Matter module.

Colour and shading models can be defined for a material. Reflectivity can be incorporated in an object's material definition, as well as transparency, which permits the transmission of light rays through material. When transparency is incorporated in an object's material definition, you can also define the refractive index. Refraction is the bending of light rays as they pass from one medium to another, such as from air through glass or water.

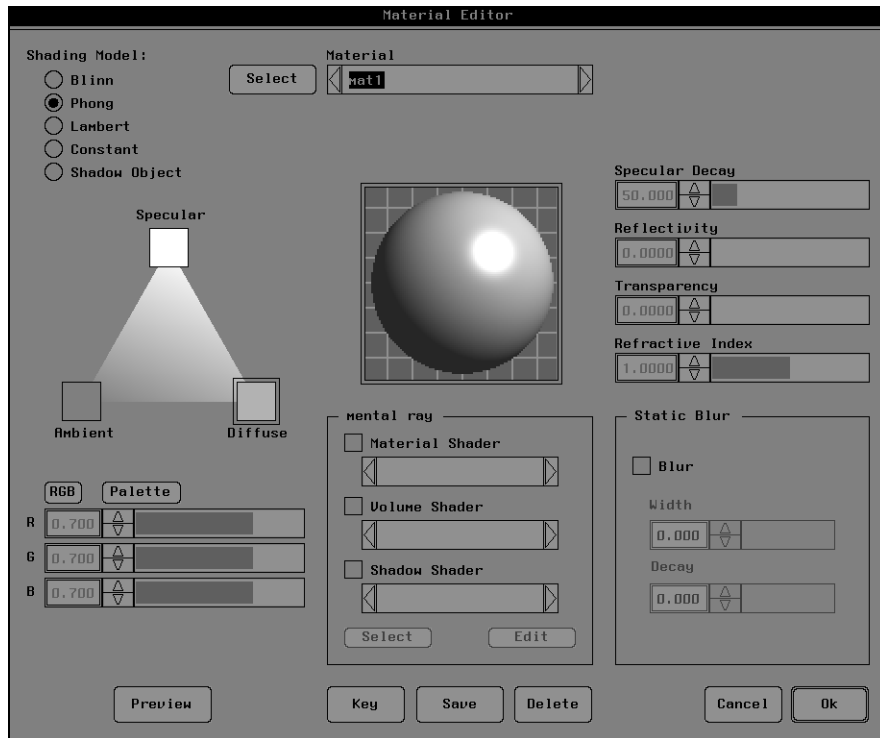
Static blur can be used to make a spherical object appear fuzzy, out of focus or glowing. You can also apply different shaders to be used with the mental ray renderer for special effects that are calculated during the rendering process.

After you apply a material, you can then apply 2D texture maps and/or 3D solid procedural textures to create patterns of colour, surface roughness, reflectivity, transparency, and other effects. The material attributes you select here have an influence on how these textures appear, especially if you choose to blend the texture with the material. For more information on 3D textures, see *3D Textures* on page 111; for information on 2D textures, see *2D Textures* on page 53.

To define an object's material in SOFTIMAGE 3D, follow these basic steps:

1. Select an object.
2. Choose the **Material** menu cell in the Matter module.

The Material Editor is displayed.



3. Select the **Shading Model**. Several kinds of shading models can be used by the software to calculate the shading. Each shading model processes the relation of normals to the light source to create a particular shading effect.
4. Select colour values for the **Ambient**, **Diffuse**, and **Specular** areas of illumination on the object surface. Depending on the shading model used, different areas of illumination are visible on an object's surface.
5. You can assign other values such as specular decay, reflectivity, transparency, refraction, static blur, or apply a shader for use with the mental ray renderer.
6. Click Ok to accept the settings.

Creating Glass

The following example illustrates the use of the material parameters for creating the effect of glass.

1. Select an object in a scene, then choose the **Material** menu cell in the Matter module to display the Material Editor dialogue box.
2. Select the **Phong** shading model and set colour (RGB) values each to 0 (black) for the ambient and diffuse areas of illumination.
3. To create a small sharp highlight, set the **Specular Decay** to 300.
4. Set the **Reflectivity** to 0.99, its **Transparency** to 0.9, and **Refractive Index** to 1.3.
5. Increase the **Specular** values to 1000-1000-1000 to compensate for the material's reflectivity and transparency.
6. Click Ok to accept the settings and exit the dialogue box.
7. Choose the **Preview → Setup** command and set the **Raytracing depth** to 4 to allow for enough rays to be bounced off the objects to calculate the transparency, reflectivity, and refraction.
8. Choose **Preview → Selection** to view the results.

Selecting a Material

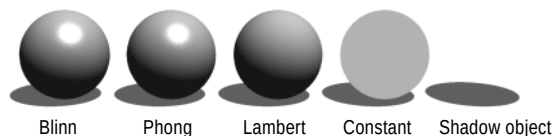
To select a material from the database, follow this procedure:

1. Select an object.
2. Choose the **Material** menu cell.
3. In the Material Editor dialogue box, click **Select** beside the **Material** text box.
4. Use the browser that is displayed to go into the directory in which **SI_Materials** is located. Double-click **SI_Materials** to bring up the various choices available within the SOFTIMAGE materials library.
5. Double-click the **METALS** chapter, for example. A list is displayed consisting of several different types of metal. Click **Options** and select **Use Icons**. This displays a sample image of each metal type making it easier for you to pick the one that you want.

6. Click **copper01.1-0**, for example, to select it, then click **Load**. The specific colours and parameters of the copper metal are loaded into the Material Editor.
7. Click **Preview** to view the results, then click **Ok** to assign the material to your object.

Choosing the Shading Model

Several kinds of mathematical shading models can be used by SOFTIMAGE 3D to calculate the shading. The shading models are available as options in the Material Editor dialogue box. Each shading model processes the relation of normals to the light source to create a particular shading effect.



Constant

The **Constant** shading model ignores the orientation of surface normals and instead considers them to be pointing directly toward an infinite light source. All the object's surface triangles are considered to have the same orientation and be the same distance from the light.

The result when using the Constant shading model is an object whose surface appears to have no shading at all, like a paper cut-out. This can be useful when you want to add static blur to an object so that there is no specular or ambient light. It also provides good support for textures because there are no attributes to interfere with the texture's definitions.

Lambert

The **Lambert** shading model deals with the intensity of reflected light. It interpolates between normals of adjacent surface triangles so that the shading changes progressively, creating a matte surface with no specular highlights. The diffuse and ambient illumination areas are used to define the surface.

The result is a smoothly shaded object. The object's surface appears as a dull matte with diffuse and ambient illumination, like an egg or a ping pong ball. Reflectivity, transparency, refraction, and texture can be applied to an object shaded with Lambert

Phong

The **Phong** shading model is the default shading model used by SOFTIMAGE 3D. This model uses ambient, diffuse, and specular areas of illumination.

The Phong shading model reads the surface normals' orientation and interpolates between them to create an appearance of smooth shading. It also processes the relation between normals, the light, and the camera's point of view to create a specular highlight. The result is a smoothly shaded object with diffuse and ambient areas of illumination on its surface, and a specular highlight so that the object appears shiny like a billiard ball. Reflectivity, transparency, refraction, and texture can be applied to an object shaded with Phong.

Blinn

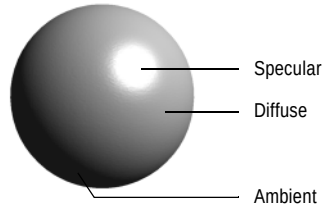
The **Blinn** shading model uses four areas of illumination: diffuse, specular, refractive index, and eccentricity. This shading model produces results that are virtually identical to the Phong shading model except that the shape of the specular highlight reflects the actual lighting more accurately when there is a high angle of incidence between the camera and the light, which is useful for rough or sharp edges. The specular highlight also appears brighter. Reflectivity, transparency, refraction, and texture can be applied to an object shaded with Blinn.

Shadow Object

The **Shadow Object** shading model is used exclusively with lights for casting shadows. The object itself is not visible when rendered, only its shadow appears. Other material and textural definition effects such as transparency, colour mapping, and transparency mapping can be used in conjunction with **Shadow Object** shading to cast complex patterns of light and shadow in the scene (the object is not visible to the camera). For more information on how to create a shadow object, see *Creating Shadow Objects* on page 21.

Areas of Illumination

Depending on the shading model you select, different areas of illumination are visible on an object's surface. The areas of illumination are ambient, diffuse, and specular.



The diffuse area is considered the “main” area affected by the light, the ambient area is the area in shadow, and the specular area is the highlight created when light hits the object's surface.

- A Constant-shaded surface has only a diffuse area of illumination.
- A Lambert-shaded surface has areas of diffuse and ambient illumination.
- A Phong or Blinn-shaded surface has areas of diffuse, ambient, and specular illumination. The size of the highlight (specular area) can be varied using the **Specular Decay** option in the Material Editor dialogue box.



The colour and brightness of the scene's ambient light can be changed using the **Atmosphere → Ambience** command.

Defining Colours

When you define the colour of an object's material, you should define the colours and textures for your objects under the default white light since coloured light sources affect their appearance. Then colour your light source to achieve the final look of the scene.

The additive colour system is used to define colours for object materials (or lights); this is the system used by the renderer to calculate colours. You can toggle between three different colour representation models: RGB (red, green, and blue – the default), HLS (hue, lightness, and saturation), and HSV (hue, saturation, and value).

The RGB colour model defines colour as light, rather than as pigment. The primary hues from which all colours are derived are red, green, and blue. These three hues mixed together at their highest values (1) make white, while absence of all hues (0) is black. When you create a colour, you must define the values of each red, green, and blue component to get exactly the desired hue. Numerical values for RGB range from 0 to 1 with a value of 1 being full saturation.

In HLS, the hue refers to the colours red, green, and blue; the lightness is the amount of white mixed in a colour, such as the difference between a pure red and pink. The saturation is the intensity or purity of the colour such as the difference between a pure red and a dusty rose.

In HSV the colour model defines the hue and saturation, like the HLS model. Value is almost identical to lightness, as in HLS, however, a Value of 1 represents a pure colour, while for Lightness it is white. In both systems, 0 is black.

Using the Colour Mixing Triangle

To change the colours of an object's material:

1. Select an object.
2. Choose the **Material** menu cell.
3. Select the **Diffuse** box in the colour mixing triangle. The diffuse area is usually the main area affected by light.
4. Select either the RGB, HLS, or HSV colour models. This is RGB by default to simply change the hues.

5. Drag the colour sliders to see how the colour changes in the triangle. You can also see the effects on the sphere in the display box to have an idea of what it will look like on a 3D object in your scene.

You can also type in numeric values from 0 to 1 in the text boxes of the sliders or use the arrow buttons beside the text boxes.

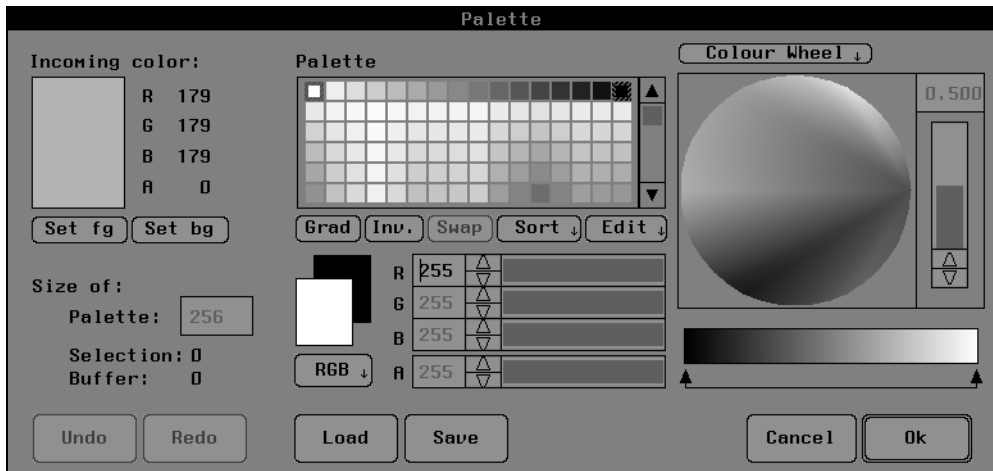


You can take a colour from one area of illumination in the Colour mixing triangle and copy it to another. Select the area to which you want to copy the colour, then middle or right-click the box associated with the colour you want to copy.

You can also change the Ambient and Specular colours the same way as for the Diffuse, but they have a different effect on your object, as you can see on the sphere in the display box.

Using the Palette

If you prefer to mix colours using the palette, click the **Palette** button in the Material Editor dialogue box to display the Palette dialogue box.



The colour mixing box is used to mix colours or modify their intensity. By default, the colour mixing box mixes black and white.

You can change its colours by selecting a colour from the palette or by defining a colour using the colour sliders, then clicking on one of the arrows below the colour mixing box with the middle mouse button.

The colour sliders provide a fast and accurate way of entering numerical values for colour components in the colour mixing triangle. They allow you to define the colour values, normally ranging from 0 to 1 for the selected area of illumination (specular, ambient, and diffuse).

You can choose from two palette types: Colour Spread or Colour Wheel (the default as shown). The Colour Spread displays a palette of 300 basic colours; the Colour Wheel displays a circular palette of interpolated colour components with an associated slider to control tonal brightness.

You can also create your own palettes using colours selected from the colour wheel, colour spread, or the colour sliders. These colours can then be saved as a palette file and retrieved later.

The following example shows how to change colours in the Palette dialogue box:

1. Select an object.
2. Choose the **Material** menu cell.
3. Click the **Palette** button and use one of these methods to change the colour in the Palette dialogue box:
 - Click inside the Colour Wheel and drag the mouse around. The colour sliders and the sample colour change as you move the mouse through the Colour Wheel. Once you have selected an appropriate colour, release the mouse button and click Ok.
 - Select Colour Spread instead of the Colour Wheel. Choose the colour you want by clicking on the appropriate square in the palette. Notice that the colour sliders and the sample colour change as you move the mouse around in the Colour Spread area. Once you have selected an appropriate colour, click Ok.
 - Apply a colour interactively by moving the sliders back and forth or by entering values between 0 and 255 directly into the RGBA text boxes.
4. The chosen colour appears in the Display Box area. Click Preview to view the results. Click Ok to apply the colour to your object.

Note

Colours are applied in the same manner for any area of illumination, as well as for any of the three colour models.

Reflectivity, Transparency, and Refraction

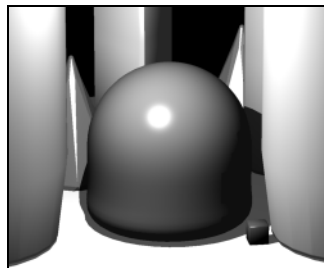
Reflectivity can be incorporated in an object's material definition, as well as transparency, which permits the transmission of light rays through material. When transparency is incorporated in an object's material definition, you can also define the refractive index.

Refraction is the bending of light rays as they pass from one medium to another, such as from air through glass or water.

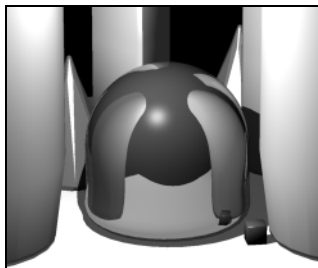
Reflectivity

You can define an object's material to be reflective using the **Reflectivity** slider in the Material Editor dialogue box. To render a reflective object, SOFTIMAGE 3D uses raytracing, which traces the paths of light rays as they bounce from one surface to another. For more information on raytracing, see *Raytracing* on page 36 of the *Rendering User's Guide*.

You can define an object's reflectivity. Reflectivity values range from 0 to 1: a value of 1 represents complete reflectivity, giving the object a completely mirrored surface.



No reflectivity in dome's material.



Reflectivity (30%)

The visibility of the other material parameters, such as those related to diffuse, ambient, and specular areas of illumination, decrease as the reflectivity value increases. You can compensate for this by drastically raising their values; for example, a specular highlight that was 1 on a non-reflective object could be reset to 1000. If an object's material is fully reflective, its other material attributes are not visible at all, so reflectivity should always be set to a value less than 1.

For information on creating a reflection map for your reflective object, see *Creating a Reflection Map* on page 79.

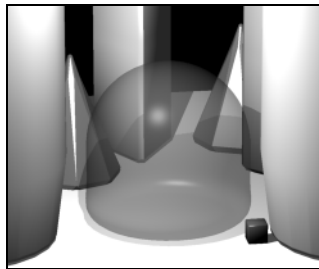
Transparency

Transparency can be incorporated in an object's material definition. This permits the transmission of light rays through material. When an object material is partially transparent, part of its colour is derived from the material, and part is derived from the background.

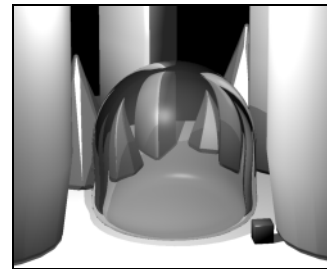
You can define an object's transparency using the **Transparency** slider in the Material Editor dialogue box. Transparency values range from 0 to 1, with a value of 1 making the object completely transparent so that you do not see it at all. For a transparent material such as glass, a value of 0.9 is more convincing.

Note

As with reflectivity, transparency affects the visibility of an object's other material attributes. You can compensate for this by increasing their values, such as resetting a specular highlight that was around 1 on an opaque object up to 10.



Transparency (70%)



Transparency with refraction (0.88)

Refraction

When transparency is incorporated in an object's material definition, you can also define the refraction value. Refraction is the bending of light rays as they pass from one medium to another, such as from air through glass or water.

You can set the refraction using the **Refractive Index** slider in the Material Editor dialogue box. The default value is 1, which represents the density of air. This value allows light rays to pass straight through a transparent material without deviation or distortion. If you increase this value above 1, distortion results: the higher the index value, the more distortion. If you decrease the index below the default value of 1, an inverse wide-angle effect results.

Note

When you use refraction, you may need to increase the **Raytracing** depth in the Render Setup dialogue box (refer to the **Render** menu cell); however, the use of refraction and increased raytracing depth may increase rendering time.

Example

In the following example, you will create a scene with three spheres, each sphere using one of the previously-mentioned properties.

1. Select an object.
2. Choose **Polygon → Automatic Colourize** to give the object a checkered pattern. This object helps demonstrate the properties that you will be setting.
3. Choose **Get → Primitive → Sphere** and create a sphere with a radius of 2.
4. Choose **Duplicate → Immediate** and create three identical spheres.

Each sphere will represent a different property. The first sphere will be reflective, the second sphere transparent, and the third sphere refractive.

5. Select the first sphere and choose the **Material** menu cell.
6. Select the **Phong** shading model.
7. Set the **Reflectivity** slider to 0.50 with a slight **Specular Delay** of 20.00. Click **Ok** to apply these settings.
8. Select the second sphere and choose **Material** again.
9. Select a glass material from the database browser.
10. Set the **Transparency** to 0.9 and **Specular Decay** to 300. Click **Ok** to apply these settings.
11. Select the third sphere and choose **Material** again.
12. Select a glass material from the database browser.
13. Set the **Specular Decay** to 145, **Transparency** to 0.50, and the **Refractive Index** to 1.9. Click **Ok** to apply these settings.
14. Choose **Preview → All** to see each of these different properties for each of the spheres.

Previewing a Material

When previewing a material, the default renderer is set to the SOFTIMAGE renderer, however, if you want to preview material, volume, or shadow shaders with the mental ray renderer, you must change the Preview Renderer to be mental ray.

Materials and textures can be previewed using the hardware renderer as is used in the Shade view mode. If you are planning to output your scene as geometry textures for rendering on another platform, such as a Games console, the Shade view is quite accurate. However, previewing with the SOFTIMAGE or mental ray renderer produces a more accurate result for a final scene that will be rendered with either of these renderers.

You can perform a preview from within the Material Editor dialogue box. This lets you try out different material attributes, see them immediately, then edit them, and continue in this manner.

Follow these steps to set up for using the previewer in this manner:

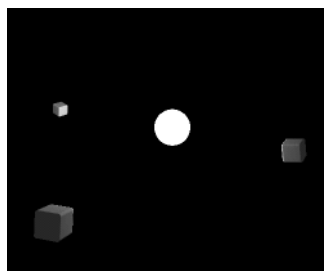
1. Choose **Preview** ➔ **Setup**. Select SOFTIMAGE 3D or **mental ray** as the Preview Renderer depending on which renderer you want to use for your final render. Click Exit.
2. Select an object.
3. Choose the **Material** menu cell. The Material Editor dialogue box is displayed.
4. Set the material parameters as you like.
5. Click the **Preview** button in the Material dialogue box.
6. Middle-click to close the preview window.

Continue editing the parameters and previewing within this dialogue box.

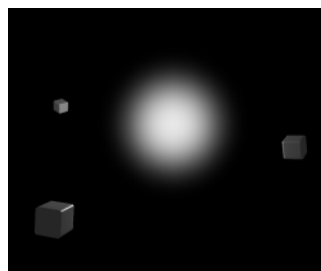
Creating Static Blur

Static blur can be used to make a spherical object appear fuzzy, out of focus, or glowing. Static blur is based on the angle between the view vector (line of sight) and the surface normal, so the effect depends on the camera view.

Static blur is particularly well-suited for spherical objects or objects with relatively continuous surface normals (such as a cylinder extruded on a curve). If static blur is to be used on an object with non-continuous surface normals, such as a cube, you should use beveling to reduce the discontinuity of the surface normals.



Sphere with Constant shading.



Static blur applied.

There are two parameters associated with static blur: **Blur Width** and **Blur Decay**. Blur decay controls the rate at which an object becomes transparent. As the decay value increases, the object becomes transparent from its centre more quickly. Blur decay causes the object to become smaller as the decay is increased. To offset this effect, you can increase the blur width, which enlarges the object.

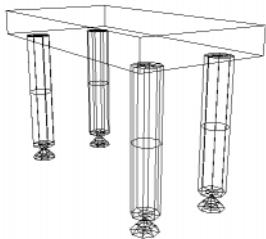
Static blur is used to create such things as fog around an object, or glowing halo-type effects. Motion blur, on the other hand, is used on moving objects to create the illusion of speed. For information on using motion blur, see *Blurring a Moving Object* on page 42 of the *Rendering User's Guide*.

Creating a Neon Light

The following example illustrates how to create a neon light tube using Static Blur.

1. Choose **Get** → **Primitive** sphere as a B-spline and a radius of 1.
2. Scale it so that it is the shape of a tube.
3. Choose the **Material** menu cell.
4. Select **Constant** as the Shading Model and change the **Diffuse** colour to neon green (R=0, G=1, B=0).
5. Select the **Static Blur** option. Change the **Width** value to 0.3 and the **Decay** value to 5. Click Ok to accept these settings.
6. Click **Duplicate** → **Immediate** to duplicate the sphere.
7. Choose **Material** again and select the **Static Blur** option and the **Width** to 1 and **Decay** to 3.
8. Click the **Preview** button in the Material Editor to preview the scene.

Creating a Hierarchy for Material Definition



Materials can be used successfully in a hierarchy to save the number of material used in a scene. However, there are certain factors that need to be considered when applying a material to a hierarchy.

For example, if you have an object such as a table, you may want all the pieces to be the same colour. If you only colour the parent, the material definition is transmitted to its children. In other words, objects without materials assigned inherit the materials (or textures) from their parents when in a hierarchy.

However, if you want one colour for the top and another colour for the legs, a better strategy would be to use *nulls*. A null is a “dummy object” that is typically used as a parent of a hierarchy or as a constraint (see *Null Objects* on page 271 in the *Modelling User’s Guide* for a description of null objects.) A null is displayed as three intersecting lines.

Note This example assumes that the objects are *not* in a hierarchy to begin with. If you are starting with objects already in a hierarchy, use the **Cut** command to dismantle the hierarchy.

This example makes use of null objects as the parent of the hierarchy.

1. Create table objects: a table top, four legs, and four feet (pods) for the table legs.
2. With no objects selected, choose the **Parent** menu cell.
3. Pick a child.

If no object is selected when you choose the **Parent** menu cell, then when you pick a child, a null parent is automatically created and linked to it. This null is displayed in the global centre (the origin).

4. Pick all the objects you want to have the same colour (the legs) as children of the null.

Once you have completed the hierarchy, you should see the base and legs highlighted, as well as a highlighted null at the centre of the world.

5. Right-click to end the parenting mode.

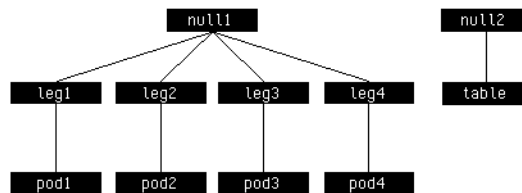


You may find it convenient to place elements of hierarchies in a useful configuration in the Schematic window. Note that you can place an object anywhere in the Schematic window without it affecting its position in the scene as shown in the other windows.

Repeat the parenting operation for the top of the table:

1. Deselect all objects.
2. Choose the **Parent** menu cell and pick the table top as the child.
3. Right-click to end the parenting mode.

Optionally, position the null/table hierarchy beside the null/legs hierarchy in the Schematic window so that it resembles the graphic below.

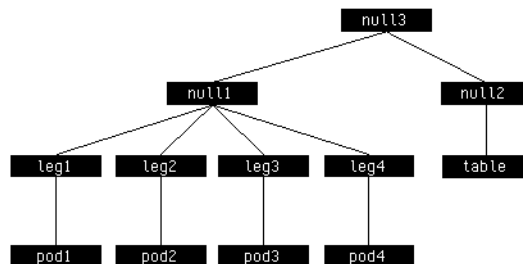


You have created two branches (with two null parents), but they are not linked. You need to create another null which will be the parent of the two other branches.

1. Deselect all objects.
2. Choose **Parent** again and pick the two nulls as children.

As before, a new null is automatically created as the parent.

3. Optionally, move the new null above the others in the middle of the table.



This hierarchy offers many advantages over the previous, simpler hierarchy. The inclusion of nulls helps you visualize the hierarchy as a tree and two branches beneath. This greatly simplifies the process of defining material (imagine modelling and colouring a house where many pieces are made of many different materials such as glass, wood, metal, brick, etc.).

In the example, you can define material for the entire table by selecting the parent. A different material can then be applied to the legs because they are a different branch than the table top. Because the parent null of all the branches is placed in the middle of the table, it is very easy to manipulate.

Copying Materials

You can copy the material definition from a specified object or polygon to another object or polygon.

This lets you copy the same material to more than one object without having to reset all of the parameters. This is advantageous if you want to select a particular material and modify some of its attributes, and copy it to more than one object. It saves you from having to select the material and set the parameters each time you want to apply it to another object.

Tip

When you duplicate an object that has a material applied, its material is also duplicated.

1. Select the destination object or polygon (using the **Polygon** menu cell commands) for the material.
2. Choose the **Mat_Oper → Copy Mat** command in the Matter module.
3. Pick the source object (or polygon material selection) from which the material is to be copied.

Both objects (or polygon groups) flash to confirm that the material was copied.

Note

If you want to copy a specific local material from a polygon mesh object, first make sure that it is the current material. You can do this by choosing the **Polygon → Next, Previous, or Current** commands in the Matter module.

For more information on polygons, see *Polygon (Matter Module)* on page 1134 of the *Reference Guide*.

Sharing Materials

The **Mat_Oper → Optimize All** command optimizes the use of saved materials in a scene by merging those that are identical and sharing them between the models. This allows you to dispose of extraneous materials and save disk space.

The **Mat_Oper → Optimize Selected** command optimizes the use of selected saved materials in a scene by merging those that are similar and sharing them between the models.

Operations must be performed using the Schematic window in the Matter mode.

1. Open a Schematic window and select its Matter mode.
2. Select the materials to be merged. Materials are represented as blue parallelograms in the Schematic window.
3. Choose the **Mat_Oper → Optimize Selected** or **All** command.

The number of materials merged is displayed in the status bar.

Associating and Disassociating Materials

The **Mat_Oper → Associate/Disassociate** commands allow you to either associate a material to, or disassociate a material from the selected object. You can associate a material to, or share a material with, more than one object. Sharing materials is especially useful because it allows you to quickly and easily edit a material that is used throughout your scene. You can also disassociate a material if you want to use a different one.

1. Open a Schematic window view in the Matter mode.
2. Select an object. For a local material, select one or more polygons on a polygon mesh object.
3. Choose the **Mat_Oper → Associate/Disassociate** command.
4. Pick the material you want to associate or disassociate.

The material is linked to, or unlinked from the selected object.

Example

If you have several objects, such as a basket of tennis balls, and you want them all to be the same, there is a quick way to do this:

1. Choose or create an object (such as a tennis ball).

2. Choose **Duplicate → Immediate** and create several more of the same object.
3. Create a different material for each object using the **Material** menu cell.
4. Open a Schematic window and select its Matter mode so you can see the materials assigned to the objects.

To make the materials on the objects the same, first disassociate the material from the object.

5. Choose **Mat_Oper → Disassociate** and select the material in the Schematic window that you want to disassociate. That material becomes disassociated from the object.
6. To assign the desired material to that object, choose **Mat_Oper → Associate** and select the object to which you want to associate it.

You can do this to all of the objects until you only have one material left and it is assigned to all of the objects. You can also assign textures in the same way.

Note

You can also assign the same material or texture to multiple objects by making a null the parent to all the objects (the children). All the children take on the same characteristics (material and texture) as the parent. However, it is important to remember that the children don't already have a material or texture already assigned to them.

Setting the Current Material

Besides associating or disassociating a material, you can also set the current material for a polygon mesh object.

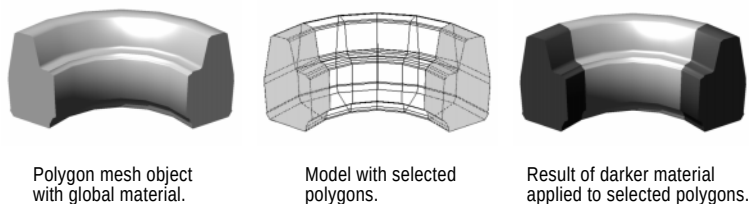
1. Open a Schematic window in the Matter mode.
2. Select a polygon mesh object.
3. Choose the **Mat_Oper → Set Current** command.
4. Pick a material.

The selected material becomes the current material. The current material link is highlighted in red for the currently selected object. Other material links are yellow.

Assigning Materials to Polygons

You can assign material to an entire object (globally), but on a polygon mesh object, you can also assign material locally to its individual surface polygons or groups of surface polygons. Since materials can be applied in both ways, each object has a global and local (where applicable) material list.

All materials (the global material applied to the entire object as well as each local material) have their own 2D and 3D texture lists. Global materials are applied directly to the object, whereas local materials are applied as children on an object. However, global textures still require a material to be defined because they inherit the material's properties.



Assigning a Local Material to Polygons

You can assign a material to the selected object using the **Material** menu cell. Then choose one of the following options depending on what you want to do.

1. Select one or more polygons using one of the following commands in the Matter module:
 - **Polygon → Select by Tag Vertex, Select by Rectangle, or Select by Raycasting.**

The selected polygons are highlighted in pink.

Tip You can avoid tagging points surrounding the polygon by choosing either the **Select by Raycasting** command or the **supra** key and then performing a rectangular selection on the desired polygon.

2. Choose the **Polygon → Assign New Material** command in the Matter module.

The Material Editor dialogue box is displayed.

3. Set the parameters for the new material as desired.

You can create any pattern you want by repeating the procedure for each new material desired and assigning it to any polygon on the object.

Editing a Material Assigned to Polygons

To edit materials assigned to polygons, follow these steps:

1. Choose the **Polygon → Current Material**, **Polygon → Previous Material**, or **Polygon → Next Material** command to select the material you want to edit.

The material name is displayed in the status line and the polygons associated with the material are highlighted in pink.

2. Choose the **Polygon → Assign New Material** command.
3. The Material Editor dialogue box is displayed. Set the parameters for the new material as desired.



This can also be done in the Schematic window. For more information, see the **Mat_Oper → Set Current** command page 972 of the *Reference Guide*.

Modifying Polygon Groupings

You can modify the grouping of polygons on a polygon mesh object for different effects with materials.

1. Choose the **Polygon → Unselect All** command to clear the object.
2. Select the material you want to assign using the **Polygon → Current/Previous/Next Material** commands.
3. Select one or more polygons using one of the following commands in the Matter module:
 - **Polygon → Select by Tag Vertex**, **Select by Rectangle**, or **Select by Raycasting**.

The selected polygons are highlighted in pink.

4. Choose the **Polygon → Assign Current Material** command to change their material.

If a local material is deleted from the polygons, the material reverts to the global material assigned to the object.

Animating Materials

You can animate all material attributes in SOFTIMAGE 3D. Animating parameters for material is actually very simple. It uses the technique of keyframe animation and the subsequent editing of function curves (see *Keyframing* on page 8 and *Editing an Animation* on page 27 of the *Animating User's Guide*).

The following example demonstrates a simple procedure for material animation.

1. Select an object, then move to a frame of the sequence using the time line pointer.
2. Choose the **Material** command to open the Material Editor dialogue box, and set the material parameters as desired.
3. Click the **Key** button at the bottom of the dialogue box.

SOFTIMAGE 3D automatically generates function curves for all of the material parameters defined.

4. Keeping the dialogue box open, move to the next desired keyframe using the time line pointer and click **Key** again.

You can repeat this for as many keyframes as desired. You do not have to enter them in any specific order. If you move between two keyframes, you will notice that parameter values are interpolated between the keys.

If you want to modify the material animation, you can select the **FcrvSelect** → **Material** command in the Motion module to display specific material parameter function curves in the Fcurve window for the current material on the currently selected node and then use the **FcrvEdit** menu cell commands to edit them. Depending on the parameter selected, there will be one, two, or three function curves. When there are three curves, such as for RGB, they are coded red, green, and blue for easy manipulation.

Using Material Shaders

A shader lets you create special effects during the rendering process when using the mental ray renderer. The main reason for using shaders is the complete flexibility and openness available to you to create and manipulate shaders to meet your specific needs.

If you are rendering with mental ray, you can select one of the mental ray shader types available in the Material Editor dialogue box: **Volume**, **Material**, or **Shadow**.

A **Material** shader can be selected to access surface shaders, which are used to define the effect of light and colour on an object's surface.

A **Volume** shader is used to modify rays as they pass through an object. They allow you to easily simulate effects such as clouds, smoke, and fire. You can also create areas of transparency in a solid object where a texture, such as holes in cheese, is visible throughout the whole object rather than just on the object's surface.

A **Shadow** shader lets you define the way in which an object's shadow is cast, such as its opacity and colour. The shader determines how the light coming from a light source is altered when it hits an object. This gives you the choice to create any type of shadow you want for an object, such as a transparent red object casting an opaque green patterned shadow.

The following example illustrates how to use Material shader called Glass.

1. Select an object and choose the **Material** menu cell.
2. In the Material Editor dialogue box, activate the **Material Shader** option. The browser opens to the current Material Shader database. Use the browser to locate the Glass shader and then click **Load**.

This shader allows you to control the opacity of the highlighted (specular) area as well as the directional opacity which modulates the glass's opacity as the angle of view is changed

3. Click in the **Material Shader** text box and then select **Edit**.
4. In the Glass simulation shader dialogue box that appears, change the **Directional Opacity** factor to 0.5 and the **Specular** opacity factor to 0.7.
5. Save the Glass shader's parameters by clicking **Save**.

6. In the Save Material Shaders dialogue box, make sure you are in the correct database and then name your shader appropriately. Click **Save** and then click **Ok** to exit the Glass simulation shader dialogue box.

 *Tip* Each of the Shader dialogue boxes has an Info, Help, or About button which gives a brief description of the various parameters as well as the shader's overall effect on the object.

7. Even though you have applied a shader to the glass, you still need to define its overall physical properties. To do so, click **Select** next to the **Material** text box. Use the browser to go to the `/SI_Materials_lib/GLASS` directory. Select one of the glass materials such as `glass2_1.0` and click **Load**.

 *Tip* To view a sample of each of the materials or shaders, click **Options** in the Load dialogue box and activate the **Use icons** option.

8. Click the **Preview** button in the Material Editor dialogue box to view the results.

 *Note* Make sure that your preview is set to mental ray, otherwise you won't be able to see the effects of the shader. To change the Preview setup, choose **Preview** → **Setup**, activate mental ray as the Preview Renderer, and click **Exit**.

C H A P T E R F O U R

2D Textures

Introduction

After you add material to an object, you can also add texture to enhance its appearance. Applying textures to your objects can give them an increased sense of realism. 2D textures can be used to create an endless variety of colour patterns, surface roughness, transparency, and reflectivity. Textures can also be used in combination with shadow-casting lights to create complex patterns of coloured light and shadow on other objects in a scene. All texture parameters can be animated.

Textures can be applied to the object's *global* material, which is the material that covers the entire surface, or it can be applied to a *local* material (or groups of polygons). Remember that an object's material attributes, such as its shading model, colour, reflectivity, and transparency may affect the way your textures appear on the object's surface. It's a good idea to select your basic material parameters first, then create your 2D textures, all in relation to your lighting.

A 2D texture is similar to a piece of wrapping paper (a picture) being wrapped around an object. To use a 2D texture, you start with a picture (**.pic**) file. These can be picture files from SOFTIMAGE 3D, imported scanned photos, or imported picture files.

You can then use the picture to create a 2D texture, such as by adding transparency or bump mapping. This lets you use the same picture file with different 2D texture files that have different parameter settings.

Two tools which will help you work with 2D textures are:

- The TXT (texture) manipulation mode, which lets you control the 2D texture support. For more information, see *Manipulation Modes* on page 13 in the *Reference Guide*.
- The Matter mode in the Schematic window, which lets you view relationships between objects, textures, and materials. For more information, see *Modes* on page 66 in the *Reference Guide*.

Picture and 2D Texture Files

To use a 2D texture, you bring in a picture (.pic) file. These can be rendered picture files from SOFTIMAGE 3D, imported scanned photos, or imported product files. A picture file is any file that contains data that describes all the pixels in an image, RGB, or RGBA data. It is a file that has a .pic extension that is generated by SOFTIMAGE or a converter.

You can then use the picture to create a 2D texture, such as by adding transparency or bump mapping.

You can even use the same picture file with different 2D texture files that have different parameter settings. This is because a picture file is simply an image with no parameter information: the 2D texture file contains all this information. Then whenever you load a 2D texture file, its associated picture file is also loaded.

Loading Picture Files

Picture files are a special case in SOFTIMAGE 3D since they can be stored in a database other than the database where your scene is located. When 2D texture files are read from a scene, SOFTIMAGE 3D checks for the necessary picture files in the following places in this order:

- The explicit path stored in the texture file.
- The **PICTURES** chapter of the database where the scene is currently read from. The **PICTURES** chapter of any database lists all pictures used for 2D textures.
- The **PICTURES** chapter of all system databases.
- The explicit path from the scene elements.

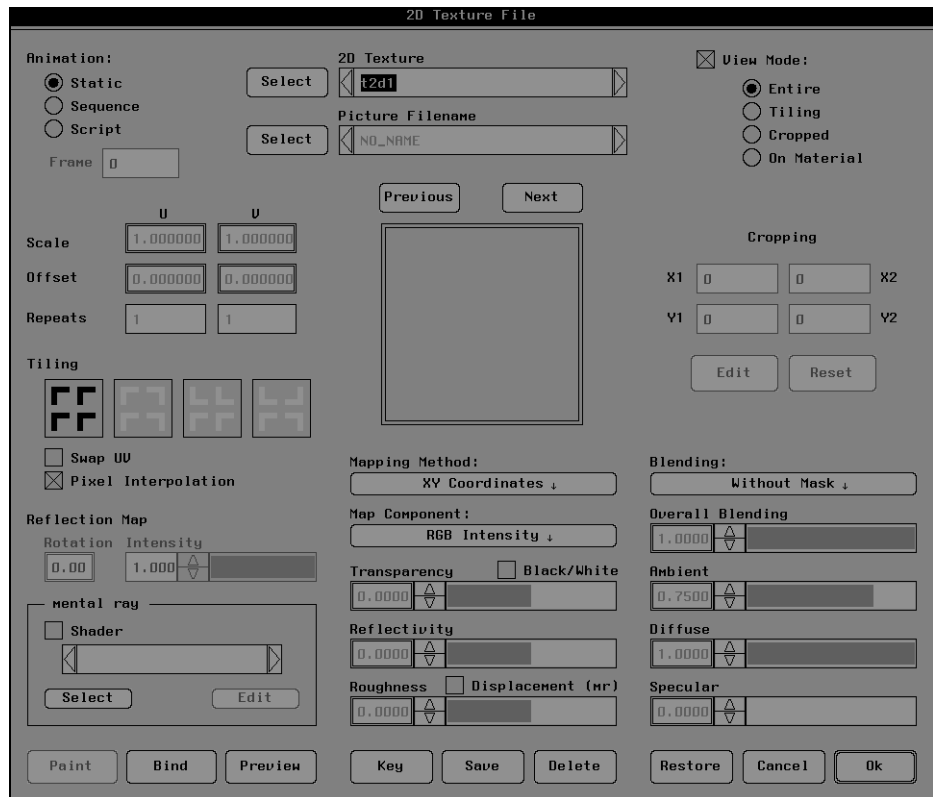
The following example illustrates how to load a picture file:

1. Select an object.
2. Choose **Texture → 2D Global (or Local)** in the Matter module.



Objects require a material definition before you can add a 2D texture. If the object has no material assigned to it, SOFTIMAGE 3D gives it a default material setting when you choose this command.

3. In the 2D Texture File dialogue box that is displayed, click the **Select** button beside the **Picture Filename** text box.



4. Use the browser that is displayed to go to the directory in which the **SI_Materials** is located. Double-click **SI_Materials** and double-click **Pictures** to bring up the various categories of picture files available with SOFTIMAGE 3D.
5. As an example, double-click **SURFACES**. A list is displayed consisting of several different types of surfaces. Click the **Options** button, select **Use Icons**, and click **Ok** to display a sample image of each surface.
6. Select one of the surfaces icons by clicking on it and then click **Load**. A sample of the picture file you selected appears in the **Display Box** in the 2D Texture File dialogue box.

7. Change the mapping method of the picture file, if you like. For example, if your object is spherical, click the current option in the **Mapping Method** menu and select **Spherical Coordinates**.
8. Click **Preview** to view the results. Then click **Ok** to assign the 2D Texture to your object.

Saving a 2D Texture File

You can save the current parameter settings as a 2D texture file so that you can create your own library of 2D textures with the specifications that you have given them. You can access this library of texture files at any time to be used with any picture file. To save a 2D Texture file, follow these steps:

1. Select an object.
2. Choose **Texture → 2D Global** (or **Local**) in the Matter module.



Objects require a material definition before you can add a 2D texture. If the object has no material assigned to it, SOFTIMAGE 3D gives it a default material setting when you choose this command.

3. In the 2D Texture File dialogue box, load a picture file as described in the previous section.
4. Change the values of the parameters in the dialogue box, such as the **Transparency** slider.
5. Type a name for this texture in the **2D Texture** text box and click **Save**.
6. The Save Texture2D dialogue box is displayed, opening to the current 2D Texture chapter. The name that you have given the texture appears in the name text box. Make sure that it is being saved in the correct 2D Texture chapter and click **Save**.

You have now created a 2D texture file that you can store in your library for future use.

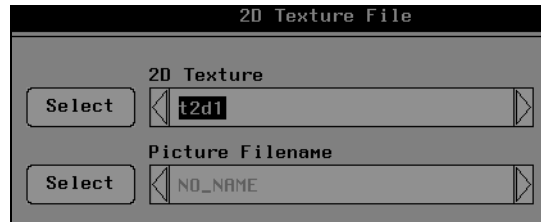
Selecting a 2D Texture File

After you have saved a 2D texture file, you can load it. When you load this file, its accompanying picture file is also loaded.

To load a 2D texture:

1. Select an object.

2. Choose **Texture → 2D (Global or Local)** in the Matter module. The 2D Texture File dialogue box is displayed.
3. Click the **Select** button beside the **2D Texture** file text box to open the database browser.



You can browse through a library of source 2D texture files, either inside or outside the database.

4. To see the icons for each file, click the **Options** button, select **Use Icons**, and click **Ok** to display a sample image of each texture.
5. Double-click the icon for the texture you want to load. The browser closes and the texture is displayed with its file name listed in the **2D Texture** text box, and the associated picture file is also loaded.

You can edit the parameters and save it 2D texture with a new name in the **2D Texture** text box.

Note

You cannot load a 2D texture file if its associated picture file has been removed.

Previewing a Texture

To preview a texture from within the 2D Texture File dialogue box, click the **Preview** button in this dialogue box. This is a handy way to change parameters and view them immediately without having to exit the 2D Texture File dialogue box.

The preview from within this dialogue box is affected by the renderer you have selected in the Preview Setup dialogue box. To check or change the renderer, choose **Preview → Setup**. Select **mental ray** or **SOFTIMAGE** as the Preview Renderer and click **Exit**. The renderer type is especially important if you want to view the results of using 2D texture shaders with the mental ray renderer.

Textures can also be previewed using the hardware renderer used in the Shade view, which gives you a quick approximation of materials

and textures used (if selected in the Shade view Setup dialogue box). If you are planning to output your scene as geometry textures for rendering on another platform, such as a Games console, the Shade view may be the most accurate.

Viewing Texture Information

You can view information about 2D textures in a scene by choosing the **Info → Textures** command. This lets you see which texture is mapped to which object. If you want, you can also edit the texture using this command.

1. Select an object with a texture applied.
2. Choose the **Info → Textures** command. The Scene Information - Textures dialogue box is displayed.
3. If you want to edit the texture, select the name of the object you want to edit, then click **Edit**. The 2D Texture File dialogue box is displayed.
4. You can then edit the texture parameters as desired and click **Ok**.
5. When you exit the 2D Texture dialogue box, the Scene Information – Textures dialogue box reappears. Click **Ok** to exit it as well.

Deleting a 2D Texture File

Deleting a texture file resets all parameters to their default settings, removes the picture files from the display box in the 2D Texture Files dialogue box (but does not delete the picture file), and the texture map from the object.

To delete a texture file:

1. Select an object.
2. Choose **Texture → 2D (Global or Local)** in the Matter module. The 2D Texture File dialogue box is displayed.
3. Click **Select** beside the **2D Texture** text box to open the browser.
4. Navigate to the appropriate 2D Texture chapter and select the file that you want to delete. The name should be displayed in the 2D Texture text box. Click **Load**.
5. In the 2D Texture File dialogue box, click the **Delete** button. The texture is deleted.

Choosing a Mapping Method

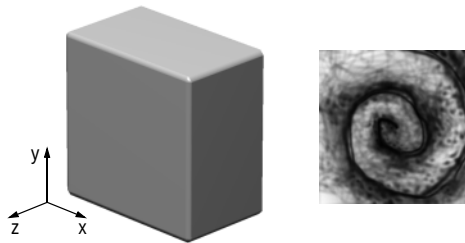
2D textures are applied to the object's material surface by a process known as *mapping*. When a 2D texture is mapped onto an object, SOFTIMAGE 3D calculates a correspondence between pixels in the texture and points on the object's surface. This process can be accomplished by projecting the texture map onto the object's xy, xz, or yz axes, or by mapping cylindrically, spherically, or in uv to create different effects.

To apply a mapping method:

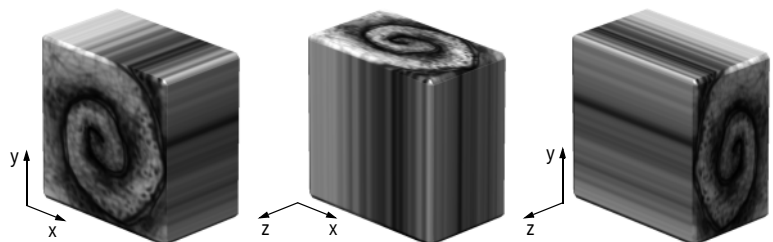
1. Select an object.
2. Choose **Texture** → **2D (Global or Local)** in the Matter module. The 2D Texture File dialogue box is displayed.
3. Load a picture file, and a 2D texture file if you like.
4. Click on the current option in the **Mapping Method** menu. Select the appropriate method as described in this section.

XY, XZ, and YZ Mapping

For xy, xz, and yz mapping, imagine an image being projected onto a cube. If the picture file is mapped onto xy coordinates, its pixels are projected accurately onto the xy surface plane of the object and are distorted across the other two planes.



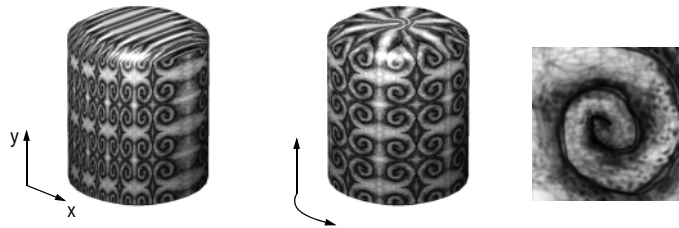
Above: Cube (left) with xyz orientation and picture file (right).
Below (left to right): Resulting projection with XY, XZ and YZ mapping methods.



Using the TXT manipulation mode, you can transform the projection of the texture map on the object.

Cylindrical and Spherical Mapping

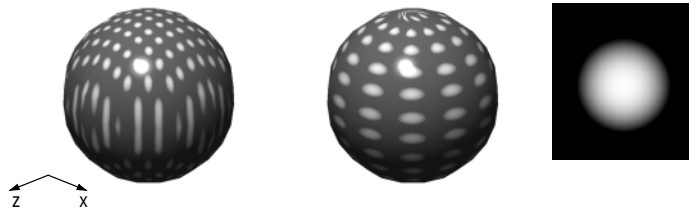
If the picture file is mapped cylindrically, it is projected as if it is a cylinder wrapped around the cube.



Polygon mesh cylinder with XY projection map (left) and Cylindrical map (right). Picture file was tiled by setting the number of repeats.

Picture file used

When mapped spherically, the picture file surrounds the object and covers the entire surface with some distortion.



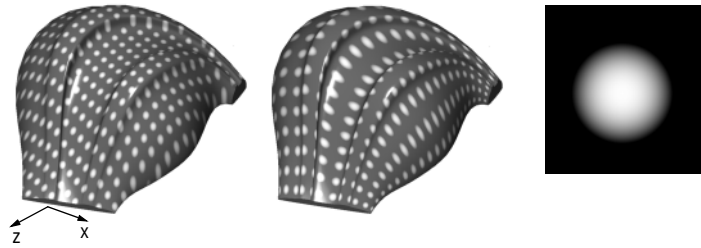
Polygon mesh sphere with XZ projection map (left) and Spherical map (right). Texture was blended at 50% to show shading of object.

Picture file used

UV Mapping

UV mapping is the most versatile mapping method, and can be used on patch or NURBS surface objects (for polygon mesh objects, see *Polygon UV Texture Mapping* on page 63). It behaves like a rubber skin stretched over the object surface. The points of the object correspond exactly to a particular coordinate point on the object.

This lets you map a texture accurately to the object's geometry. Even when you deform an object, its texture follows the object's geometry.



NURBS surface with XZ map (left) and uv map (right).
Pattern follows the contours of the object with uv map.

Picture file used

Polygon UV Texture Mapping

To use uv mapping on a polygon mesh object, you must use a slightly different method, but the result is the same. To convert the texture projection method to UV (and generate the UV texture information for polygons referring to the material on which the texture is applied), select the object and choose the **Txt_Oper → Info UV Coord. (2D Global or Local)** command in the Matter module.

The vertex of each polygon corresponds exactly to a particular coordinate within or outside the texture map (for example, the UV coordinates do not need to be within (0.0, 0.1), they can be outside these values). This lets you deform an object and still have the texture follow the object's geometry. For more information on this command, see page 1435 in the *Reference Guide*.

For information on converting cylindrical/spherical texture maps to UV maps, see *UV Editing* on page 1031 in the *Reference Guide*.

Custom Effects for Texture Mapping

The **Deformation → Unwrap** command in the Model module allows you to distort a model as a guide for cylindrical or spherical projection texture mapping. Unwrap distorts the selected model into a rectangular region in the xy plane. This image can then be used as a guide for distorting a texture map. Features of the texture may be accurately aligned with features of the model. A typical use of Unwrap is as a guide for distorting a scanned image of a head to match features on a model of the head when textured.

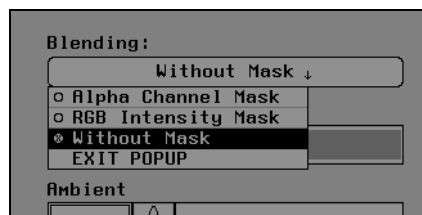
For more information, see this effect's description in the *Reference Guide*. Also, see the *Modelling User's Guide* for information on deforming an object's shape.

Blending Textures with the Material

The **Overall Blending** and **Blending** options in the 2D Texture File dialogue box let you control how the picture file and the current material on the object's areas of illumination are blended together.

The **Blending** menu lets you choose exactly what values you want blended with the material. After you select an option from this menu, you can set the **Overall Blending**, or choose to blend on a certain illumination area of the material's definition (ambient, diffuse, or specular areas).

This menu bar displays the current selected blending type. Click on the current type to display a menu listing the available options.



You can view the results of each option by selecting the **On Material** view mode.

- **Without Mask** uniformly blends the picture file with the object's current material. The ratio of picture to material visibility is controlled using the **Overall Blending** slider.
- **Alpha Channel Mask** uses the alpha channel (transparency) of the picture file as a blending factor. The picture file is blended with the object's current material according to the different alpha channel values of the picture pixels. Where the alpha channel value is high (white), the colour of the picture file is visible; where the alpha channel value is low (black), the object's current material is visible.

Note

A scanned picture imported into the SOFTIMAGE 3D file format may not have an alpha channel, but can be added by using the **alpha** standalone program. Refer to the *Standalones HTML* file on the *On-line Documentation* CD.

- **RGB Intensity Mask** uses the RGB colour intensity of the picture file as a blending factor. The picture file is blended with the object's current material according to the different RGB intensity values of the picture pixels. Where the RGB intensity is high (white), the

colour of the picture file is visible; on low intensity pixels (black), the object's current material is visible.

Blending with Areas on the Material

Using the **Overall Blending** slider, you can control the amount of overall blending between the picture file and the object's current material. Values range from 0 to 1; if the value is set to 0, only the material is visible; if the value is set to 1, only the picture file is visible.

You can also control the blending with certain areas of the material's definition:

- If you choose the **Ambient** slider, you can control the intensity of the picture file on the object's ambient area of illumination. Values range from above 0 to 1. If the value is set to 0, the picture file is replaced by the object's material (global or current local).
- If you choose the **Diffuse** slider, you can control the intensity of the picture file on the object's diffuse area of illumination. Values range from above 0 to 1. If the value is set to 0, the picture file is replaced by the object's material (global or current local).
- If you choose the **Specular** slider, you can control the intensity of the picture file on the object's specular area of illumination. Values range from above 0 to 1; the value may be set higher to compensate for reflectivity or transparency. If the value is set at 0, the picture file is replaced by the object's material (global or current local).

Blending Material with 2D Textures

Here's a basic example of steps to follow for blending a 2D texture with the material.

1. Create or select any object. In this example, it will be a cylinder.
2. Choose the **Material** menu cell and change the **Diffuse** colours of the material to a bright orange, for example. Click Ok to accept these values.
3. Choose **Texture → 2D (Global or Local)** in the Matter module. The 2D Texture File dialogue box is displayed.
4. Load a 2D texture file, preferably something with lots of black and white areas so that the blending is obvious.

5. Click on the current option in the **Mapping Method** menu and select the **Cylindrical** method.
6. Select **RGB Mask** as the Blending method to use the RGB values of the picture file.
7. Select the **Diffuse** blending slider to blend the texture with the material's diffuse area of illumination (the orange area). Change the value to 0.5 for a decent blend between the two.
8. Preview your image by clicking the **Preview** button in the 2D Texture File dialogue box and notice how the dark and light areas of the 2D texture are blended with the orange material.

Displaying Textures

To view the actual texture on a selected object or on all objects in the Shade view in any window, select the **SETUP** option in a window title bar with the Shade view mode selected. In the dialogue box that is displayed, select the **Enable Hardware Texture** option. To see repeated (tiled) textures, select the **Texture Repeat - Grid** option.

The **Txt_Edit** commands in Matter module let you see how the texture is displayed on an object. To use any of these commands, you must first have the **TXT** (texture) manipulation mode selected.

- The **Txt_Edit** → **2D Global** command displays a graphic representation of a globally applied 2D texture.
- The **Txt_Edit** → **2D Local** command displays a graphic representation of the current locally applied 2D texture. Choose the **Polygon** → **Preview/Next Material** command to move among lists of materials applied at the polygon level.
- The **Txt_Edit** → **Previous** command displays the 2D texture file applied to the object's surface before the current one, and the **Txt_Edit** → **Next** command displays the 2D texture file applied after the current one. If more than one 2D texture is applied to the object or the selected polygon area, you can use the **Txt_Edit** → **Previous** or **Txt_Edit** → **Next** commands to display them. The file name of the texture is displayed in the status line at the bottom of the screen. If you lose track of which texture is currently being displayed, choose the **Texture** → **2D Global/Local** command to open the dialogue box for the current texture.
- The **Txt_Edit** → **Align Txt** command allows you to realign 2D texture to one or more selected polygons of the object to which the texture is applied.

Viewing the 2D Texture Support and Projection

To see the texture's support or projection, you can choose certain **Txt_Edit** commands in the Matter module. With them, you can select a 2D texture that is assigned to an object and display a graphic representation (in coloured outline) of its support or projection on the object's surface. To use any of these commands, you must first have the **TXT** (texture) manipulation mode selected.

You can then modify the position and size of the support or projection on the object interactively using the **ScaleXYZ**,

TransXYZ, and **RotXYZ** menu cells (see *Scaling, Rotating, and Translating Textures* on page 69). These transformations can be animated.

The **Txt_Edit** → **Support** command in the Matter module displays the texture support as blue outline around the object, which represents the surface parametrization system used. If *xy*, *xz*, or *yz* mapping is used, it is displayed as a box; if cylindrical mapping is used, it is displayed as a cylinder; and if spherical mapping is used, it is displayed as a sphere.

You can perform transformations on 2D texture supports which alter the way a texture's image is projected onto an object. The texture is constrained to the support, so when the support is rotated and scaled, the texture is also affected. For example, if the texture support is scaled up, the texture image is also enlarged.

The texture's centre of projection (calculated according to the centre of the texture support) is automatically displayed and can be translated anywhere within the texture support, allowing you to further distort the texture's image on the object.



UV, raytraced, and non-raytraced reflection mapping has no support.

The **Txt_Edit** → **Projection** command displays a graphic representation in red outline of how the texture is projected, allowing you to visualize where the texture falls on the object.

Scaling, Rotating, and Translating Textures

Picture files, or texture maps, applied to the material surface of an object can be scaled, rotated, or translated to modify their appearance. By default, the map fills the entire surface plane defined by the selected axis coordinates. All transformations are in relation to the mapping method you chose: XY, YZ, XZ, cylindrical, etc.

Using the Transformation Menu Cells

In TXT (texture) manipulation mode, you can use the mouse to interactively scale, rotate, or translate the map along the appropriate axis using the **Scale**, **Rotate**, and **Translate** menu cells as you would with any object. These transformations can be animated. You can also align 2D textures to one or more selected polygons of the object to which the texture is applied.

The following illustrates how to use the transformation menu cells:

1. Select an object that has 2D texture applied to its surface.
2. Select the TXT (Texture) manipulation mode.
3. If you are working on global 2D textures, choose the **Txt_Edit → 2D Global** command to display the texture if it isn't already visible.

If you are working on local 2D textures, use the **Polygon → Previous Material** or the **Next Material** menu cells to select the local material that is the base for the texture you need, then choose the **Txt_Edit → 2D Local** command.

4. Use the **Translate**, **Rotate**, or **Scale** menu cells to move, rotate, and resize the texture on the object. All transformations are done in relation to the texture's centre of projection.

Using the Scale and Offset Options

You can also scale and offset (translate) a texture from within the 2D texture dialogue box. The **Scale** and **Offset** option text boxes reflect any changes you may have made in the **Scale** or **Translate** menu cells.

Unlike scaling or translating with **Scale** or **Translate** menu cells, the **Scale** and **Offset** options scale and offset using the upper-left corner of the picture file as a reference point instead of the texture's "centre." The **Scale** and **Offset** options may be useful when using the **Repeat** option to tile a texture. For example, say you repeat the texture to be

tiles 12 times, but you want to increase that number. Using **Scale** and **Offset**, you can quickly adjust the size and placement of the tiled texture map from within the 2D Texture File dialogue box.

The following example illustrates how to apply a texture on an object and then scale the texture so that it looks like a label on a soup can:

1. Choose **Get → Primitive → Cylinder** to create a soup can. Scale it so that it is approximately 1.8 on all axes.
2. Choose the **2D → Texture (Global or Local)** command. Click the **Select** button beside **Picture Filename** and select any picture file.
3. Select **Cylindrical** as the Mapping Method.
4. Set the **Scale** to 0.5 and 0.5 in u and v. The **Scale** option allows you to reduce the texture so that it covers only a portion of the object's surface, or enlarge it so that only a portion of the texture map is visible.
5. Set the **Offset** to 0.75 and 0.25 in u and v. The **Offset** option allows you to position a texture map on the surface plane.
6. Click **Preview** to see the cylinder with the texture applied to look like a label.

Transforming a Texture Support

The texture support lets you control the way the texture is projected on the model. For example, if you choose a spherical object and a spherical mapping type, the texture support wraps around the sphere and defines a spherical shape from which the texture is projected.

1. Select an object that has 2D texture applied to it.
2. Select the **TXT (Texture)** manipulation mode.
3. Choose the **Text_Edit → Support** command to display the blue outline of the texture support and its centre of projection.
4. Use the **Scale XYZ** or **Rot XYZ** menu cells to resize or rotate the support. Use the **Trans XYZ** menu cell to move the centre of projection.

If you have the Shade view in a window set up to preview the textures (choose **SETUP** in the window's title bar and select the **Enable Hardware Texture** option), you see the results immediately. You can also view the results by choosing the **Preview → Selection** command.

Tiling a Texture

The **Repeats** option in the 2D Texture File dialogue box allows you to repeat a picture file to create a wallpaper-like pattern. When a picture file is repeated, its edges should be absolutely symmetrical or else you will see seams. A solution to this is to carefully retouch its edges selecting the **Paint** button in the 2D Texture File dialogue box (see *Painting Textures* on page 94).

For example, select a picture file and select a Tiling pattern. Set the **Repeats** value to 3 in both u and v and click **Preview** to see what it looks like with the texture repeated three times.

To view the actual texture on a selected object or on all objects in the Shade view in any window, select the **SETUP** option in a window title bar with the Shade view mode selected. In the dialogue box that is displayed, select the **Enable Hardware Texture** option. To see repeated (tiled) textures, select the **Texture Repeat - Grid** option.



For more information on tiling textures, see *Infinite Tiling* on page 85 of the *Reference Guide*.

Creating Mapping Effects

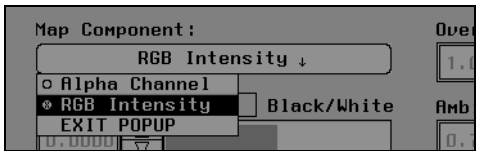
A wide variety of complex textural effects can be created in SOFTIMAGE 3D by using picture files to map surface roughness (bump mapping), reflectivity, and transparency. When using mental ray you can also use displacement mapping.

The alpha channel and RGB intensity values of the picture file's pixels can also be used as a mask or effect to further control the various texture mapping effects. One picture can be used to create several texture maps at the same time, and different picture files used for different textures can be applied to the same object's material both globally and locally.

All mapping effects depend on the mapping method of projection that you choose – XY, YZ, XZ, cylindrical, etc. For more information, see *Choosing a Mapping Method* on page 61.

Using the Alpha Channel and RGB Values

In the **Map Component** menu in the 2D Texture File dialogue box, you can choose either the Alpha Channel or the RGB Intensity values of a picture file as a map component.



These two options affect the mapping effect you choose: colours, bump mapping (roughness), displacement mapping, reflectivity mapping, and transparency mapping.

The **Alpha Channel** uses the alpha channel of the picture file to create transparency, reflectivity, or roughness effects on the object. The different alpha channel values of the picture pixels are used to define the various effects.

The **RGB Intensity** uses the RGB colour intensity of the picture file to create transparency, reflectivity, and roughness effects. The different RGB intensity values of the picture pixels are used to define the various effects. This is the default setting.

This is a basic procedure to follow for using the mapping effects:

1. Select an object and choose the **Texture → 2D (Global or Local)** command.
2. Select the **Mapping Method** menu to choose a projection type (XY, YZ, XZ, cylindrical, etc.)
3. Click **Preview** to see that the mapping method is correct.
4. Select the **Map Component** to be either RGB Intensity (default) or the Alpha Channel for the mapping effect.
5. If you're using **Transparency** or **Reflectivity**, leave the **Overall Blending** at 1.0 for the full effect of the texture. If you're using **Roughness** (bump mapping) or **Displacement Mapping**, turn the **Overall Blending** down to 0 or 0.1 to see more of the “bumpy” effect in relation to the material.
6. Select the mapping effect: **Transparency**, **Reflectivity**, **Roughness** (bump mapping), or **Displacement mapping**.
7. Preview the effect with the **Preview** button.



If you're using **Displacement mapping**, make sure to choose mental ray as the preview renderer in the **Preview → Setup** dialogue box.

8. Adjust the slider values for the appropriate mapping effect.

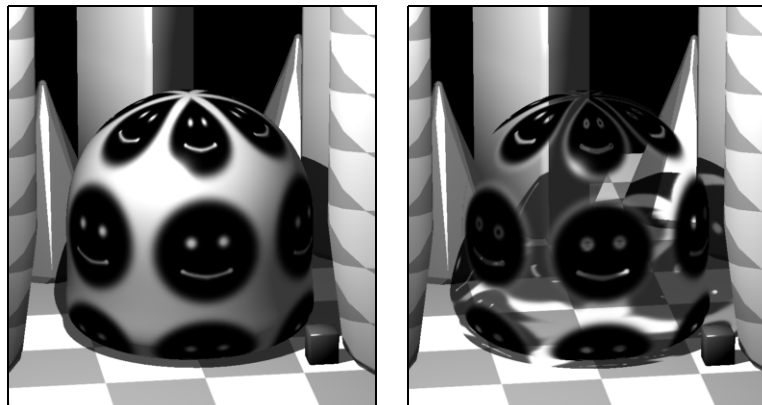
Transparency Mapping

A texture map can be used to define areas of transparency on your object. SOFTIMAGE 3D uses the alpha channel or RGB intensity of the picture file pixels and applied a factor to map a pattern of varying degrees of transparency on the object's material. The factor is determined by the value set with the **Transparency** slider. For example, a transparency value of 1 in combination with pure white picture file pixels would create an actual hole in the object's material. Selecting the **Black/White** option above the **Transparency** slider causes each completely black and white pixel in an object to become transparent.

Transparency mapping can be used to create many kinds of effects, such as the translucent pattern on a Chinese teapot, holes in an ornate Christmas tree ball, or coloured patterns of a cast shadow (when combined with shadow-casting light). The overall

transparency of the map can also be blended with the object's material by using the associated blending sliders.

The transparency assigned to the material itself does not affect the texture map's transparency factor.



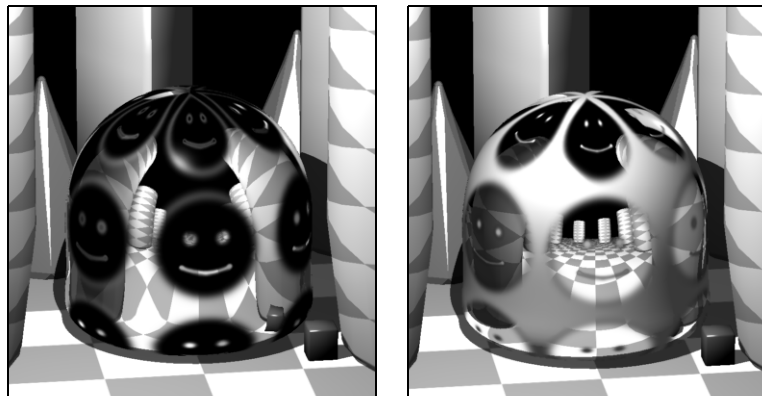
Transparency

Dome with texture of happy faces, no transparency (above left).
Texture transparency set to 100% (above right).



Reflectivity

With texture reflectivity, white areas of texture become transparent (below left).
Negative reflection value: black areas become reflective (below right).



Example

The following example shows the results from using an alpha channel with transparency mapping.

1. Create or select a cylinder.

2. Choose the Material menu cell and apply a bright colour, such as red, so that the mapping effects are obvious.
3. Choose the **Texture → 2D (Global or Local)** command and apply a texture to the cylinder (try and find one that has lot of black and white areas).
4. Make sure that **Material On** is selected so you can see what is happening. Set the **Transparency** slider to -1 so the black disappears.
5. Click the **Paint** button and choose **Alpha only** in the Paint dialogue box that appears.
6. Using the **Pen**, write your name on the texture. Click **Accept** to save the picture and to return to the 2D Texture dialogue box.
7. Select **Alpha Channel** as the Map Component.

You can see your name appear on the texture in the **Display Box**.

Reflectivity Mapping

Reflectivity mapping can be used to create varying patterns of reflectivity on an object. When reflectivity is applied as a texture map, SOFTIMAGE 3D reads the alpha channel or RGB intensity of the picture file pixels and applies a reflectivity factor which is determined by the value set with the **Reflectivity** slider in the 2D Texture dialogue box. For example, a reflectivity value of 1 applied in combination with pure white picture file pixels creates a mirror on the corresponding area of the object's material. Overall reflectivity can also be blended with the object's material by using the associated blending sliders.

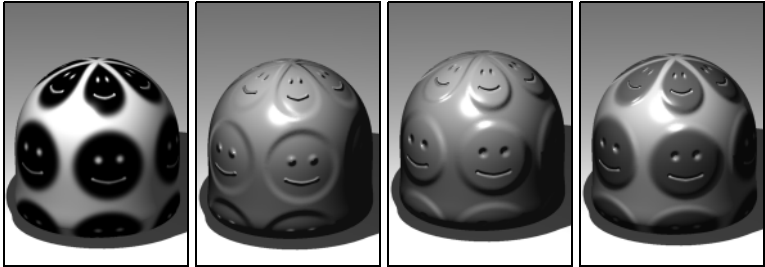
The reflectivity assigned to the material itself does not affect the texture map's reflectivity factor.

Bump Mapping

You can simulate complex rough surfaces using bump mapping, or surface normal perturbation, to create the appearance of surface roughness on your object. Use the alpha channel or RGB intensity of the picture file's pixels to "perturb" the object's surface normals to simulate a relief pattern.

The apparent height or depth of the relief can be controlled using the **Roughness** slider in the 2D Texture dialogue box; the values range from 20 to -20. Since bump mapping does not use the RGB colour of

the picture file to calculate roughness, values set for blending purposes do not affect the appearance of roughness. However, a picture file can be used to map both colour and roughness in the same texture file setup.



Roughness (SOFTIMAGE renderer)
Texture roughness causes white areas of picture to have appearance of being raised.
Dome with texture (left). Roughness set to 8 (right). Blending was set to zero to show the effects of surface roughness only.

Negative value
Black areas of picture appear raised when Roughness set to a negative value.

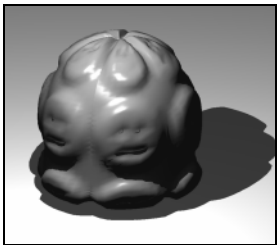
Blending
Combine the picture file with the surface Roughness by adjusting the blending factor (0.4 shown).

Note Since bump mapping uses the picture file's alpha channel or RGB intensity, the relief effect may be easier to predict if the picture is black and white (grey scale).

For good results within bump mapping, start with a low **Overall Blending** value, such as 0 or 0.1 and gradually increase it to see the effect of blending the texture with the material.

Displacement Mapping

Displacement mapping is available only with the mental ray renderer. Unlike regular bump mapping which only creates the illusion of depth, displacement mapping actually moves the object's vertices so that during the rendering, the object's geometry is altered to create a bumpy surface. Since displacement mapping only alters the object's geometry in the renderer and not the actual object in the scene, you can create highly complex object's without having to actually model them.



Displacement mapping
(mental ray renderer)
Displacement mapping affects the geometry of the object during the rendering process. Objects edges are visibly raised, and the texture casts shadows.

To activate displacement mapping, select the **Displacement (mr)** option above the **Roughness** slider. Then use the **Roughness** slider to set the values for it.

Example

The following example illustrates how to create displacement mapping using a NURBS or Patch grid.

1. Choose **Get → Primitive → Grid** (NURBS or Patch) and use the default values.
2. Choose the **Material** menu cell and select the Lambert shading model.
3. Select **Preview → Setup** and choose mental ray as the preview renderer.
4. Choose **Texture → 2D Global**.
5. Assign a global 2D texture to your grid by clicking **Select** beside the **Picture Filename** text box. In the browser, go to the **/SI_Materials/PICTURES/BUMPS** chapter and select the **bump1** file. Click **Load**.
6. Select **UV coordinates** as the Mapping Method.
7. Select **Alpha Channel Mask** from the Blending menu.
8. Use 0 for both the **Ambient** and **Diffuse** blending values so that only the alpha information is taken from the current map.
9. Set the **Roughness** slider value to 1 and select the **Displacement (mr)** option above it.
10. Change the **Repeats** values to 5 by 5 to increase the map repetitions.
11. Click the **Preview** button to preview your image.

Increase the **Roughness** value to be between 5 or 10 and watch what happens!

Custom Effects for Mapping

The **Deformation → BumpMap** command in the Model module allows you to deform the surface of a model according to a picture file. The BumpMap effect works on the same principle as bump mapping in SOFTIMAGE 3D except that the control points of an object are actually offset according to the intensity of the image

channels. You have independent control over each of the red, green, blue, and alpha channels. Filtering parameters ensure that the result does not show aliasing artifacts.

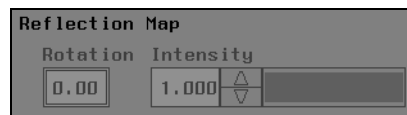
For more information on using this effect, see its command description in the *Reference Guide*.

Creating a Reflection Map

Reflection mapping can be used to simulate an image reflected on the object's material, but without using raytracing. It can also be used to add an extra reflection to an object's reflective, raytraced surface.

When used without raytracing, only the reflection map appears on the object's surface; when used after raytracing, the map is combined with raytraced reflections.

When a picture file is used as a reflection map, it is given a spherical parametrization as if it was a patterned sphere that surrounds the object and reflects off the object's surface. Unlike other kinds of maps, a reflection map is not linked to the object and remains stationary when the object rotates, unless its degree of rotation is animated. The **Reflection Map Intensity** slider in the 2D Texture File dialogue box allows you to control the intensity of the map.

**Note**

The object's material must already be reflective before the reflection map is applied. The material's reflectivity factor also influences the visibility of the texture map of the object.

Objects that are both reflective (have a **Reflective** value of more than 0 in the Material Editor dialogue box) and have an image assigned as a **Reflection Map** (in the 2D Texture dialogue box) use reflection mapping.

Using Raytraced or Non-raytraced Reflection Maps

In the **Mapping Method** menu, you can select either a raytraced reflection map or a non-raytraced reflection map.

The **Raytraced Reflection Map** displays the reflection map and the raytraced reflection of surrounding objects on a reflective object. The reflection map is mapped spherically onto the object.

When you use this option, the texture map can be used, but the raytraced reflection rays take precedence. This means that if a reflection ray hits another object in the scene, that ray is used to compute the reflection component for the original object intersection point. However, if the computed reflection ray doesn't

hit an object in the scene, the reflection map is used. So, if there is a reflection from an object(s) in the scene, use it; otherwise, use the reflection map to get a reflection.

The **Non-Raytraced Reflection Map** option lets you see the reflection map on the reflective object, but does not use the raytracing process. It is an efficient way to simulate reflective objects: since the raytracing is disabled, surrounding objects are not reflected.

The reflection map for non-raytraced reflection maps is actually a “fake”: there is no reflection ray or object intersection, but instead a faked environment that tricks the renderer into believing that the secondary ray hit something in the scene. This leads to a rapid and easy simulation of reflection.

The following example illustrates how to put a non-raytraced reflection map on an object. In this instance, the object has already been created and exists in the Viewpoint directory. You will find this image and put the reflection map on the object.

1. Choose **Get → Element**.
2. Go into the **Viewpoint** directory.
3. Choose the **porsche82**. image as the model.
4. Go into the **Material** dialogue box and apply a chrome material to the object.
5. Set the **Spectral Decay** and **Reflectivity** to 100%.
6. Choose the **Texture → 2D Global** command and select the **Non-raytraced reflection map** from the Mapping Method menu.
7. Click the **Preview** button to preview the scene.

Creating a Reflection Map Using mental ray

Here is another way of creating a reflection map generated from a model which acts as an environment for other scene models. The environment model which generates the reflection map is hidden once rendered with the mental ray renderer. The following steps that show how to create this effect:

1. Create a simple scene by choosing **Get → Primitive → Sphere** and loading another model, preferably something with a reasonable amount of surface area.

2. Scale the sphere to about twice the size of your model. The sphere, acting as an environment, should encompass the other model.
3. Select the large sphere and choose **Effect → Inverse** in the Model module. This inverts the sphere's normals so that they should be pointing inward. You want the normals to point inward because your model is inside the sphere and will reflect its surface.
4. Assign a material to the model and increase the material's **Reflective** value to 0.7.
5. Assign a material and a 2D texture to the sphere (choose **Texture → 2D Global** and assign a picture).
6. Select the sphere and choose **Info → Selection**.
7. Click the **Render Setup** button to access the mental ray Render Setup dialogue box. From the **Object Visibility** options, deselect the **Primary rays** and **Shadows** options so that *only* the sphere's **Secondary rays** option is selected.

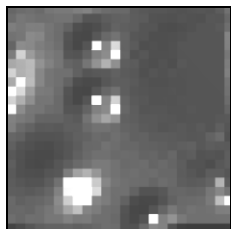
This means that only the reflection and refraction values are looked at during the rendering process of the scene. The rendered pictures will not show the sphere's geometry nor its shadows.

8. Include at least one light source in your scene and make it **Raytraced**.

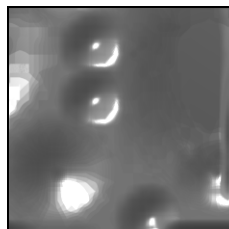
You can now render the scene using mental ray (see *Rendering with mental ray* on page 55 in the *Rendering User's Guide*).

Refining the Texture's Resolution

If the camera is close to an object with a texture map, you may be able to see the picture file pixels when the object is rendered. You can avoid this by using a picture file with higher resolution (a higher number of scan lines or rows of pixels) or by activating the **Pixel Interpolation** option in the 2D Texture File dialogue box. This option blurs the pixel edges so that the low resolution of the texture is less apparent.



No pixel interpolation



With pixel interpolation

Copying Textures

The **Txt_Oper** → **Copy All** and **Copy Selection** commands in the Matter module allow you to copy all or selected the textures from a specified object or polygon to another object or polygon.

These commands allow you to copy the same texture to more than one object without having to reset the parameters. This is advantageous if you want to select a particular texture and modify some of its attributes, then copy it to more than one object. It saves you from having to select the texture and set the parameters each time you want to apply it to another object. For example, if you have four objects and only one of the object's has a texture applied to it, if you want the same texture applied to all of the other objects, you can use the **Txt_Oper** → **Copy All** option.

 When you duplicate an object, its texture is copied with it.

For more information on applying textures to polygons, see *Assigning Textures to Polygons* on page 86.

1. Select the destination object or objects (**Multi** menu cell) or polygon (using the **Polygon** menu cell) for the texture.
2. Choose the **Txt_Oper** → **Copy All** or **Copy Selection** command in the Matter module.
3. Select the source object (or polygon) from which the textures are to be copied. Both the destination and source objects (or polygons) flash to confirm the operation.

The 2D Texture File dialogue box for each texture is displayed sequentially. If you want to copy the texture, click Ok. If you do not want to copy that texture, click Exit.

 You can edit the parameters in the dialogue box before clicking Ok.

Custom Effects for Copying Textures

The **Effect** → **Puzzle** command in the Model module allows you to apply the same 2D texture (global or local) to several objects with different and coherent cropping and translation values. For example, if you wanted to model a puzzle, you would need to apply a single picture in different ways to each piece of the puzzle.

The Puzzle effect allows you to avoid manually cropping and scaling several textures of the same picture to create a puzzle model, for example. The texture applied to the resulting object is parted and cropped according to the ratio between the surface of the bounding box of each child and the bounding box for the whole hierarchy. You can also create effects, for example, where thousands of people in a stadium each move a piece of paper to create a big logo.

For more information on this effect, see its command description in the *Reference Guide*.

Setting the Current Texture

The **Txt_Oper → Set Current 2D** command allows you to select the current 2D local or global texture for a polygon mesh object from the Schematic window.

For more information about working in the Schematic window, see *Schematic Window* on page 57 of the *Reference Guide*.

1. Open a Schematic window and select its Matter mode.
2. Select an object or local material in this window.
3. Choose the **Txt_Oper → Set Current 2D** command.
4. Pick a global or local texture or supporting material.

The selected texture becomes the current texture for the object or local material.

Assigning Textures to Polygons

You can assign textures to an entire object (globally). On a polygon mesh object, you can also assign textures locally to groups of surface polygons or globally to all the polygons of the polygon mesh. Since textures can be applied in both ways, each object has a global and local (where applicable) material “list”, each of which can have its own texture list.

All materials (the global material applied to the entire object as well as each local material) have their own 2D and 3D texture lists. Local textures are only applied to local materials, whereas global textures are blended with local textures. If there is a blend factor of 1 for the global texture, you won’t be able to see the local texture at all. However, if the blend factor is less than 1, you can see a blend of global and local textures.

By selecting **Polygon → Automatic Texture**, you can automatically assign a texture to the selected polygons. This works essentially the same as adding a texture to a selection of polygons by choosing the **Txt_Oper → UV Coordinate (2D Global or Local)** command, and accepting the default texture coordinates. This command lets you quickly add local textures to a group of selected polygons.

Quickly Assigning a Texture to a Polygon

1. Select one or more polygons using one of the following commands in the Matter module:
 - **Polygon → Select by Tag Vertex**, **Select by Rectangle**, or **Select by Raycasting**.

The selected polygons are highlighted in pink.

 You can avoid tagging points surrounding the polygon by choosing either the **Select by Raycasting** command or the **supra** key and then performing a rectangular selection on the desired polygon.

2. Choose the **Polygon → Automatic Texture** command. The Automatic Texture dialogue box is displayed.
3. Select **UV Texture Coordinate Only** to set options for texture coordinate mapping if the model already has a material.
or
Select the **Material + Texture + Coord.** option to add both a material and a texture in one operation while simultaneously

setting some of the options for the texture coordinate mapping.

4. Select one of these options if desired:
 - **Swap U & V** exchanges both the u and v directions of the texture coordinates. The texture map is rotated and flipped.
 - **Inverse U** flips the texture only in the u direction.
 - **Inverse V** flips the texture only in the v direction.
5. Click Ok to apply the default material, if you had selected the **Material + Texture + Coord.** option, and exit the dialogue box.

Using the **Polygon → Automatic Texture** command also has one advantage: the texture coordinates automatically adjust the texture to fit it over all the selected polygons. After you have assigned the texture using this command, it works just like any other stored texture, meaning you can edit the texture coordinates using the **Txt_Oper → UV Coordinate (2D Local)** command (see page 1439 of the *Reference Guide*).

However, since this command attempts to make the texture fit on the selected polygons, there are also some limitations for what you can select:

- You can only select four-sided surface polygons, such as the face of a cube or most of a polygon mesh sphere (the polygons at the poles of a sphere are only three-sided, so you can't select this area).
- Since the command is mapping a square image on a surface, it needs a rectangular grid of polygons. This means, for example, that you cannot select a side of a polygon mesh sphere if one polygon in the middle of it is unselected.

The command checks that the selected polygons are valid for the operation and informs you if it finds a problem.

Applying and Editing Textures on Polygons

The **Txt_Oper → Info UV Coord. (2D Global or Local)** command in the Matter module lets you apply a global (or local) 2D texture map's coordinates to a polygon mesh object's polygon vertices, which define its geometry. Once you apply these coordinates, you can also edit their values.

Only one set of uv texture coordinates can be stored for each vertex used by each polygon. This means that the geometry only "remembers" the coordinates of a single txt map. If there are multiple

“blended” uv-mapped textures on a material, the polygons refers to the same areas of those textures.

For automatically applying texture map coordinates to a polygon mesh object, see how to use the **Polygon → Automatic Texture** command as described on page 86.

1. Select a polygon mesh object and assign a material (**Material**) and a 2D global texture to it (**Texture → 2D Global**).
2. In the 2D Texture dialogue box, select one of these **Mapping Methods**: XY, XZ, YZ, cylindrical, or spherical.
3. Click Ok to exit the 2D Texture dialogue box.
4. Choose the **Txt_Oper → Info UV Coord. (2D Global)** command to store the texture coordinates with the object’s vertices. You can also use this command to manually edit the actual texture coordinate value for the polygon mesh object’s vertices.



Only polygons using the texture are affected by the operation (for example, uv-mapped polygons using different textures keep their coordinates).

The UV texture coordinates dialogue box appears.

If there are selected polygons on the currently selected polygon mesh object, only the texture coordinates for those polygons are displayed in this box.

5. To accept the default settings for the texture coordinates, click Ok.

If you want to edit the texture coordinate’s values, follow these steps:

6. Select the Browse order: it is **Polygon** by default, meaning that all the texture coordinates used by the polygon are adjacent in the scroll box. If you select the **Vertex** browsing order, all the texture coordinates at that point appear in the scroll box, one for each polygon that shares the vertex.

With either browsing order, the scroll box displays the identifying number of each vertex and the polygon to which it belongs.

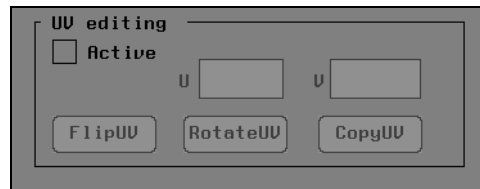
7. Select a vertex in the scroll box for editing. In all SOFTIMAGE 3D windows, the selected vertex is highlighted in green, and the polygon to which the vertex is associated is highlighted in pink.

8. The current values of the texture coordinate for the selected vertex are displayed in the U and V text boxes. Enter a value in the text boxes.
9. Apply the changes to the vertex using the **Modify** or **Modify vrtx** buttons.
10. The Cancel button undoes modifications while keeping the dialogue box open, even after selecting one of the **Modify** buttons. Click Ok to accept all settings and exit the dialogue box when you're done.

Editing UV Textures on Polygons

You can edit the uv texture mapping on a polygon mesh object by choosing the **Paint** menu cell, or by clicking the **Paint** button in the 2D Texture File dialogue box.

In the Paint dialogue box, selecting **UV Editing** changes the texture projection method to uv and generates uv texture coordinates for polygons using the current texture.



By storing texture coordinates with the polygon mesh object's vertices, a texture map is essentially "tacked" to the object's geometry. This means that when you deform an object, the texture map will follow its appropriate vertex.

1. Select the **UV Editing** option.



If the current texture is not uv-mapped on the model, a warning appears that the texture mapping method will be changed from the current projection model to uv.

2. Select polygons in 3D Projection view on the right side of the dialogue box and display their mapping outlines. Then use the mouse buttons as follows:
 - Left mouse button allows you to display the uv outlines, but not edit them. Click on a polygon and drag the mouse to select other polygons in the same way. Non-editable outlines are shown in dotted red lines.

- Space bar-left mouse button allows you to display and edit UV outlines. Select polygons in the same way as above. Editable outlines are solid red lines. UV handles are also displayed and can be edited (see next step).
 - Space bar-middle mouse button deselects the outline of the polygon under the cursor.
 - Space bar-right mouse button clears all editable outlines.
3. To edit the uv texture coordinates of polygons, press the **m** Supra key; in the Clip view, click on the UV handle you wish to modify and drag it around as required.

Note If multiple outline handles are overlapped in the 2D Clip view, pressing **m** moves all of them at the same time. If you don't want all of them to be modified simultaneously, modify the polygon selection from editable to non-editable for those polygons that you don't want to modify.

When the selected **Texture Display** option is either **Fast** or **Full**, your UV modifications are updated on the model in the 3D projection view only when you release the mouse button.

Copying UV Textures

When the **UV Editing** option is selected, you can share UV texture information by copying the UV texture coordinates from one polygon to another.

The **Copy UV** option is available only when one polygon is selected as editable. You can only copy UV information between polygons with the same number of vertices.

1. Select one active UV outline in the 3D Projection view.
2. Click **Copy UV**.
3. Click on any other polygon to copy UV texture coordinates.
4. Repeat step 3 as many times as desired.
5. Right- click to exit the “copy” mode.

Custom Effects for Assigning Textures to Polygons

The **Effect → CubicMap** command in the Model module allows you to apply 2D planar textures on an existing polygon mesh to a new polygon mesh using cubic projection. It checks each polygon and,

based on the polygon normals, applies up to a maximum of six local materials and textures.

The CubicMap effect is typically used to automatically apply 2D textures locally to a polygon mesh, such as applying the texture of a brick on the four walls of a model of a room. CubicMap keeps the original material and texture information and creates up to six local materials and local textures, one for each possible projection plane.

The **Effect → Label** command in the Model module allows you to apply 2D textures mapped on an existing polygon mesh or patch model to a new polygon mesh object while maintaining the aspect ratio. It is typically used when you want to preserve the original aspect ratio of the texture picture when applied on a model (for example bottles, logos, etc.).

For more information on using these effects, see their command descriptions in the *Reference Guide*.

Realigning a Texture on Multiple Polygons

After performing various mapping operations, you may want to realign a texture to multiple polygons.

1. Select one or more polygons using one of the following commands in the Matter module:
 - **Polygon → Select by Tag Vertex**, **Select by Rectangle**, or **Select by Raycasting**.

The selected polygons are highlighted in pink.

 You can avoid tagging points surrounding the polygon by choosing either the **Select by Raycasting** command or the **t** supra key and then performing a rectangular selection on the desired polygon.

2. Select the **TXT** (texture) manipulation mode.
3. Choose the **Txt_Edit** command and activate either the **2D Local** or **2D Global**, and the **Support** or **Projection** commands, as desired.
4. Choose the **Txt_Edit → Align Txt** command.

The texture is repositioned so that it is aligned to the selected polygon or polygons.

Using 2D Texture Shaders

A shader lets you create special effects during the rendering process when using the mental ray renderer. The main reason for using shaders is the complete flexibility and openness available to you to create and manipulate shaders to meet your specific needs.

If you are rendering with mental ray, you can select a 2D texture shader in the 2D Texture File dialogue box. SOFTIMAGE 3D default 2D texture shaders compute a texture surface (the texture vertices) and interpolate the vertices during rendering.

The options in the mental ray area of the dialogue box let you define 2D texture shaders for one or more selected objects. When you select the **Shader** option, the browser is displayed in which you can choose and activate a texture shader.

For more information on using shaders, see *Using Shaders* on page 65 in the *Rendering User's Guide*.

The following example illustrates how to select a 2D texture shader called fabric:

1. Select an object.
2. Choose the **Material** menu cell to apply a basic material to the object. In the Material Editor dialogue box, select Lambert as the **Shading Model**. Click Ok to accept these parameters.
3. Choose **Info** → **Selection** and change the **Step** value to 10 in both the U and V directions. This increases the object's resolution which results in a more precise displacement map.
4. Select **Preview** → **Setup** and choose mental ray as the preview renderer.
5. Choose **Texture** → **2D Global**. In the 2D Texture File dialogue box, click the **Select** button beside the **Picture Filename** text box.
6. Use the browser to go to the `/SI_Materials_lib/PICTURES/TILINGS` directory. Select a low-resolution image such as `tile_blue` and click **Load**.



To apply a 2D texture shader, you must first apply an texture to your object. Any image will do, so choose a low resolution image.

7. Select the **Shader** option in the mental ray area of the dialogue box. Use the browser to go to the Shader_Lib directory. Select **Fabric** and then click **Load**.
8. Click **Edit** to manipulate the Fabric shader parameters.
9. In the Preview area of the dialogue box that appears, select **Refresh**. This gives you visual feedback of the shader in the form of a Custom Shaderball Preview. By selecting the **Auto** option, the Shaderball automatically updates itself after each revision.

Tip

See *Custom Shader Ball* on page 132 for information on the shader ball preview.

In the OZ-Fabric dialogue box, change the RGBA values for both the **Horizontal** and **Vertical Thread**. Create the colours of your choice.

The OZ-Fabric shader is made up of Horizontal and Vertical pieces of fabric woven together. The colour of the thread blends into the **GAP** colour (the space between the woven pieces of thread) to create the impression of roundness.

10. Change the **Width Variation** value to 0.4. This adds a certain amount of randomness to the width of the pieces of thread making the fabric more uneven and natural looking.
11. Change the H and V Amplitude values to 0.02. This creates a more realistic woven effect by making the thread a little bit wavy.
12. Change the **Texture Range** to 30 in the U direction.

Tip

Click **About** to get more information on the various parameters.

13. Click **Ok** to accept all other default parameters.
14. Click the **Preview** button in the 2D Texture File dialogue box to view the results.

Painting Textures

The **Paint** menu cell in the Matter module allows you to edit a texture in various ways (such as “painting”) and modify uv texture coordinates.

You can also create and modify a colour palette to your own specifications, generate a colour-indexed or RGBA texture, and create different effects using the Painterly Effects option, such as the ripple effect or the stained glass effect.

The **Paint** feature can also be accessed by clicking the **Paint** button in the 2D Texture File dialogue box.

For more information on the Paint dialogue box parameters, see *Paint* on page 1006 of the *Reference Guide*.

Selecting a Clip

When you select the **Clip Db** button, the 2D Clip view displays a scroll box representing the database of clips associated with the selected model, as well as user-defined clips. In the Paint dialogue box, a clip is a texture file.

Each clip in the list is represented by:

- An icon, which is a snapshot of the actual picture.
- Information such as name, type (Local vs. Global), the width and height in pixels, and whether it is in RGBA or Colour Index mode.

If you are displaying a clip, it is the current selection in the list. If you wish to select and edit another clip:

- Double-click on its associated icon

or

- Click on the icon and click the **Clip Db** button again.

Either action displays the selection in the 2DClip view, ready for editing.

Editing the Clip

The following summarizes the overall process you might use to edit your clip using some of the **Paint** tools.

When you open the **Paint** dialogue box, the 2D Clip view displays the current texture. If you're not sure what the current texture is, check

in the Schematic window (Matter mode); the current texture has a red link.

After you have selected a clip, you can now edit it by:

- Using the editing buttons such as Pen, Blur, Smear and so on. The brush size and colour can be controlled.
- Manipulating the current palette (either the default palette or the user-defined palette), cutting and pasting entries within the same palette or different palettes.
- Editing the clip as an RGB image and as a colour-indexed image.
- Using the clipboard functions to cut, paste, and combine different clips in the database.
- Applying special effects, using the Painterly Effects by selecting the **Paint FX** button in the **Effects** menu.
- Rotating the clip either clockwise or counterclockwise, flipping, or tiling.

You can also edit the uv texture mapping by selecting polygons on the model and editing their mapping, as described in *UV Editing* on page 1031 of the *Reference Guide*.

Painting on the Image

1. Starting with a model which has a texture applied, choose the **Paint** menu cell.
2. The selected texture is displayed in the 2D Clip view area, located in the upper-left of the Paint dialogue box. The model is displayed in the 3D Parallel Projection view, on the right side of the dialogue box.
3. By default, the initial editing mode is RGBA, and the palette is the default palette of 256 colours. If you wish, you can load a user-defined palette using the **LoadP** button. For more information on the palette, see *Creating a Palette* on page 102.
4. To paint on the texture, choose a colour in the palette and one of the Tools, such as Pen, Blur, Smear and so on. The brush size and colour can also be controlled by changing the values in their text boxes.
5. Start moving the cursor around in the 2D Clip view to see the effects of the colour, tool, and brush size you chose.

Note

If at any time you want to undo a change, click the Undo button. If you decide that you do want that particular change after all, click the Redo button.

Any of the Tools can have their transparency controlled by RGBA mode by changing the alpha value in the palette for the current colour.

Using Foreground and Background Colours

The foreground or background colours of the palette can be used for all drawing or painting tasks on the clip.

Selecting a New Foreground Colour

To select a new foreground colour, click in the palette. The entry now has a red and green outline, indicating it is the current foreground colour.

To modify the foreground colour, you can use several methods:

- Adjust the colour sliders. A button located to the left of the sliders toggles between the RGB, HLS, and HSV colour models.
- Click anywhere in the Colour Wheel/Spread.
- Use the Colour Mixer.
- You can also modify the foreground colour by selecting Colour from the Tools options. This is not a palette feature, but a Paint feature. This allows you to pick a colour in the RGB image itself and update the foreground colour.
 - In RGB editing mode, if you click on a pixel in the 2D Clip view, the foreground colour in the palette is updated.
 - In Colour Index mode, this action selects the corresponding palette entry (helping you to identify the colour of the selected pixel) but does not update the entry.

Selecting a New Background Colour

When you Cut a portion of the clip, it is replaced by the background colour. In the colour palette, it has a black and green outline.

The background colour can also be used for several of the painting operations, if you perform them using the middle mouse button instead of the usual left mouse button.

To select a new background colour, middle-click on an entry in the palette. The selected entry now has a black and green outline, indicating it is the background colour.

You can modify the background colour, the same way you do for the foreground colour. This is also a Paint feature, not a Palette feature.

Note

To update or select the background colour, remember to use the middle mouse button when picking a colour in the clip.

Cutting and Pasting a Clip

You can cut, copy and paste an entire texture or a selected area of a clip, using the **Cut**, **Copy**, and **Paste** buttons in the Clipboard menu.

1. To select an area to cut or copy, use either the **Select** editing tool or press the space bar.
2. Then use any mouse button to select an area in the clip. If nothing is selected in the clip, the cut/copy operations operate on the entire image.
3. Once you have made your selection, choose **Cut** or **Copy** from the Clipboard menu.

Note

Cut removes the contents of the selection and replaces it with the background colour.

The selection is now displayed in the clipboard. The **Select** button is still selected.

4. Now paste the clip where you want. When you paste, the result of the paste is shown as long as you keep the mouse button depressed and until you release it.
5. To paste the clipboard contents within the selected area, choose **Paste**. You can now place the clipboard contents anywhere within the selected area.
6. To paste the clipboard contents anywhere in the image, choose **Select** again. This deactivates the selection in the clip. The **Select** button remains selected (for example, the current clip editing tool is still **Select**).

7. Choose **Paste**, then paste with the mouse buttons as follows:
 - Left mouse button pastes the contents of the clipboard using the **Alpha** contained in the clip to blend with the actual image so that the image is visible through the clip once the clip is pasted on top of the actual image (over).
 - Middle mouse button pastes without considering **Alpha**.
 - Right mouse button pastes the contents of the clipboard using **Alpha** contained in the image to blend with the clip, so that the clip is visible through the image (under).

You can also paste your selection in a different image:

1. **Copy** or **Cut** an area in the 2D Clip view as described previously.
2. Choose **Clip Db** to change to the database list of textures.
3. Select another clip from the list and click again on **ClipDb** to return to 2D Clip view.
4. In the new clip, paste the clipboard contents into a selected area or anywhere in the image.

Creating a New Clip

In the Paint dialogue box, you can also:

1. Load a picture from disk, using the **Load** button.
2. Create a new clip from the current one by selecting the **MakeClip** option in the Clipboard menu.

Using Painterly Effects

In addition to drawing on your clip, you can apply other special effects, known as Painterly Effects.

Select the **PaintFX** option in the **Effects** menu to access the Painterly Effects dialogue box. Forty-two Painterly Effects are available, such as emboss, grain, or glow effect.

You can experiment freely, previewing the results of effects on different areas of the image, adjusting the parameters to increase/decrease the overall changes to the surface.

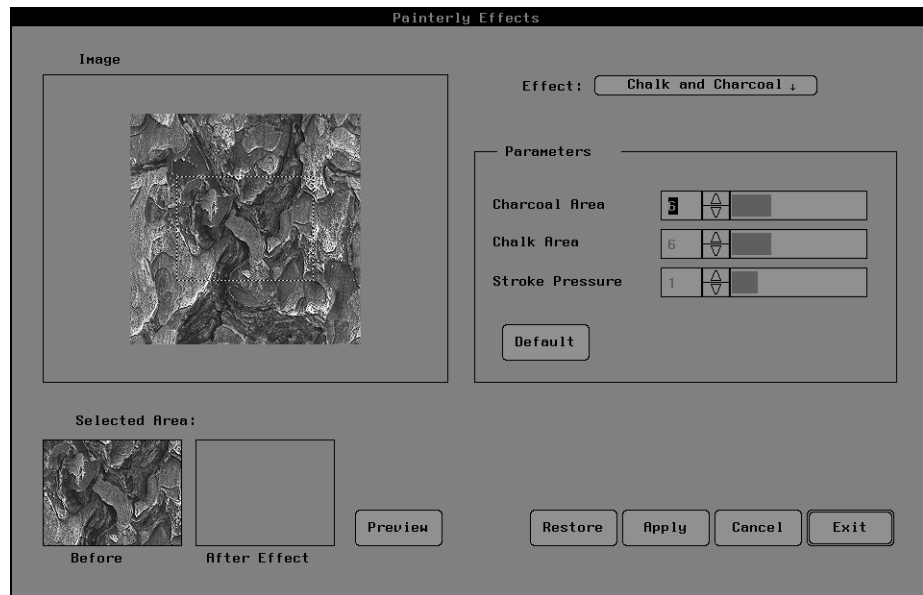
Once satisfied, you can apply the changes to the clip and return to the Paint dialogue box to continue editing.

The location of the Painterly Effects Plug-ins is indicated by the environment variable `SI_PAINTERLY_FX`. If this variable is undefined, the **Paint FX** button is dimmed.

For information on installation, refer to the *SOFTIMAGE 3D Installation Guide*.

For an example of using Painterly Effects, follow these steps:

1. Select an object.
2. Choose **Texture** → **2D Global** or **Local** and select a texture to your sphere (try to get one with several colours).
3. Click on the **Paint** button. The clip of your image appears in the 2D Clip view.
4. Select the **Paint FX** option in the Effects menu. The Painterly Effects dialogue box appears.



5. The clip appears in the **Image** area. There is a small box in the middle of your clip, you can move this box around to choose any area of your clip. This area of your image appears in the **Selected Area - Before** box; this is updated as you move the box.
6. Click on the **Effects** menu and select Volume 3 (there is a choice of three volumes of effects).

7. Select the **Stained Glass** painterly effect, for example, and click the **Preview** button. Set your parameters. The image appears with the Stained Glass painterly effect applied to it in the **Selected Area - After Effect** box.

If you like the effect, click the **Apply** button to apply it to your clip.

Click **Exit** to return to the Paint dialogue box.

Generating a Colour-indexed Clip

At any point, if you want to generate a colour-indexed version of the clip and edit it. A colour-indexed clip has a certain number of colours available because all pixels reference a reduced palette.

You can change the editing mode from RGBA to Colour Index using the menu below the 2D Clip view.

Be aware that this action generates a colour-indexed version of your clip based on the *current* palette. If the colours in this palette are not based on the actual colours of the image (for example, if it is simply the default palette) then the colour-indexed version may be degraded.

To generate a new palette based on the colours in the image, select the **Generate** option from the **Pal. Oper.** menu *before* changing to Colour Index mode. This action opens a dialogue box in which you specify palette generation parameters and allows you to maintain the closest colour conversion. For example, the default number of colours is 256, but you can change this to 60 if you want only 60 colours in the palette. Once the number of colours is entered, a new palette is created. It appears in the colour palette area.



If entries are currently selected in the palette, you can't change the number of colours to be generated. The number that is displayed is the number of non-locked entries in the selection.

Once the new image-based palette is generated, you can change to Colour Index mode.

When in Colour Index mode, you can modify a colour in the palette and change the colour of all referenced pixels in the image; for example, by changing the colour of palette entry #6, all pixels in the image which reference entry #6 also change.

Most editing tools are also available in Colour Index mode, so you can still “paint” on the image just as in RGB mode.

At any point, you can return to RGB editing mode.

Note

Be aware that if you return to RGB mode in this way, some of the colour updates you made in the colour-indexed mode will be lost and the RGB version may look different.

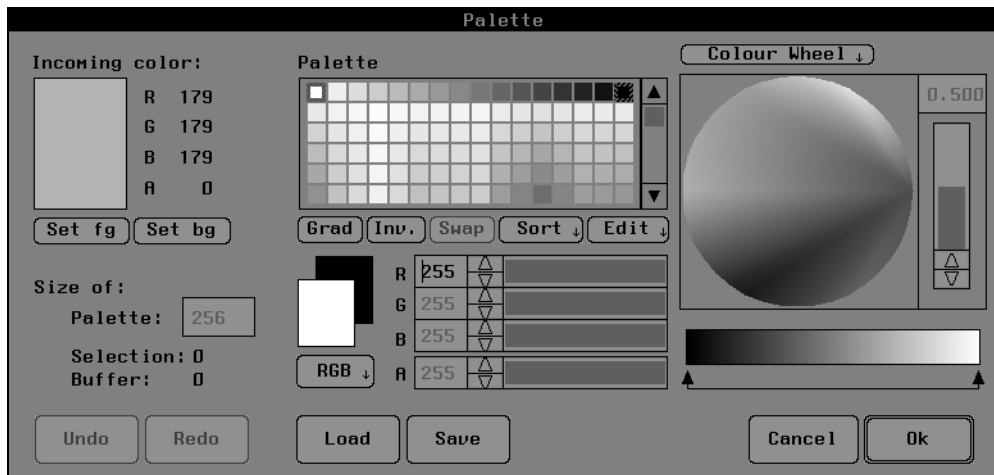
To convert the Colour Indexed version of the image back to RGB, select the **CI → RGB** option from the **Effects** menu before switching back to the RGB (true colour) version. In this case, the resulting RGB version will be identical to the last colour-indexed one.

Creating a Palette

In the Paint or Palette dialogue boxes, you can create and modify palettes. This can be useful for creating specific palettes to be applied consistently to a group of materials or textures.

The Paint dialogue box can be accessed by choosing the **Paint** menu cell or clicking the **Paint** button in the 2D Texture File dialogue box. The Palette dialogue box is accessed by clicking the **Palette** button in any of these dialogue boxes: the Material, 3D Solid Texture, or the Depth Fading dialogue boxes. The Palette dialogue box, as shown below, has the same parameters as are available in the Palette area in the Paint dialogue box.

For more information on the Paint and Palette dialogue box parameters, see *Paint* on page 1006 of the *Reference Guide*.



The options located in the **Pal. Oper.** menu in the Paint dialogue box allow you to create and edit a palette, as well as apply the current palette to the source image with or without dithering. By selecting the **Generate** option, you can generate a new palette based on the number of colours that best represent your image.

The following demonstrates some of the colour palette features:

1. Select the **Generate** button in the **Pal. Oper.** menu. This action opens a dialogue box in which you can specify palette generation parameters.

2. Indicate that you want 32 entries in the new palette. Once you click OK, the new palette is created with the number of entries indicated.
3. Select **Colour Index** in the menu under the 2D Clip view window (on the left side of the dialogue box) to go into Colour Index mode.
4. Select the second row of the palette by pressing the Shift key. Then click on **Edit → Copy**.
5. Deselect the entries that are currently selected by pressing the Shift key and the right mouse button. Click on **Edit → Paste Before**. There are now 48 entries in the palette. (All the entries in the first row are not indexed– see the **Nb of Pixels** when selecting these entries).
6. Select **Pal. Oper → Optimize**. The **Optimize** feature acts as internal management. It ensures that there is only one entry for each colour in the image. If there are several entries in the palette that are identical, by selecting **Optimize**, all the pixels that are using this colour now refer to the first entry of this redundant colour. This means that all the entries in the second row are now indexed.
7. Click the **Pal Oper → Cleanup** button. The **Cleanup** button removes all entries not being referenced by the image (the third row of entries).
8. You now have a new palette that is representative of the entries in your image and have cleaned up the palette to save space.

Note

The **Optimize** and **Cleanup** features also work on sets of selected entries.

Interaction with Editing Modes

In all editing modes, the colours of the current palette are available for painting and editing the image. However, the following differences apply:

- In the three RGB modes (**RGB Only**, **Alpha Only**, and **RGBA**), the palette is simply a set of colours available for painting on the image. By editing the palette entries, you do not change the pixels of the image, you only change the colours available to paint on the image (this is known as “true colour” mode).

- In the two Colour Index modes (dithered and undithered), every pixel in the image references an entry in the palette. In this case, when you edit the colour of a palette entry, you change the colour of referenced pixels in the image.

Selecting Palette Entries

You can enter Select mode by pressing the Shift key and clicking the mouse. If you left-click in the palette and drag the cursor, it clears any entries that are currently selected and begins a new entry selection.

By dragging the cursor in the palette, all entries to be selected have a black outline surrounding them. When you release the left mouse button, the outlined entries are selected and have a green and white outline.

While you are in Select mode, you can also drag the cursor above or below the palette entries to scroll up or down the palette directly without releasing the mouse button.

If you use the middle mouse button, the current selection is kept and a new range of entries is either added to or removed from the current selection. This new range is added to the current selection if the first entry you clicked was unselected. The new range is removed from the current selection if the first entry was selected.

If you right-click in the palette, all selected palette entries are deselected.

Release the Shift key to exit the Select mode.

Modifying the Palette

There are many ways you can modify the palette:

- Add and delete entries.
- Cut, copy, and paste entries in the same clip or different ones
- Swap entries.
- Invert the order of entries or sort entries.
- Establish a gradation between palette entries.
- Pick colours from the clip in order to select or update the corresponding entries in the palette.
- Lock entries.
- Load and save user-defined palettes

Adding and Deleting Entries

If you click below the last palette entry, a new line of black entries is added to the palette. These palette entries can then be filled by selecting a colour from the Colour Wheel or Colour Spread and then clicking in the appropriate entry.

To delete one or multiple entries, select the entry or entries that you want to cut and select **Cut** from the **Edit** menu.

Creating a Gradation

You can do a gradation on the palette by following these steps:

1. Make a selection in the palette by holding down the Shift key and selecting with the left mouse button.

Note

If no selection is made, the entire palette is considered to be selected, so the whole palette changes.

2. Click the **Grad** button.
3. You are prompted to choose the first colour where the gradation will start. You do this by left-clicking the appropriate palette entry.
4. You are then prompted to choose the last colour where the gradation will end. You do this by right-clicking the appropriate palette entry.
5. Click the **Grad** button again and the gradation is performed on the palette.

Note

You can exit **Grad** mode by clicking the Esc key.

Cutting, Copying, and Pasting Palette Entries

In the **Edit** menu you can cut, copy, and paste one or more palette entries from one palette to another. The **Edit** operations affect only entries that are selected.

You can edit the palette by following these steps:

1. Select an entry or entries in the palette with the Shift key and using the left mouse button.
2. Select **Copy** or **Cut** from the **Edit** menu.

3. If you select **Cut**, the selected entries are cut from the palette.

To see how many entries have been cut from the palette, the box next to **Buffer** indicates how many colours were cut.

4. If you want to copy the entry, click the **Copy** button after you make a selection in the palette.
5. Your selections are cut or copied to the palette clipboard and can now be pasted in the same palette or a different palette.
6. Select either the **Paste Before** and **Paste After** options, as described below, to paste the palette entry or entries where you want them.

When pasting clipboard contents, the following rules apply:

Paste Before

- If you choose **Paste Before** and no entry is selected, it inserts the entries of the copy buffer before the foreground entry, moving all the other entries forward.
- If you have made a selection, it replaces the entries of the selection with the entries in the copy buffer until the end of the selection of the copy buffer is encountered.

Paste After

- If no entry is selected, it inserts the entries of the copy buffer after the foreground entry, moving all the other entries forward.
- If you have made a selection, it replaces the entries of the selection with the entries in the copy buffer until the end of the selection of the copy buffer is encountered.



Palette clipboard operations can be applied between different textures in the clip database. For example, you can copy entries from the current texture, go into the clip database, select another texture, and paste the entries in the new texture palette.

Swapping Palette Groups

The **Swap** button lets you switch two selected groups in the palette.

1. Select the palette source entries.
2. Click **Swap** (selection colour changes from green to purple).

3. Select destination entries (displayed in green) by holding the Shift key.
4. Click **Swap** again to apply.

If both selections have the same number of entries, all selections are swapped; otherwise, the number of items in the smallest selection set will be swapped.

You can exit **Swap** mode by pressing the Esc key.

Locking a Palette Entry

Locking a palette is useful if you want to protect it from being changed when doing a gradation, invert, palette generation, sort, swap, cut/paste, optimize, or cleanup some of the entries in the palette.

1. Select an entry in the palette.
2. Click on the **Lock** button (or use the **L** key to enter Lock mode). These entries will have a diagonal line through them to indicate that they are locked.
3. To unlock entries that are locked, select the locked entries and click on the Lock button again.

Saving and Loading a Palette

1. To save a palette, click the **SaveP** button.
2. The browser appears opened to the current PALETTE chapter.
3. Specify a name for the palette and click Save.
4. To load a palette into the Paint or Palette dialogue box, click the **LoadP** button and select the palette you want from the appropriate PALETTE chapter.

Animating 2D Textures

You can also animate 2D textures by creating a series of picture files and applying them to the object sequentially. There are two ways to perform sequential animation of 2D textures: either using the **Sequence** option or the **Script** option in the 2D Texture File dialogue box.

Sequence

This option uses a sequence of previously rendered picture files as the texture map. SOFTIMAGE 3D synchronizes the picture file frame numbers with the corresponding texture numbers (such as a sequence mapped onto a TV screen to simulate an actual program). Another example is to create a shadow for smoke or a flickering candle, or a group of moving clouds. For sequence animation, the picture files must have the same name and frame number corresponding to each frame of the sequence. You specify the frame number in the Frame text box.

For example, you could use an animated sequence of a bouncing ball. The sequence will have one name, and each frame will be numbered sequentially.

1. Activate the **Sequence** option in the 2D Texture File dialogue box and enter the name of the picture sequence in the **2D Texture** text box.



The texture file name you enter in the **2D Texture** text box should not contain the frame number extension or the **.pic** extension.

2. Map the picture sequence onto the object (scaling and positioning the map to fit).

The frame numbers of the bouncing ball picture are synchronized with the frame numbers of the scene to create an animated image on the object.

Script Files

For the second method of animating a 2D texture, you create a script file which contains a list of pictures. When the object is rendered, the first picture on the list is mapped onto the object at frame 1, the next picture on the list at frame 2, and so on.

Uses a list of picture files for the substitution process. The picture file is an accessible text file created by the text editor that contains picture file names. Each picture file name must be entered on a separate line. You can use non-sequential files for this script, such as **myfile.2**, **myfile.4**, **myfile.8**, **myfile.6**, etc. The script executes the picture files in the order that they are listed in this file. The file names list all the paths that you must go through to reach the file.

When you select the **Script** option, enter the script file name in the **Picture filename** text box. If you use another path for the script file, you must enter the full path name in this text box. As the sequence is rendered, SOFTIMAGE 3D loads the picture file name on the line corresponding to the current rendering frame. The main advantage of using **Script** is that it gives you control over each individual frame so that cycling, reversing, looping, and other effects are possible.

The example of a TV screen can be animated with Script using a cycle of TV snow intercut with other images, giving the impression of erratic transmission, or create a music video with different images being flashed on the screen every second or two.

There are some important points to remember when using script files:

- You should specify the explicit path name (starting with the root directory) pointing to the pictures.
- Make sure that name of the script file is simple: no spaces, periods, special characters, etc. that may not let the operating system read the file.
- If the picture is part of a sequence, the number extension must be included. The show numbers option of the jot or vi text editor is recommended to show you the correspondence of frames to the picture it is mapping. When you are calling the script, make sure that you are in script mode.
- It is important that the frame number (under script) is at 1, or at a frame that you have a picture.

Example

Here's an example for creating a script:

1. Open a text editor. Remember the tips: keep the name simple.

2. For the script file itself, include the absolute path to the picture file on each line, starting at the root level. The “show numbers” option of the jot or vi text editor is recommended to show you the correspondence of frames to the picture it is mapping. For example:
 - (on line 1) /usr/people/user/RENDER/RENDER_PICTURES/test.1
 - (on line 2) /usr/people/user/test/RENDER_PICTURES/test.2
 - (on line 3) /usr/people/user/PICTURES/final.5
 - (on line 4) /usr/tmp/picture.4
 - (on line 5) /usr/people/user/RENDER/RENDER_PICTURES/test.1
3. Choose Texture → 2D Global or Local.
4. Select the **Script** option and type in the name of the script with its path in the **Picture Filename** text box.
5. Once you have typed in the name of the script, the picture for that frame is displayed in the preview window. Make sure the frame number specified in the dialogue box is within the range of the script.

Note

If for any reason, SOFTIMAGE 3D cannot load an image, a “?” (default icon) is substituted.

C H A P T E R F I V E

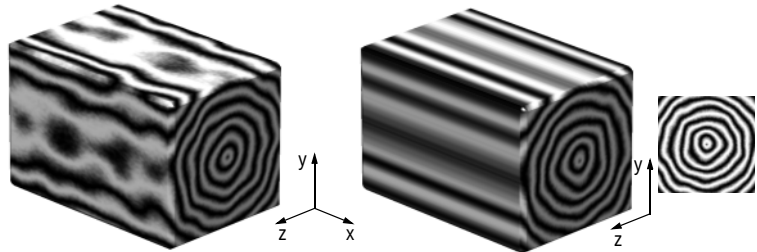
3D Textures

Introduction

In addition to material, you can also add texture to an object to enhance its appearance. Applying 3D textures to your objects can give them an increased sense of realism. Textures can be used to create an endless variety of colour patterns, surface roughness, transparency and reflectivity. Texture can also be used in combination with shadow-casting lights to create complex patterns of coloured light and shadow on other objects in a scene.

3D textures are called “3D” because they are calculated as procedural volumetric textures, but only the intersection with the object’s surface is rendered. To imagine 3D textures, pretend that the object that is carved from a block of marble or wood, or cloud mass. Marble creates a pattern of superimposed layers, wood creates a pattern of concentric cylinders, and cloud creates a pattern of cloud or sponge-like effects.

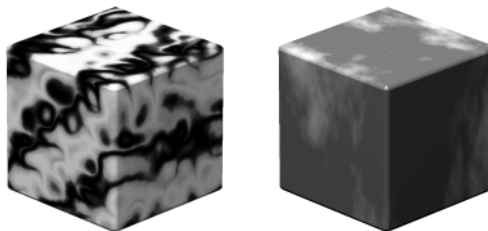
The procedural nature of 3D textures allows them to be animated through a surface, resulting in a wide variety of animated textural effects, such as fire, water, etc.



3D texture (wood)
Procedural texture creates patterns which can vary along 3 dimensions.

Compare with 2D texture
Cross-sectional pattern (right) causes streaks when projected onto xy face of cube.

Other 3D textures
Marble and cloud (below left and right) are two other procedural algorithms.



Textures can be applied to the object's *global* material, which is the material that covers the entire surface, or it can be applied to a *local* surface polygon's material (or groups of polygons).

All of 3D texture parameters can be defined in the 3D Solid Texture dialogue box which is open when you choose the **Texture → 3D Global/Local** command in the Matter module.

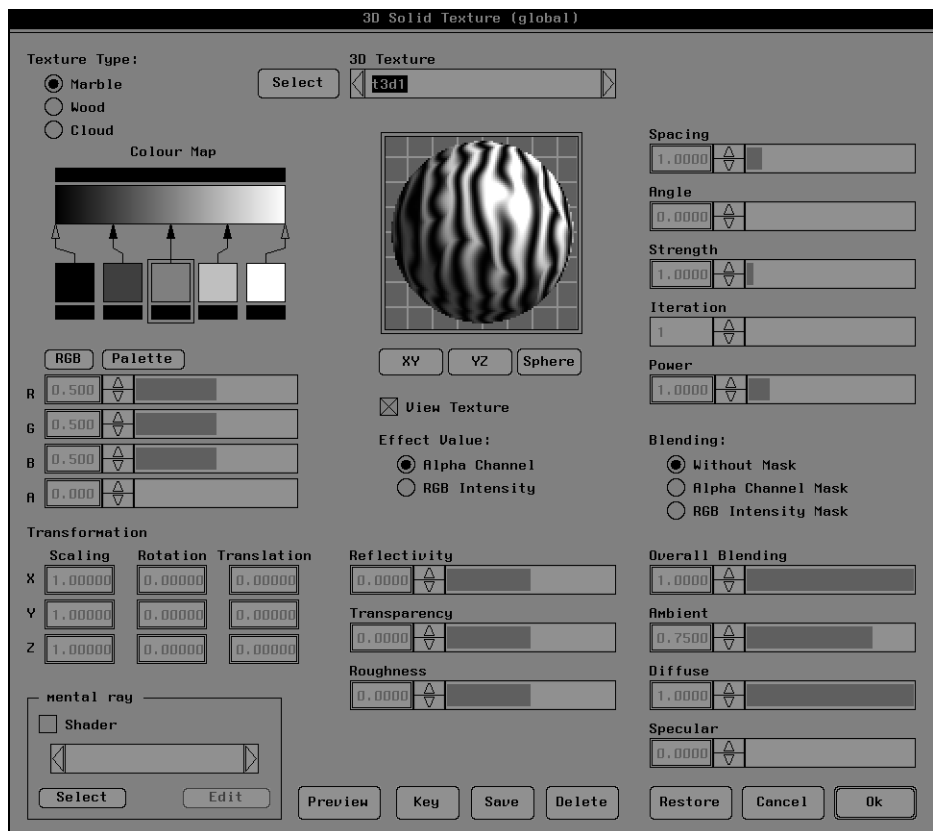
A tool which can help you use 3D textures is the Matter mode in the Schematic window. This lets you view relationships between objects, textures, and materials. For more information, see *Modes* on page 66 in the *Reference Guide*.

Creating 3D Textures

The 3D solid procedural textures can be used to create an infinite variety of patterned effects. Based on three basic pattern categories (marble, wood, and cloud), the procedural patterns can be perturbed and deformed in a variety of ways. Using the procedural parameters in the 3D Solid Texture dialogue box, you can modify the spacing and angle of pattern elements, increase their level of detail, or compress and stretch them. You can also set reflectivity, transparency, and roughness effects.

The following example illustrates how to create a 3D texture.

1. Select an object to receive the 3D texture.
2. Choose the **Texture** → **3D Global** or **Local** command in the Matter module. The 3D Solid Texture dialogue box is displayed.



Note

Objects require a material definition before you can add a 3D texture. If the object has no material assigned to it, SOFTIMAGE 3D gives it a default material setting when you choose this command.

3. Click the **Select** button to open the database browser so that you can browse through a library of source 3D texture files, either inside or outside the database.
4. To load a texture file in the 3D Solid Texture dialogue box, double-click its file name: the browser closes and the picture is displayed with its file name listed in the **3D Texture** text box. You can change the name of the file in this text box if you like, such as for making edits to the parameters and saving it with a new name.
5. Set all parameters as you need them.

As a quick introduction to the parameter settings, try the following simplified steps:

6. Select a **Texture Type**: Marble, Wood, or Cloud.
7. Experiment with the colour of the texture with the colour sliders for the **Colour Map**. Try changing the blending factors in the Colour Map by dragging the arrows back and forth.
8. Experiment with the **Spacing, Angle, Strength, Iteration, and Power** of the surface pattern by using the appropriate sliders.
9. Change the **Scaling, Translation, or Rotation** of the pattern using the appropriate sliders.
10. Preview the results in a test window by clicking the **Preview** button.
11. Click **Ok** to accept the parameter settings.

Saving a Texture File

In the 3D Solid Texture dialogue box, you can save the current parameter settings as a 3D texture file (.t3d) so that you can create your own library of 3D textures.

To save a 3D texture file, follow these steps:

1. Select an object.
2. Choose **Texture → 3D (Global or Local)** and open the 3D Solid Texture dialogue box.

3. Set the parameters as you want them.
4. Type a new name for this texture in the **3D Texture** text box.



5. Click on **Save**.
 6. The **Save Texture3D** dialogue box appears. The name that you have given the texture appears in the name area. Click on **Save**.
- You have now created a texture file that you can store in your library for future use.



To modify an existing 3D texture, you can also open a Schematic window, select the Matter mode, then select the displayed texture symbol to display the 3D Solid Texture dialogue box.

Selecting 3D Textures

After you have saved a 3D texture file, you can load it again to be used, or change the parameters and save it under a new name.

To load a 3D texture:

1. Select an object.
1. Choose **Texture → 3D (Global or Local)** in the Matter module. The 3D Solid Texture dialogue box is displayed.
2. Click **Select** to open the database browser. It opens to the current TEXTURES 3D chapter so that you can browse through a library of source 3D texture files, either inside or outside the database.
3. To see the file icons for each file, click the **Options** button and select the **Show Icons** option. This lets you easily see what the texture is without having to load it first.
4. To load a texture file in the **3D Texture File** dialogue box, double-click its file name: the browser closes and the picture is displayed with its file name listed in the **3D Texture** text box. You can change the name of the file in this text box if you like, such as for making edits to the parameters and saving it with a new name.

Previewing a Texture

To preview a texture from within the 3D Solid Texture dialogue box, click the **Preview** button in this dialogue box. This is a handy way to change parameters and view them immediately without having to exit the dialogue box.

The preview from within this dialogue box is affected by the renderer you have selected in the Preview Setup dialogue box. To check or change the renderer, choose **Preview → Setup**. Select **mental ray** or **SOFTIMAGE** as the Preview Renderer and click Exit. The renderer type is especially important if you want to view the results of using 3D texture shaders with the mental ray renderer.

Textures can also be previewed using the hardware renderer used in the Shade view, which gives you a quick approximation of materials and textures used (if selected in the Shade view Setup dialogue box). If you are planning to output your scene as geometry textures for rendering on another platform, such as a Games console, the Shade view may be the most accurate.

Viewing Texture Information

You can view information about 3D textures in a scene by choosing the **Info → Textures** command. This lets you see which texture is mapped to which object. If you want, you can also edit the texture using this command.

1. Select an object with a texture applied.
2. Choose the **Info → Textures** command. The Scene Information - Textures dialogue box is displayed.
3. If you want to edit the texture, select the name of the object you want to edit, then click **Edit**. The 3D Solid Texture dialogue box is displayed.
4. You can then edit the texture parameters as desired and click Ok.
5. When you exit the 3D Solid Texture dialogue box, the Scene Information – Textures dialogue box reappears. Click Ok to exit it as well.

Deleting a 3D Texture File

Deleting a 3D texture file resets all parameters to their default settings and the texture is removed from the object.

To delete a texture file:

1. Select an object.
2. Choose **Texture → 3D (Global or Local)** in the Matter module. The 3D Solid Texture dialogue box is displayed.
3. Click **Select** beside the **3D Texture** text box to open the browser.
4. Navigate to the appropriate 3D Texture chapter and select the file that you want to delete. The name should be displayed in the 3D Texture text box. Click **Load**.
5. In the 3D Solid Texture dialogue box, click the **Delete** button. The texture is deleted.

Editing the Texture

Choosing a Pattern Type



The three basic patterns define the basic nature of the 3D texture you can create. There are three types of 3D solid procedural textures: marble, wood, and cloud.

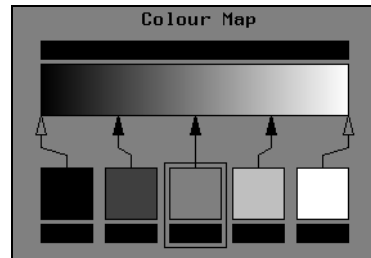
- The **Marble** 3D texture defines a pattern of superimposed layers of colours.
- The **Wood** 3D texture defines concentric cylinders of colours.
- The **Cloud** 3D texture type defines a more “organic” pattern that can be visualized as a sponge.

After you have defined your basic pattern, you can change the colour mapping. You can also edit the texture by selecting the following parameters: Spacing, Angle, Strength, Iteration, and Power.

Defining the Colour

The RGB button located above the colour sliders toggles between RGB, HLS, and HSV colour models.

The five colours in the Colour Map are defined by clicking on corresponding squares and changing colour values using the colour sliders (colours can also be defined with the Palette button).



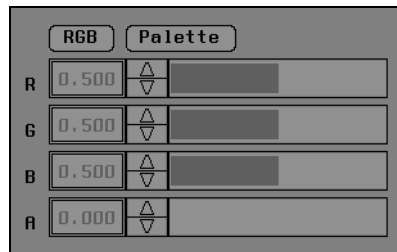
The texture colour map is created from the five colours you define for each of the associated squares, and an interpolation (blending) factor that mixes each of the colours with its neighbour. The interpolation can be controlled by moving the black factor arrows: the closer two colours get to each other, the more abrupt the transition between them.

Note

The **Colour Map** works in the same manner for both Cloud and Wood texture types.

Using the Colour Sliders

The **RGB** button located above the colour sliders toggles between RGB, HLS, and HSV colour models (see *Defining Colours* on page 33 for information on the colour models).



Drag the colour sliders to see how the colour changes in the colour boxes. You can also see the effects on the sphere in the display box to have an idea of what it will look like on a 3D object in your scene.

You can also type in numeric values from 0 to 1 in the text boxes of the sliders or use the arrow buttons beside the text boxes.

Alpha Values

The transparency value of the alpha channel associated with each of the five basic colors in the Colour Map can be defined with the Alpha slider. The interpolation between levels of transparency can be seen in the black bar at the top of the Colour Map.

Using the Palette

Clicking the **Palette** button above the sliders displays the Palette dialogue box for selecting and mixing colours.

In the Palette dialogue box you have the options to choose one of the following to modify your colours: the Colour Wheel, the Colour Spread, or the Colour Sliders. You also apply a colour interactively by moving the RGBA sliders back and forth or by entering colour values between 0 and 255 directly into the RGBA text boxes.

You can also define and save your own palettes. For more information on using the palette, see *Creating a Palette* on page 102.

The **Incoming Colour** option is available in only the Material and 3D Texture dialogue boxes. **Incoming Colour** allows you to transfer an incoming colour to foreground and background entries.

Select a colour in the 3D Solid Texture dialogue box, then click **Palette**. The edited colour appears in the **Incoming Colour** box. You can now add this colour to the palette. The **Set Foreground** and **Set Background** buttons allow you to transfer the edited colour to the foreground or background entry.

Editing the Pattern

There are a number of parameters that let you define the appearance of the 3D texture type you selected (wood, marble, or cloud).

- **Spacing** controls the distance between layers (in Marble) and cylinders (in Wood). It is not used with the Cloud type. Values range from 0 to 10.
- **Angle** blends the pattern at one end so layers (in Marble) and cylinders (in Wood) are not parallel. It is not used with the Cloud type. Values range from 0 to 45.
- **Strength** deforms the basic pattern by blending, stretching, and squeezing it in all directions. Values range from 0 to 20. It is not used with the Cloud type.
- **Iteration** controls the amount of pattern detail. The greater the value, the more detailed the pattern (and the longer it takes to render). Values range from 1 to 8. It is not used with the Wood type.
- **Power** is used only when the **Iteration** number is fairly high. It deforms the basic pattern in a way similar to **Strength**, but is applied on a larger scale. Values normally range from -2 to 20.

 Patterns created using the parameters described above can be further altered by setting values for the **Scaling**, **Rotation**, and **Translation** parameters (see page 126).

Example of Editing the Texture

The basic patterns created by the marble, wood, and cloud types can be manipulated using sliders that control the following parameters.

The following example, describes various ways to change the colours and parameters of a 3D texture:

1. Select an object.
2. Choose the **Texture → 3D Global** command. In the 3D Solid Texture (global) dialogue box is displayed.

Note

Objects require a material definition before you can add a 3D texture. If the object has no material assigned to it, SOFTIMAGE 3D gives it a default material setting when you choose this command.

3. Select Marble as the **Texture Type**.
4. Change the colours in the texture **Colour Map** by selecting one of its squares and then doing any one of the following:
 - Click in the RGBA sliders and drag the pointers back and forth to manipulate the colours.
 - Input exact colour values between 0 and 1 directly into the RGBA text boxes.
 - Click the **Palette** button and modify your colours using the Colour Wheel, the Colour Spread, or the Colour Sliders in the Palette dialogue box.
5. Select each of the associated Colour Map squares in turn and manipulate their colours. You will notice on the sphere in the display box that each associated square represents a different area within the texture.
6. Change the **Spacing** to 5 and the **Angle** to 40.
7. Click **Preview** to view the results.
8. Click **Ok** to assign the 3D texture to your object.

Blending the Texture with the Material

The **Overall Blending** and **Blending** options in the 3D Solid Texture dialogue box let you control how the 3D texture and the current material on the object's areas of illumination are blended together.

Results are displayed in the display box when the Sphere view is selected.

The **Blending** options let you choose exactly what values you want blended with the material. After you select an option, you can set the **Overall Blending**, or choose to blend on a certain illumination area of the material's definition (ambient, diffuse, or specular areas).

- **Without Mask** uniformly blends the texture with the object's current material. The ratio of texture to material visibility is controlled using the **Overall Blending** slider.
- **Alpha Channel Mask** uses the alpha channel (transparency) of the colour map as a blending factor. The texture is blended with the object's current material according to the different alpha channel values of the colour map. Where the alpha channel value is high (white), the colour of the texture is visible; where the alpha channel value is low (black), the object's current material is visible.
- **RGB Intensity Mask** uses the RGB colour intensity of the colour map as a blending factor. The texture is blended with the object's current material according to the different RGB intensity values of the colour map. Where the RGB intensity is high (white), the colour of the texture is visible; on low intensity pixels (black), the object's current material is visible.

Blending with Areas on the Material

Using the **Overall Blending** slider, you can control the amount of overall blending between the texture and the object's current material. Values range from 0 to 1; if the value is set to 0, only the material is visible; if the value is set to 1, only the texture is visible.

You can also control the blending with certain areas of the material's definition:

- If you choose the **Ambient** slider, you can control the intensity of the texture on the object's ambient area of illumination. Values range from above 0 to 1. If the value is set to 0, the texture is replaced by the object's material (global or current local).

- If you choose the **Diffuse** slider, you can control the intensity of the texture on the object's diffuse area of illumination. Values range from above 0 to 1. If the value is set to 0, the texture is replaced by the object's material (global or current local).
- If you choose the **Specular** slider, you can control the intensity of the texture on the object's specular area of illumination. Values range from above 0 to 1; the value may be set higher to compensate for reflectivity or transparency. If the value is set at 0, the texture is replaced by the object's material (global or current local).

Transforming the Texture

You can scale, rotate, or translate a 3D texture on an object to create the effect that you want. Use these three parameters in the 3D Solid Texture dialogue box to transform the texture. You can see the results in the display box.

Scaling controls the size of the 3D texture in proportion to the size of the selected object. Values range from negative infinity to positive infinity in X, Y, and Z.

Rotation controls the orientation of the 3D texture in relation to the selected object. Values range from 0 to 360 in X, Y, and Z.

Translation controls the location of the 3D texture in relation to the selected object. Values range from negative infinity to positive infinity in X, Y, and Z.

Transformation			
	Scaling	Rotation	Translation
X	1.00000	0.00000	0.00000
Y	1.00000	0.00000	0.00000
Z	1.00000	0.00000	0.00000

Copying Textures

The **Txt_Oper** → **Copy All** and **Copy Selection** commands in the Matter module allow you to copy all or selected the textures from a specified object or polygon to another object or polygon.

These commands allow you to copy the same texture to more than one object without having to reset the parameters. This is advantageous if you want to select a particular texture and modify some of its attributes, then copy it to more than one object. It saves you from having to select the texture and set the parameters each time you want to apply it to another object. For example, if you have four objects and only one of the object's has a texture applied to it, if you want the same texture applied to all of the other objects, you can use the **Txt_Oper** → **Copy All** option.

 When you duplicate an object, its texture is copied with it.

For more information on applying textures to polygons, see *Assigning Textures to Polygons* on page 129.

1. Select the destination object or objects (**Multi** menu cell) or polygon (using the **Polygon** menu cell) for the texture.
2. Choose the **Txt_Oper** → **Copy All** or **Copy Selection** command in the Matter module.
3. Select the source object (or polygon) from which the textures are to be copied. Both the destination and source objects (or polygons) flash to confirm the operation.

The 3D Solid Texture dialogue box for each texture is displayed sequentially. If you want to copy the texture, click Ok. If you do not want to copy that texture, click Exit.

 You can edit the parameters in the dialogue box before clicking Ok.

Associating and Disassociating Textures

The **Txt_Oper** → **Associate 3D/Disassociate 3D** commands in the Matter module allow you to either associate a texture to or disassociate a texture from the selected object using the Schematic window.

You can associate a 3D texture to more than one object. Sharing materials is especially useful because it allows you to quickly and easily edit a material that is used throughout your scene. When you associate a texture to an object, it becomes the current one.

For more information about working in the Schematic window, see *Schematic Window* on page 57 in the *Reference Guide*.

1. Open a Schematic window and select its Matter mode.
2. Select an object or local material.
3. Choose the **Txt_Oper** → **Associate 3D** or **Disassociate 3D** command.
4. Pick the 3D texture you want to associate or disassociate.

The texture is linked to or unlinked from the selected object or local material.

Assigning Textures to Polygons

You can assign textures to an entire object (globally). On a polygon mesh object, you can also assign textures locally to groups of surface polygons or globally to all the polygons of the polygon mesh. Since textures can be applied in both ways, each object has a global and local (where applicable) material “list”, each of which can have its own texture list.

All materials (the global material applied to the entire object as well as each local material) have their own 2D and 3D texture lists. Local textures are only applied to local materials, whereas global textures are blended with local textures. If there is a blend factor of 1 for the global texture, you won’t be able to see the local texture at all. However, if the blend factor is less than 1, you can see a blend of global and local textures.

Global and local textures can be viewed and easily manipulated in the Schematic window when the Matter mode is active. For more information on the Schematic window, see *Schematic Window* page 57 of the Reference Interface.

For more information on applying textures, see *Assigning Textures to Polygons* on page 86.

Using 3D Texture Shaders

A shader lets you create special effects during the rendering process when using the mental ray renderer. The main reason for using shaders is the complete flexibility and openness available to you to create and manipulate shaders to meet your specific needs.

If you are rendering with mental ray, you can select a 3D texture shader using the options in the mental ray area of the 3D Solid Texture dialogue box. When you select the **Shader** option, the browser is displayed in which you can choose and activate a texture shader for one or more selected objects.

For more information on using shaders, see *Using Shaders* on page 65 in the *Rendering User's Guide*.

The following example illustrates how to select a 3D Texture Shader:

1. Select an object.
2. Choose **Preview** → **Setup** and choose mental ray renderer as the previewing type.
3. Choose the **Texture** → **3D Global or Local** command. The 3D Solid Texture dialogue box is displayed.
4. Click the **Select** button beside the **3D Texture** text box.
5. Use the browser to go to the **3D Texture Shader** library and select either brick or noises. Click **Load** and the shader is applied to the object.

Note If you need to search for a shader, double click the .. (two dots) at the top of the browser and select the appropriate chapter.

6. To edit the shader's parameters, click **Edit**, which displays the dialogue box containing the shader's parameters.
7. Click the **Preview** button to see effect of shader.

Example

The following example incorporates a 3D texture shader onto your object by applying a wood shader. The wood shader is very similar to the Wood texture type, but the wood shader contains more parameters which can be manipulated for greater flexibility. The following example shows you how to create a plank of wood.

1. Choose **Get** → **Primitive** → **Cube**. Change the length to 4 and click **Ok**.
 2. Scale the object to these values: $x = 0.45$, $y = 0.14$, and $z = 2.75$.
 3. Choose the **Material** menu cell and apply a basic colour to your object.
 4. Select **Blinn** as the Shading Model and click **Ok**.
 5. Choose **Preview** → **Setup** and choose mental ray renderer as the previewing type.
 6. Choose **Texture** → **3D Global**.
 7. Select the **Shader** option in the mental ray area of the 3D Solid Texture (global) dialogue box. Use the browser to go to the `/Shader_Lib/Matter` directory. Select **3D_Wood** and then click **Load**.
 8. Click the **Edit** button to open the OZ-Wood dialogue box.
 9. Select the **Auto** option in the **Preview** area and click **Refresh** to open the Shaderball Preview.
 10. Reduce the **Grain Bias** value to 0.2 and increase the grain size. Select both the **Wobbly Structure** and **Turbulence** options. Manipulate the other variables until you achieve the desired results. Check the results of your modifications in the Shader Ball Preview.
-  Click the **About** button to get more information on the various parameters of the shader.
11. When you are satisfied with the results, click **Save**. In the Save Texture 3D_Shaders dialogue box, name your shader and click **Save**.
 12. Click **Ok** to exit the OZ_Wood dialogue box.
 13. Increase the **Specular** value to 1.0 so that the texture is visible in the specular area of illumination. This gives the plank a more realistic wood-like appearance.
 14. Click the **Preview** button in the 3D Solid Texture dialogue box to view the wood shader applied to your plank.
 15. Click **Ok** to accept the parameters of the 3D texture and exit the dialogue box.

Note

If the properties of the wood shader are not proportional to the size of the plank of wood; manipulate the overall **Scaling** values in the 3D Texture dialogue box on all three axes. Try starting with a value of about 2.0

Custom Shader Ball

The Custom Shader Ball allows mental ray previewing of the edited material/texture and associated shader.

To access the Custom Shader Ball, select a shader and click **Edit** in the mental ray area. The Custom Shader Ball is accessible from a Shader dialogue box that contains a **Preview** button.

Click Preview and a small dialogue box with the Custom Shader Ball appears with the texture or material shader that you have chosen. To enable automatic previews while modifying shader parameters, click **Auto**.

To remove the Custom Shader Ball, click Ok.

C H A P T E R S I X

Atmosphere

Introduction

The **Atmosphere** menu cell commands in the Matter module let you add atmospheric effects such as fog, illumination, and depth-fading to your scene.

Depth Fading allows you to realistically simulate depth-fading by creating a fog-like effect over the entire image.

You can also define atmospheric (volume) shaders when rendering with mental ray. Volume shaders using the Depth Fading command are the same as volume shaders you can access from the Material menu cell, except that these shaders are associated with the space between all objects in the scene.

Ambience controls the ambient illumination of all objects in a scene.

Similar to depth fading, **Layer Fog** allows you to apply a fog effect to any model containing visible triangles without affecting the background of a scene.

For more information on the Atmosphere commands, see the **Atmosphere** commands starting on page 99 of the *Reference Guide*.

Creating Depth-fading

The **Atmosphere → Depth-Fading** command allows you to realistically simulate depth-fading by creating a fog-like effect over the entire image. Depth-fading can also be animated.

Depth-fading is like a hollow sphere of fog centered around the camera. The distances measured are in units from the camera.

The **Start Distance** is the distance that defines the inner-most part of the hollow sphere where there is no fog. If the distance to an object is less than the **Start Distance**, then there is no fog between the camera and the object (the object is inside the hollow of the sphere).

The **End Distance** is the distance from the camera where opacity stops accumulating. Beyond the stop distance from the camera, the fog doesn't get any thicker.

Between the start and end distances of the fog, opacity is added linearly with distance. There is less fog closer to the start and more toward the end.

For example, let's say that the start distance is 50 units, the end distance is 100 units, and the maximum opacity of the fog is 100%. There are three objects in the scene: the first object is 25 units, the second is 75 units, and the third is 106 units from the camera.

Using these conditions, the amount of fog is as follows:

- First object – distance to object is less than the start distance and there is no fog.
- Second object –
 - k = distance into the fog (position of start distance) $75 - 50 = 25$ (fog bounds)
 - m = end distance (75) - start distance (25) = 50.
 - linear interpolation $k/m = 25/50 = 0.5$

This means that the object is 50% of the distance between the start and the end distance. Therefore, the opacity of the fog for the second object is 50% of the maximum.

- Third object – the distance to the object is greater than the end distance and there is 100% fog.

Example

The following example illustrates how to create depth-fading effects:

1. Show the camera in one of the parallel projection windows (**Camera → Show Camera**).
2. Choose the **Info → Distance** command to get the distance between the camera and the object or point at which you want fading to end.
3. Middle-click near the camera and then your object. To use the object's centre as a reference point, press the Shift key and then pick the object.
4. The points are highlighted and a yellow line is drawn between the camera and the object's centre. The distance (in SOFTIMAGE units) between the two is displayed in the status line at the bottom of the display. Take note of this number.

See page 905 in the *Reference Guide* for more information on using this command.

5. Choose the **Atmosphere → Depth-Fading** command.
6. The Depth-fading Setup dialogue box is displayed.
7. Select the **Depth fading** option to activate depth-fading.
8. Enter the **Starting** and **Ending Distances** from the values you figured out with the **Info → Distance** command.
9. Set the **Transparency** and factors for the fog. This controls the maximum transparency of the fog beyond the ending distance. The value ranges from 0 (opaque) to 1 (transparent).
10. Define the colour of the fog using the colour sliders or the colour **Palette**.
11. If you want to use a volume shader with the mental ray renderer, select the **Shader** option in the mental ray area to choose a shader from the database (see *Volume Shaders* on page 139).
12. To animate the values, click **Key** to set the parameters for a specific keyframe, move the time line pointer to another frame, change the parameters and click **Key** again. Continue this process to create as many keyframes as you like.
13. Click **Ok** to confirm the settings and exit the dialogue box.

Creating Murky Waters

The following example creates the effect of murky waters. When creating this effect, you first have to determine the appropriate distance for the fading effect.

1. Create a scene that has a floor (such as a sea bottom and an object such as a fish, starfish, or deep-sea squid).
2. Choose **Camera → Show Camera** to display the camera.
3. Choose **Info → Distance** and middle-click in the Top window, near the camera and then your object. The status line displays the distance between the two points. You should obtain a distance of approximately 50 units.

You want the depth-fading effect to start between the camera and the object, and to end between the object and the far edge of the bottom of the screen.

4. Choose **Atmosphere → Depth-Fading** in the Matter module to open the Depth-fading dialogue box. Activate the **Depth fading** option.
5. Set the Starting Distance and the Ending Distance using the values that you figured out with the **Info → Distance** command.
6. Change the RGB colour values to 0, 0.5, 0.4, and click Ok to confirm your settings.
7. Choose **Preview → All** to see the depth fading effect (middle-click to exit the **Preview** window).

To enhance the underwater effect, choose **Atmosphere → Ambience** and set the ambient light to a dark blue colour.

Volume Shaders

A shader lets you create special effects during the rendering process when using the mental ray renderer. The main reason for using shaders is the complete flexibility and openness available to you to create and manipulate shaders to meet your specific needs.

If you are rendering with mental ray, you can select a volume shader using the options in the mental ray area of the Depth-fading dialogue box. When you select the **Shader** option, the browser is displayed in which you can choose and activate a texture shader for one or more selected objects.

Atmosphere (volume) shaders are used to modify rays as they pass through an object. Volume shaders allow you to easily simulate effects such as cloud, smoke, and fire. The volume shaders you access from the Depth-fading dialogue box are the same as volume shaders you can access from the **Material** menu cell, except that the depth-fading volume shaders are associated with the space between all objects in the scene.

The following example illustrates how to apply the volume shader:

1. Choose **Get → Primitive → Cube** and accept the default settings. Get another cube by choosing **Duplicate → Immediate**.
2. With the second cube selected, translate it in the Top window by 0.5 units in positive x and 0.5 units in negative z. Then in the Front window, translate the same cube by 0.5 units in positive y.
3. Add a light to your scene by choosing **Light → Define**. Select Spot as the **Light Type**. Click Ok to exit the Create Light dialogue box.
4. Choose **Show → Cone** to make the cone of light visible.
5. Translate the spot light and its interest so that the cone falls directly across the object. Edit the cone angle if necessary by choosing **Light → Edit**.
6. Select the cube and choose the **Material** menu cell. In the Material Editor dialogue box, change the **Transparency** value to 1.0 to make the cube totally transparent.
7. Choose **Atmosphere → Depth Fading**.
8. In the mental ray area of the dialogue box, select the **Shader** option. In the browser, go to the Shader_Lib directory, select the March_Fractal shader, and click **Load**.

9. Click in the **Shader** text box and click **Edit**.
10. In the March_Fractal Shader dialogue box, select the **Shaderball** option.
11. In the Scattering area, click the **Select** button beside the **Lights** text box. Select the spot light and click **Ok**.
12. Change the colour of the **Ambience** and **Absorption** to light grey.
13. Select the **Volumic Density** option and enter a density value of 0.1.
14. Click the **Select** button next to the **Transformation Model** text box. Select the object you named “fogArea” and click **Ok**.
15. Select the **Proximity** option and change the **Fractal** size to 2.0.
16. Click **Ok** to exit the dialogue box.
17. Click **Ok** to accept the depth-fading parameters.
18. Choose **Preview** → **Setup** and choose mental ray renderer as the previewing type.
19. Choose **Preview** → **All** to view the final result.

Controlling the Global Ambience

Ambience simulates a certain amount of light not coming from any specific source. For example, if you are creating lighting in a room using a regular light source, you can't reproduce realistic, natural looking lights, such as light bouncing off tables, walls, etc. in the room. Ambience helps you to recreate that realistic looking light.

The **Atmosphere → Ambience** command lets you define global ambience for the objects in your scene. The ambient area of illumination on an object's material definition allows you to define colour values on the area that is shaded with ambient light, an indirect overall illumination. You can only set colours using this command when the material's definition is using the Lambert, Blinn, or Phong shading model, as defined in the Material Editor dialogue box (choose the **Material** menu cell).

Depending on the shading model used, different areas of illumination are visible on an object's surface. A Lambert-shaded surface has areas of ambient illumination, simulating an effect of overall "ambient" lighting most evident where direct light does not reach the object surface. A Phong or Blinn-shaded surface had ambient areas of illumination which simulate the effect of light rays bouncing from the object surface directly into the eye of the observer or camera, thus creating a specular highlight.

Even if the same tonal value is set for ambient and diffuse areas of illumination, the object still appears shaded with a darker ambient light. This is because when SOFTIMAGE 3D applies an ambience to all objects in a scene, a default shifts the ambience to a slightly lower value than that set in the dialogue box.

The **Atmosphere → Ambience** command controls the ambient illumination for all objects in a scene, working in conjunction with the objects' ambient areas of illumination, as just described.

To use the command:

1. Choose the **Atmosphere → Ambience** command in the Matter module. The Global Ambience dialogue box is displayed.
2. Define the ambient colour using the **Colour** sliders or the **Palette** (for more information on either of these, see *Defining Colours* on page 33).
3. Click Ok to confirm the setting or Cancel to exit.

Creating Fog

The **Atmosphere → Layer Fog** command allows you to apply a fog effect to all models containing visible triangles. Layer fog is very similar to the depth-fading effect, except that you can also set base and thickness values for the fog.

The layer fog is constrained between the top and bottom distances, which are values in the y-axis. Below the bottom and above the top, there is no fog. If a ray passes through the fog, it is interpolated linearly, as in depth-fading.

The fog effect is “distance-attenuated” so that objects near the starting distance are less affected by the layer fog effect than objects that are farther away. The fog’s attenuation changes according to its height, and all parameters can be animated.

The base of the fog sets the starting distance, in grid units, from the xz plane. For example, setting the base to 0 activates the effect directly on the xz plane. Setting the base at -2 activates the layer fog at two units *below* the xz plane.

In conjunction with the base, the thickness sets the distance from the base setting in the y-plane. Thickness is also measured in grid units. For example, setting the thickness at 6 deactivates the layer fog at six units from the specified Base setting.

The layer fog effect is also attenuated according to its height, appearing the most dense at the midway point between the base and thickness settings, and gradually weakening toward its edges.

Here are the basic steps to follow for creating a layer fog effect:

1. Show the camera in one of the parallel projection windows (**Camera → Show Camera**).
2. Choose the **Info → Distance** command to get the distance between the camera and the object or point at which you want fog to end.
3. Middle-click near the camera and then your object. To use the object’s centre as a reference point, press the Shift key and then pick the object.
4. The points are highlighted and a yellow line is drawn between the camera and the object’s centre. The distance (in SOFTIMAGE

units) between the two is displayed in the status line at the bottom of the display. Take note of this number.

See page 905 in the *Reference Guide* for more information on using this command.

5. Choose the **Atmosphere → Layer Fog** command. The Layer Fog dialogue box is displayed.
6. Click the **Layer Fog** option to activate it.
7. Enter the **Starting** and **Ending distance** settings in the appropriate text boxes using the values that you figured out with the **Info → Distance** command.
8. Enter the **Base** setting and then the **Thickness** setting in relation to the base.
9. Enter the **Density** setting for the fog with values ranging from 0 (transparent) to 1 (opaque).
10. Define the fog's colour using the colour sliders or the **Palette** (for more information on either of these, see *Defining Colours* on page 33).
11. To animate the values, click **Key** to set the fog for a specific keyframe, move the time line pointer to another frame, change the fog parameters and click **Key** again. Continue this process to create as many keyframes as you like. For more information on keyframing, see the *Animating User's Guide*.
12. Click **Ok** to confirm the settings and exit the dialogue box.

C H A P T E R S E V E N

Reducing the Number of Palette Colours

Reducing the Palette

You can create a new colour palette that is representative of the colours present in a scene. You can then generate a colour-indexed image that approximates the original image through the use of the colours contained in this colour palette.

This feature is particularly useful if you want to convert true colour images in a format (colour-index) that is supported on a personal computer or games console.

To reduce the palette, choose the **C_Reduction** menu cell in the Tools module. In the dialogue box that appears, you can load an image and from it, create:

- A corresponding colour palette from the image.
- A colour-indexed image or sequence which best approximates the original, but uses fewer colours from a colour palette.

Alternately, instead of creating a new colour palette, you can load an image, then load an existing palette, and use it to generate a colour-reduced image.

By editing the palette, you can alter the colours of the generated image. Change some of the generation parameters and repeat the process, generating new palettes and versions of the colour-reduced image until you are satisfied with the results.

You can also apply colour reduction to a sequence of images.

You can save palettes for reuse, as well as saving the colour-reduced images in various formats.

When generating a colour-indexed image, the system considers how many pixels in the original image use each RGB colour. When the number is relatively low, such a colour is grouped with others with similarly limited use. This allows these colours to be combined to make a single colour index in the generated palette, according to the generation method specified in the dialogue box.

If no entries are selected in the palette, all the entries are replaced (unless they are locked). Otherwise, the palette generation is done for the selected entries only.

For more information on the parameters in the dialogue box for colour reduction, see *C_Reduction* on page 230 in the *Reference Guide*.

Generating a Colour-reduced Image

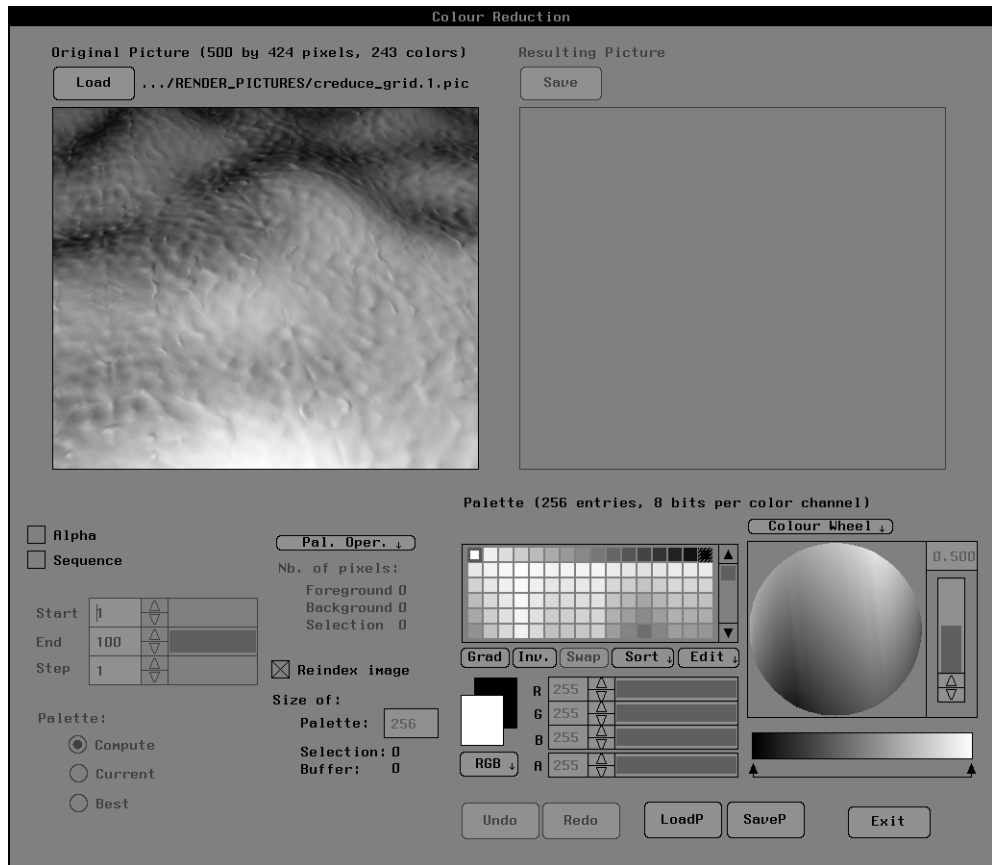
Reducing a Single Image

It is possible to reduce a single image or a sequence of images. When you reduce a single image, you load the image, and all the colours in the image are represented in the colour palette. You reduce the number of colours in the palette according to how large you want your palette to be. When you reduce a sequence of images, you load the number of images, indicate the start and end frames, and then reduce your palette the same way as reducing a single image.

1. Select an object.
2. Choose the **C_Reduction** menu cell in the Tools module.
3. Click **Load** in the Colour Reduction dialogue box that appears.
4. When you click on this button, a file browser appears. Choose the image file you wish to load.

The image is displayed in the display area below the **Load** button. Notice the number of colours in at the top of the Original Picture

Area. This indicates the number of colours that exists in image.



5. Select the **Generate** option from in the **Pal. Oper.** menu. The **Palette Parameters** dialogue box appears in which you can enter the number of colours and bits per colour channel, as well as the method: median, average, and pixel average.
6. Click either the **Apply Dithering** or **Apply Undithering** button to display the resulting colour-indexed image in the display area to the right of the original image.

When you select either option, a browser is displayed in which you enter the prefix for the resulting images, and select an output image type.

7. The corresponding colour palette is shown in the palette display.

At this point, you can do any of the following:

- Edit the generated palette as described in *Palette Operations* on page 1019 of the *Reference Guide*.
- View the results immediately by applying the modified palette to the generated image.
- Change the colour generation parameters and repeat the generation process.
- Save the generated colour palette with or without saving the generated image (see *Saving your Work* on page 151).

Experiment as much as you wish to get the look you want.

During the Reduction

- First, source files are checked for readability; if some are unreadable, you are asked whether you wish to continue.
- During the reduction, a message box shows the amount of work done. If output file names already exist, you may be asked whether you wish to overwrite them.
- At any point, you can press Esc to stop the operation. Since the key is only verified when going from one image to the next, you may have to keep it pressed for a few seconds.
- If no errors occur during the operation, a message advises you only of the number of messages reduced.
- If errors have occurred during the operation, a message box displays the following information at the end of the operation:
 - Number of images reduced
 - Number to do
 - Number skipped (unreadable)
 - Number of errors

Reducing a Sequence of Images

The reduction process for a sequence of images is basically the same as for a single image, except that you need to specify the start and end frames for the image sequence.

You can perform the second and third steps in either order:

1. Choose the **C_Reduction** menu cell in the Tools module.

2. Click the **Load** button.
3. A file browser appears in which you can select one frame from the sequence you wish to use. For example, if the sequence includes `robot.1.pic` to `robot.100.pic`, you may load any image between 1 and 100, such as `robot40.pic`.
4. Select the **Sequence** option.
5. Fill in the **Start** and **End Frame** values to correspond to the complete or partial image sequence you want to reduced. For example, you may wish to reduce frames 1 to 75.
6. Set the **Step** value to determine frames to be skipped. For example, if you specify a value of 3, every third frame is used in the process.

Follow the rest of the steps as for the single image process.

Saving your Work

You can either save the colour-reduced image or save only the palette.

- To save the colour-reduced image under a file name, click the **Save** located above the colour-indexed image and specify a name in the browser that appears.
- To save only the palette, click the **SaveP** button located below the colour-indexed image in the bottom right of the dialogue box. The usual file browser appears, allowing you to save a palette in both PAL and DGT formats.

Working with the Colour Palette

Loading an Existing Palette

If you wish to load an existing colour palette rather than generate one from scratch, click on the **LoadP** button. A file browser allow you to load a palette (.PAL) file or extract a palette file associated with an image; for example, select a Digitizer (.DGT) file and load the palette associated with it.

Editing

When you modify individual palette entries, the only pixels in the colour-indexed image which change colour are those which reference these modified entries. For example, if 1500 pixels reference a palette entry which was green and you change it to red, these 1500 pixels are now red. The result may be quite different if you apply the modified palette – see *Regenerating the Image* below.

For information on editing the Colour Palette, see *Palette Operation* on page 1019 of the *Reference Guide*.

Regenerating the Image

If you modify the palette and then select **Apply**, the colour-indexed image is completely regenerated. In this case, the system makes the best approximation of the original image based on the current palette as a whole. The number of pixels referring to a palette entry may change each time an Apply is performed, especially if some colours change in the palette. Using the green-to-red example, there may now be 6500 pixels which now reference that same red entry.

Note

If the palette entries are selected, by clicking **Apply** you can generate an image that approximates the original image by using only the selected palette entries. If no entries are selected, the whole palette is used.

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