MAYA FOR GAMES

A Taste of Maya

Alias | Wavefront provides a fully integrated solution to address your complete game production pipeline, and one that measures up to the demands of next generation game consoles. The video on the left shows how some of our customers have used Maya to hurdle into the realm of next-gen game development.

This tutorial will give you a taste of some of Maya's powerful games creation tools.

In this tutorial:

- Modeling with polygons... *page 2*
- Texturing polygons... *page 7*
- UVs and mapping textures... *page 10*
- Multitexturing... *page 14*
- Using the Texture View... *page 22*
- Light mapping for games... *page 26*



Before you start:

This tutorial requires Maya scene files. To download the tutorial files, please visit the Taste of Maya web site at www.aliaswavefront.com/tasteofmaya.

Starting Maya:

Double-click the **Maya 3.0 Evaluation** icon on the desktop, or from **Start > Programs > Maya 3.0 Evaluation > Maya**.

In Maya:

Once the tutorial files have been installed, you have to set the current project to access the Maya scene files. To set the current project from within Maya:

- Select **File > Project > Set** and navigate to the directory where you installed the Maya scene files.
- Select the **Maya_tutorial_data** directory and press **OK**.

MODELING WITH POLYGONS

The fastest and easiest way to create game characters and objects is to use polygonal primitives as a base, then change its mesh density, pull vertices, and extrude and collapse faces to complete the character.

Polygonal geometry for game creation

To maintain appropriate frame rates and real-time interaction when creating games, it's best to use polygonal geometry to build your models. Polygonal geometry is less data-intensive than NURBS geometry, which means it takes less time to evaluate a surface. The number of polygons, as well as texture sizes and the amount of scene-specific data, are also critical elements in determining the time required to process data, display information to the screen, and to react to your input.

Building a polygonal object

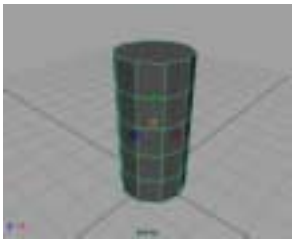
This lesson focusses on Maya's polygonal modeling techniques. A tower object is quickly and efficiently created from polygonal primitives. To deform its shape, it is transformed using both polygon-specific tools such as **Extract**, **Collapse**, and **Bend**, as well as Maya's generic tools **Move**, **Scale**, and **Duplicate**.



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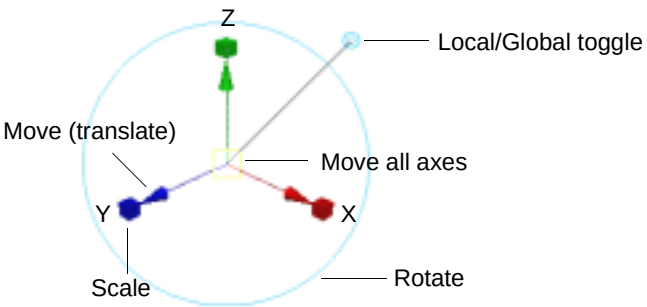
Create a shape for the tower's base

1. Select **Create > Polygon Primitives > Cylinder** ❐ to open the options window and set the following:
   - **Subdivision Around Axis** to **10**
   - **Subdivision along Height** to **5**
   - **Subdivision on Caps** to **0**
2. Rename the cylinder **Tower** in the Channel Box.
3. Press **6** to view the Tower in shaded mode.
4. Scale the cylinder to resemble the following image. This forms the base shape of a tower.



Create the tower roof

1. **RMB-click** on the selected cylinder and choose **Select by component type > Faces** from the marking menu.
2. Select the top face (*cap*) of the cylinder and choose **Polygons > Extrude Face**.
3. An extrude manipulator displays which you can use to interactively extrude the faces.



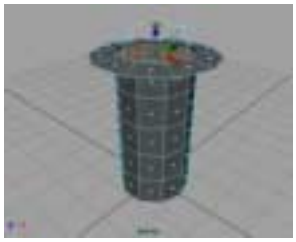
The manipulator handles correspond to the X, Y, and Z directions indicated at the bottom-left of the view. Like the standard transform manipulator, you can move, scale, and rotate with it. You can also change its pivot. Unlike the standard transform manipulator, you can also switch between global and local modes.

When you select a translate manipulator handle (the arrows), it highlights in yellow. The same thing happens when you select a scale manipulator handle (the boxes). The square in the center of the manipulator lets you transform the components in all directions at once. If you are in a snap mode, this square becomes a circle. Like the standard Maya transform manipulator, you can also change the pivot of the Move Component manipulator.

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4 Move the selection slightly downward to create the base position of the tower's roof.

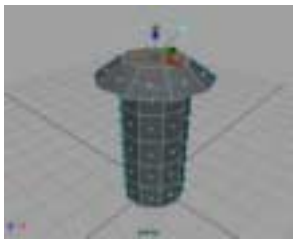
5 Scale out the face on all three axes to create the overhang.



Collapse a face to create a point

1 Press **g** to repeat the last command (**Extrude**).

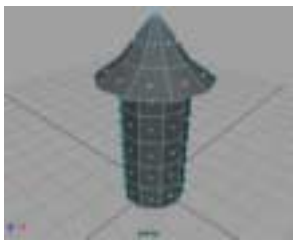
2 Move the face up and scale it to almost half its original size.



3 Press **g** again to repeat the last command, and move the face up to create one more segment to the tower.

4 With the top face selected, choose **Edit Polygons > Collapse**. This creates the peak of the roof by collapsing the face into a single vertex. If the roof looks a little crooked, move the vertex to the center.

The tower should resemble the following (your tower may not look exactly like the one in the image).



Refine the tower's shape (optional)

The following steps are optional.

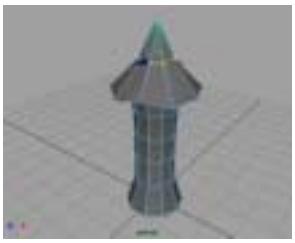
1 **RMB** on the tower and select **Vertex** from the marking menu.

2 Select a single row of vertices in the middle of the tower and scale the row in a bit.

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3 Select another row and repeat. Do the same for the middle row on the roof.

4 Continue editing the tower's shape using the **Scale** and **Move** tools on complete rows of vertices.



5 Delete the unnecessary bottom face (*cap*) of the tower since this portion will not be seen.

Tip

When working with Polygons, deleting unnecessary faces can decrease the polygon count.

Soften the tower's edges

1 **RMB** on the tower and select **Edge** from the marking menu.

2 **Marquee-select** (drag a box) around all the edges of the tower.

3 Once all the edges are selected, choose **Edit Polygons > Normals > Soften/Harden** ❐.

4 Select **All Soft**, then click **Soft/Hard** at the bottom of the options window.



Tip

By softening the edges, the shading algorithm interprets the shading along adjacent edges as smooth by averaging between face normals when calculating shading representations. The polygonal object comprised of separate flat faces and sharing common edges appears smoother along its surface than it is.

Duplicate the tower

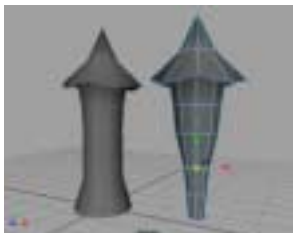
1 Make sure you are in object selection mode , select the tower, and choose **Edit > Duplicate** ❐.

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2 Press the **Reset** button at the bottom of the options window to ensure you are working with the default settings, then press **Duplicate**.

3 Move the duplicate over to the side of the original tower so you can work on it separately.

4 Taper the base of the duplicate by scaling the bottom rows of vertices.



Apply a bend deformer to the tower

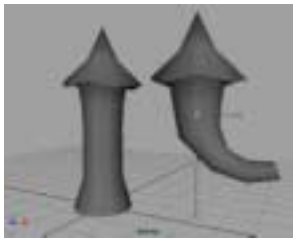
1 Select the duplicate and choose **Deform > Create NonLinear > Bend** to apply a non-linear bend.

2 In the Channel Box, select **bend1** from the **Inputs** section.

3 Press **t** (*Show Manipulator Tool*) to display the manipulator for the bend deformer.

4 Grab the central ball and pull it out to bend the duplicate.

5 To prevent undesired bending from occurring on the top portion, select the top ball on the manipulator (controls the High Bound), and pull it down.



Tip

You can also edit the appropriate fields in the Channel Box.

Group the object and the deformer

To maintain control over the object and the deformer affecting it, you group them together.

1 Open the Hypergraph (**Window > Hypergraph**).

2 In the Hypergraph, select **Tower1** and **bend1Handle**.

3 Select **Edit > Group**.

4 Rename the new group node **TowerArm**.

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5 Select the top node, TowerArm, and choose **Modify > Center Pivot** to place this group node's pivot at the center of the object.

6 Select **Edit > Duplicate** to create a second arm named **TowerArm1**.

Transform the group

You can now Move, Rotate, and Scale at the group node level and the child nodes (Towers and bend1Handles) are affected at the same time.

Translate (move) both arm pieces separately at the group node level (**TowerArm** and **TowerArm1**) to place them in positions that resemble the following:



Modeling methods

The following methods are quite common when modeling with polygons:

- **Cube-up**: Starting with a primitive shape as a base and then building up from it.
- **Face by face**: Creating each face of the model.
- **NURBS to Polygons**: Creating NURBS surfaces and converting them to polygonal surfaces.

Tip

Re-use your character models to save time. Simply edit them to make them unique and save them under a different name.

TEXTURING POLYGONS

These lessons concentrate on using some of Maya's texturing tools to create the best possible texture placement on a deformed polygonal object. This lesson:

- covers some of Maya's basic polygonal texturing techniques.
- goes into more detail and covers some of the more advanced texturing techniques.

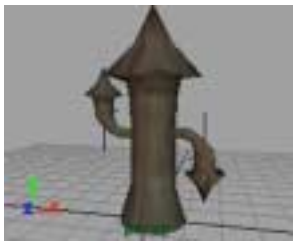
This lesson covers Texture Assignment, Unitizing UVs, Copying / Pasting, and Painting Vertex Colors.

UV information is essential for texture assignment on any polygonal object. Since the tower was created as a Polygon Primitive (Cylinder), it already has appropriate UV information for a cylindrical surface.

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Assign a texture

1. Select **File > Open** and choose **tower1.mb**.
2. Select **File > Import** to import the file Shaders off the CD. This **Shaders** file contains shaders with textures intended for use with this lesson.
3. In the perspective view, press **6** to view the tower in shaded mode.
4. **MMB-drag-drop** the **Rock** material from Hypershade onto each surface of the Tower, Tower Arm, and TowerArm1.



Unitize UVs

The texture placed on these surfaces does not resemble rocks yet.The texture is wrapping once around each surface as a result of the Cylinder's UV information.

The TowerArms adopted the Tower's UV information at duplication time. The texture itself however, was designed to appear on a smaller scale and repeat many times over each surface.

1. To place the texture on each face instead of across the surface as a whole, make sure faces are selected from the component pick mask and draw a bounding box around all objects—Tower, TowerArm, and TowerArm1.
2. With all the face centers displayed together, redraw a bounding box around the faces, then select **Edit Polygons > Texture > Unitize UVs**.

The texture is now applied to each face separately creating the intended effect.



Texture the roof

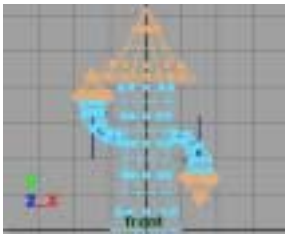
1. With faces selected from the component pick mask, select only the faces that make up the roof of the Tower, TowerArm, and TowerArm1. In the front view, marquee-select the desired faces and using the following hotkeys:

   Shift + Selection: Adds / Removes to / from current selection

   Ctrl + Selection: Removes only, does not Add to current selection

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Ctrl + Shift + Selection: Adds only, does not Remove from current selection



2 Once the faces are selected, open the Hypershade (**Window > Hypershade**) and **RMB** over the **Shingles** material and choose **Assign Material To Selection**.

Since these faces were already unitized in the previous step, the Shingles texture is mapped to each face and is producing the desired effect.

Place the Window texture on portions of the Tower body

1 With faces selected from the pick mask, select a few faces around the Tower body where you want to place windows.

2 In Hypershade, **RMB** over the **Window** material and choose **Assign Material To Selection**.

A single image of a window is applied to each of the selected faces.



Copy/Paste the Window texture

Textures can be copied and pasted to other surfaces and/or faces. The Window texture applied to the Tower body is copied and pasted to a few faces on the TowerArm that points upwards.

1 Select a face that has the Window texture applied to it.

2 Choose **Edit Polygons > Clipboard Actions > Copy**.

3 From the TowerArm that points upwards, select a few faces where you want to place windows, then select **Edit Polygons > Clipboard Actions > Paste**.

The window texture has now been pasted to these selected TowerArm faces.

Age the tower

Select the bottom row of faces on the Tower body.

RMB over the **Algae** material in Hypershade and choose **Assign Material To Selection**.

The Tower now seems to have algae forming at its base.

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Paint Vertex Colors on the Tower

Using the *Paint Vertex Color Tool*, it's possible for objects to inherit color information at the vertex level. This means a surface not only has assigned textures, it can also use color to affect the overall look of these textures. In this case, the desired effect is to simulate a toxic swamp that emanates a green glow onto its surface.

1. Select **Display > Custom Polygon Display ❐** and make sure **Objects Affected** is set to **All** and that **Color in Shaded Display** is checked **On**.

The model displays as black, which indicates that no color information is associated with those vertices.

2. In Select by Object Type mode, select the Tower and both TowerArms and choose **Edit Polygons > Color > Paint Vertex Color Tool ❐**.
3. In the Tool Settings window, adjust the **Radius(U)** and **Radius(L)** attributes to create an appropriate brush size.
4. Under the Color section, click on the color swatch and choose a bright green color from the Color Chooser.
5. Paint around the base of the Tower at the vertices defining the bottom portion to simulate a green glow emanating from below and falling on the surface.
6. Continue painting and incorporating different colors to add variation to the tower.

UVS AND MAPPING TEXTURES

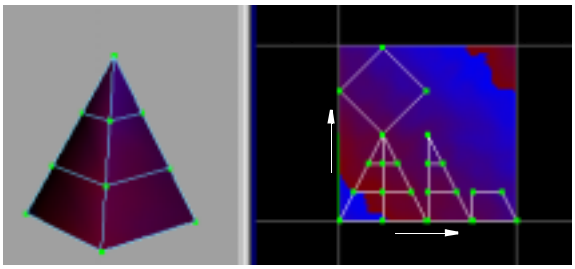
Textures are rectangular in shape. Placing a rectangular texture on a NURBS object is straightforward because NURBS objects are a collection of rectangular patches. Polygonal objects, however, can have an arbitrary topology that is non-rectangular. This poses the problem of how to place and fit a rectangular texture on a non-rectangular surface.

The answer is *two dimensional parametric mapping*. Polygonal objects must have a UV reference to correctly apply a texture. Similar to geographic references—such as a street address or a pair of latitude and longitude coordinates—UVs enable Maya to identify the appropriate location of the texture on the object. UVs must be present on an object to see the textures applied to it.

Using a variety of techniques, you can create UVs and map them to a rectangular area called the *texture space*. Each UV corresponds with a vertex on the object. By manipulating UVs in the UV texture space, you control how the texture is positioned on the surface.

A texture map is always defined by **U** for the horizontal component and **V** for the vertical component.

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Object with UVs.

UV map in Texture View.

By default, polygon primitives (Sphere, Cube, Cylinder, Cone, Plane, Torus) have UVs as do polygons created using **Polygons > NURBS to Polygons**. If the object is not a primitive, or if you import models or create polygonal objects that do not have UVs, you cannot view the textures you assign to them. You need to create UVs using one of Maya's mapping techniques—Planar, Cylindrical, and Spherical. For this lesson, you will use **Planar projection mapping**.

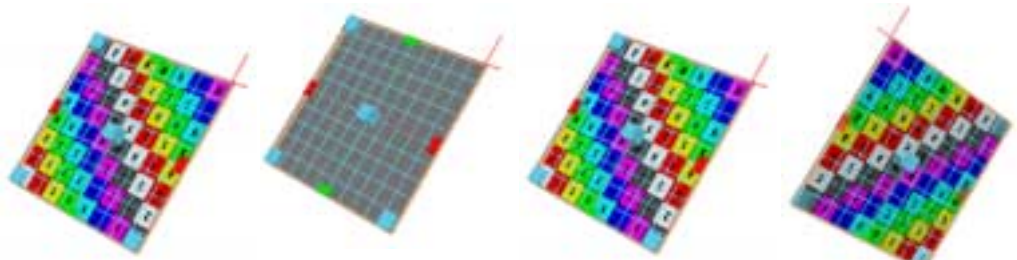
Planar mapping

Planar Mapping creates a texture map by projecting UVs at the vertices of an object onto a plane.

Project a planar texture map

The following example shows how to map a planar texture using **Smart Fit** and the **Fit to Best Plane** or **Fit to Bounding Box** options. You can also use manipulator handles to fit the texture to the object.

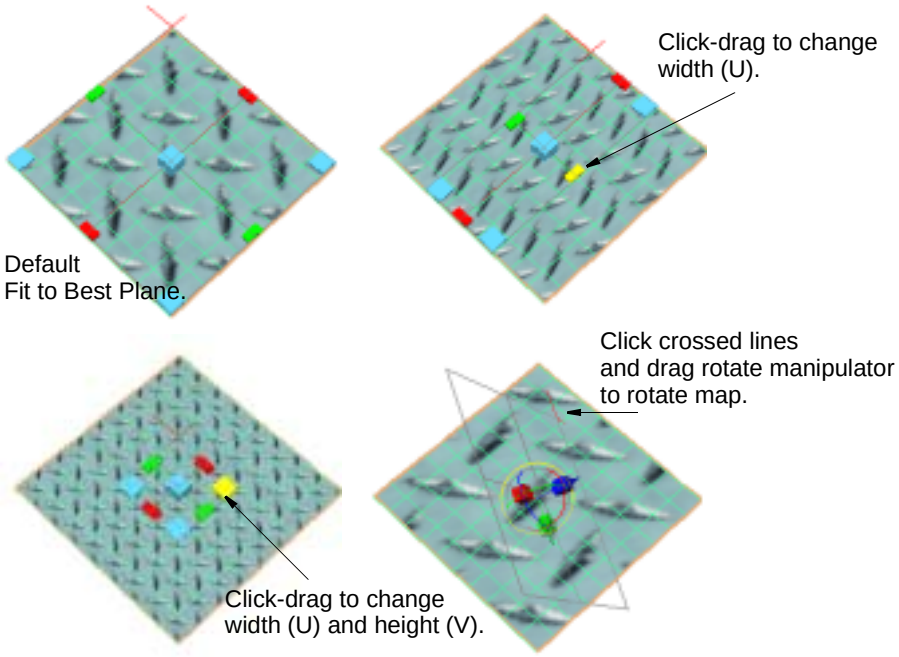
1. Select **Create > Polygonal Primitives > Plane** and click in a view.
2. Press **F11** or RMB-select **Face** from the marking menu, then marquee-select the entire plane to select the faces you want to map.
3. Select **Edit Polygons > Texture > Planar Mapping** ❐ to open the **Polygon Planar Projection Options** window.
4. Make sure **Smart Fit** is turned on. If it is not on, the **Fit to Best Plane** or **Fit to Bounding Box** options cannot be used.
5. Click **Fit to Best Plane** or **Fit to Bounding Box**.
6. Click the **Project** button. A manipulator displays and the texture is fit to the plane.



Wireframe Smooth shaded Front view. Back view.

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7 To adjust the texture, drag the manipulator handles to translate, scale, or rotate the texture map on the polygonal faces, or change the settings in the Attribute Editor or Channel Box and press Enter.



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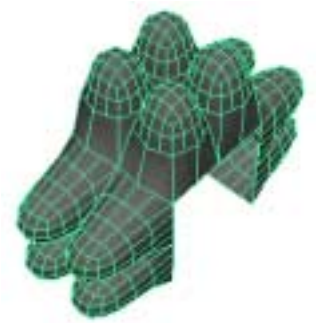
Assigning textures to polygonal objects

Once your object has UVs, you can assign a texture using Hypershade. See *Part 1 — Render Overview* and *Part 2 — Using Render View/IPR* to find out more about Hypershade and the finer details of assigning textures to objects.

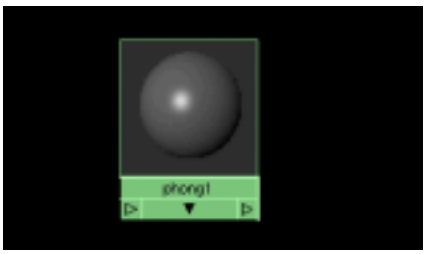
Assign a texture to a polygonal object

1. make sure the object has UVs.
2. To to see the texture on your object in the current view, select **Smooth Shade All** and **Hardware Texturing** from the view's **Shading** menu.

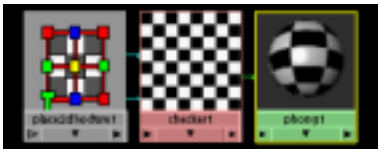
The object should now be in shaded mode.



3. Open Hypershade (**Window > Hypershade**).
4. Create a new surface material (for example, select **Create > Materials > Phong** to create a new Phong surface material).
5. Click in Hypershade to display the material icon.



6. In the **Visor** panel (at the left of Hypershade), open the **Create/Textures** folder.
7. MMB-drag-drop a texture (for example, the *Checker* texture) onto the material icon and click **Color** from the pop-up menu that displays. The material icon updates in Hypershade to display the texture.

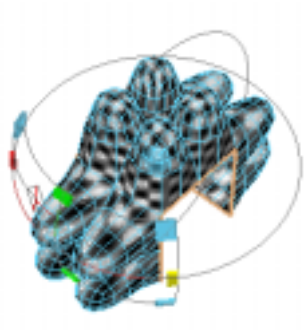


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8 To assign the texture to your object:

- Select the object in the current view.
- In Hypershade, RMB-click the material icon and select **Assign Material To Selection** from the pop-up menu.

The texture is mapped onto the polygonal object in the current view. You can now proceed to select the faces of the object and manipulate the existing UVs to fit the texture as you need to.



Spherical Mapping
chosen for all faces.

MULTITEXTURING

Multitexturing is the layering and blending of multiple textures on an object, potentially using a distinct UV set for each layer. Although it is not necessary that each texture contains its own set of UVs, it is often an important part of multitexturing.

Creating and editing UV sets

- You can create and edit multiple UV sets to work with multitextured objects which can be viewed in hardware shaded display mode as well as software rendered.
- You can create a new UV set when you map UVs, or you can create an empty UV set independent of a projection.

Creating a new UV set when you project a map

In the projection options window, turn on **Create New UV Set** and type a name for the set in the **UV Set Name** box.

Creating a new empty UV set

1 Select the object, then select **Edit Polygons > Texture > Create Empty UV Set** ❐.

2 In the **Create UV Set Name** box, type the name of the empty set and click **Create**.

Making a UV set current (select the set)

- RMB on the object and select **UV Sets > UVsetName**, where *UVsetName* is the name of the UV set you are selecting.

or

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- In the Texture View (**Window >Texture View**), select **Image > UV Sets > UVsetName**, where *UVsetName* is the name of the UV set you are selecting.

or

- Select the object, then select **Window > Relationship Editor > UV Linking > UV-Centric** and click on the UV set name.

or

1. Select the object, then select **Edit Polygons > Texture > Set Current UV Set** ❐.
2. In the **UV Set Name** box, type the name of the UV set you want to make current.

Rename a UV set

1. Select the set you want to rename.
2. Select **Edit Polygons > Texture > Rename Current UV Set** ❐.
3. In the **New UV Set Name** box, type the new name for the set and click **Rename Current** or **Apply**.

Copy values from one set to another existing set

1. Select the set you want to copy from.
2. Select **Edit Polygons > Texture > Copy Current UV Se**t ❐.
3. In the **UV Set Name to Copy to** box, type the name of the UV set to which you want to copy the UVs of the selected set.

Delete a UV set

1. Select the set you want to delete.
2. Select **Edit Polygons > Texture > Delete Current UV Set**.

Applying layered textures to UV sets

Use the **Layered Texture** node to manage multiple textures. You can MMB-drag-drop file textures onto this node, and RGB and alpha connections are automatically made. Or you can drag textures from Hypershade into the Layered Texture's Attribute Editor.

The following shows you how to create UV sets, layer textures, and how to manage the correspondence between texture layers and UV sets.

To create UV sets:.

1. In the top view, create a polygonal plane, scale it larger than the default, and select it.

.

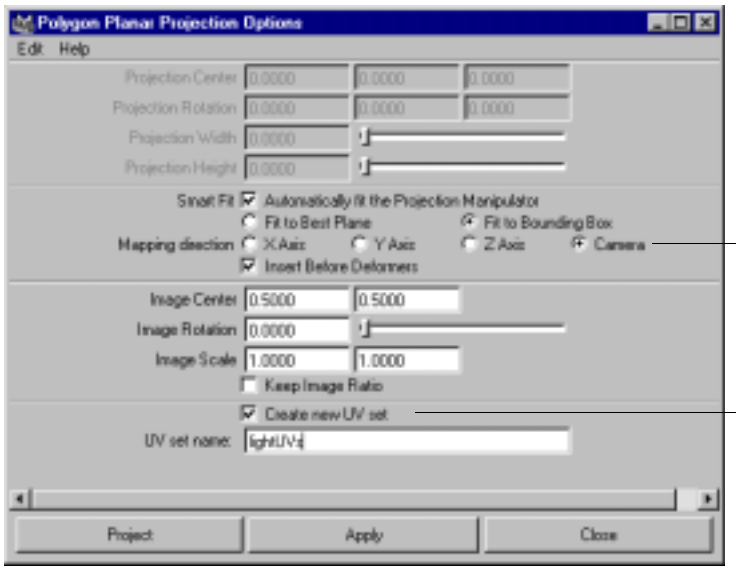
Tip

From the top view's menu, select **Shading > Smooth Shade All** and **Hardware Texturing** to see the results when you have completed the texture assignment.

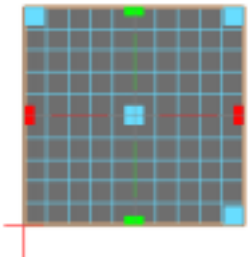
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2 Select **Edit Polygons > Texture > Planar Mapping** ❐ to open the Planar Projections Options window.

3 Set the **Mapping Direction** to **Camera**, turn on **Create New UV Set**, and type **lightUVs** as the set name, then click the **Project** button.

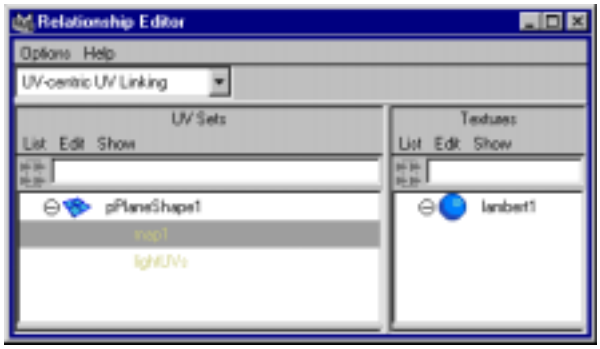


The plane should now display the projection map manipulators.



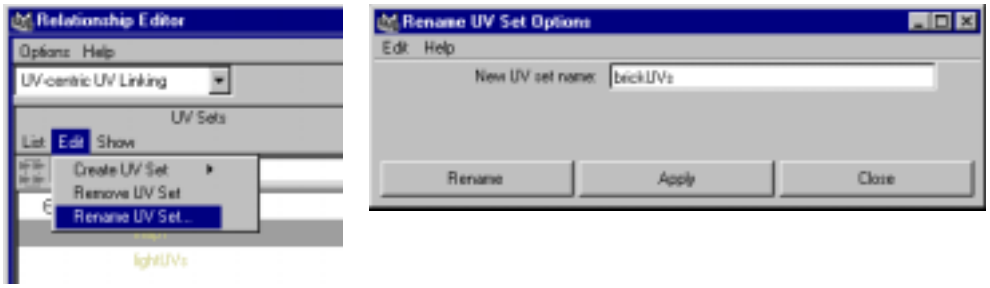
4 Select **Window > Relationship Editors > UV Linking > UV-Centric**.

5 Click **map1** to make it current.

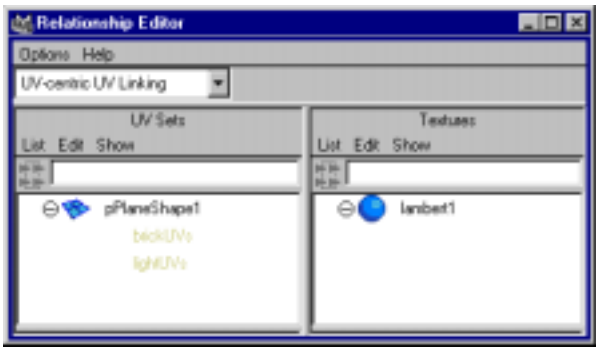


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6 Select **Edit > Rename UV Set** and type **brickUVs** in the **Rename UV Set** options window.



The Relationship Editor displays both UV sets.



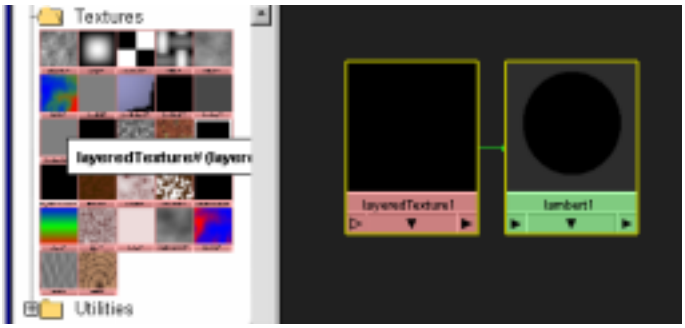
7 Make sure **brickUVs** is selected in the Relationship Editor.

8 Select half the faces on the plane, then select **Edit Polygons >Texture > Unitize UVs** to tile the UVs for the **brickUVs** UV set.

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Create texture layers

1 In Hypershade, MMB-drag the **Layered Texture** icon from the **Visor** panel onto the material icon in Hypershade and connect it to one of the material's attributes (such as Color. Select **Color** from the material swatch's pop-up menu).

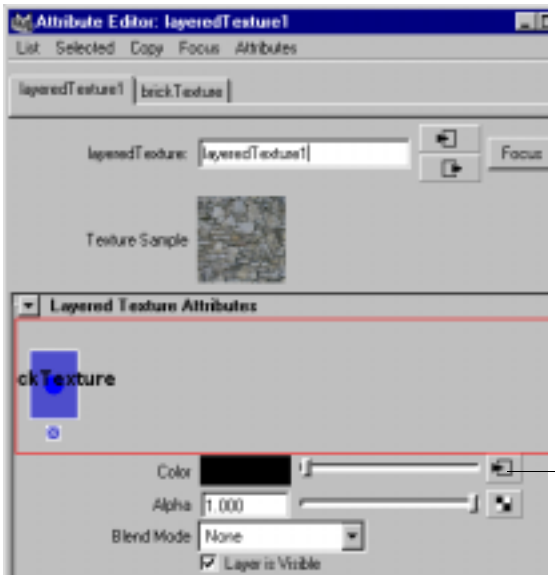


or

Select **Create > Textures > Other > Layered Texture**, click in Hypershade and MMB-drag the texture icon over the material icon to connect it to an attribute.

2 Double-click the Layered Texture icon in Hypershade to open its Attribute Editor.

3 In the Layered Texture's Attribute Editor, map the **Color** to a texture (for example, some kind of brick or stone texture, or use any of the textures Maya provides). Click the box beside **Color** to open the **Create Render Node** window, then select a texture. Name this texture **brickTexture**.





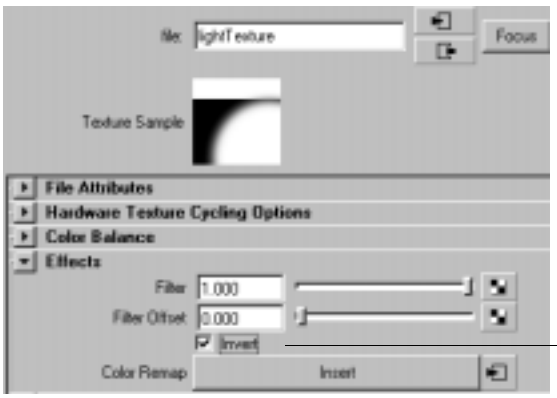
Result in the view panel.

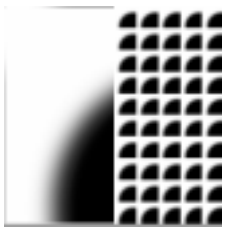
Click to map a 2D texture to the Color attribute.

4 Click in the top-most area of the Layered Texture Attributes section of the Attribute Editor to create a second layer and click the box next to **Color** to map it to another texture. Rename this texture **lightTexture**.

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5 In the lightTexture's Attribute Editor, open the **Effects** section and turn on **Invert** to invert the lightTexture.

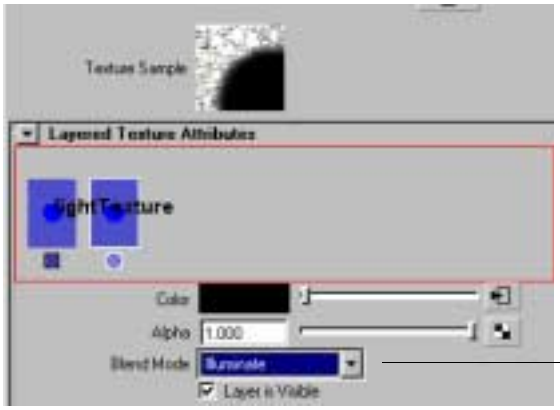




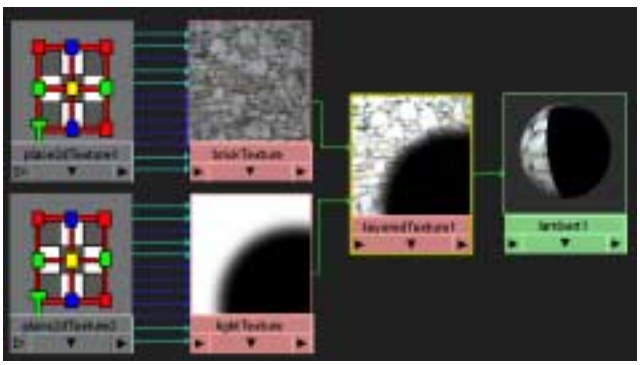
Result in the view panel.

Turn Invert on.

6 In the Layered Texture's Attribute Editor, click the lightTexture icon and set the **Blend Mode** to **Illuminate** (or **Subtract**).



Select the Illuminate or Subtract Blend Mode.



Hypershade view.

7 Click the **brickTexture** icon and make sure the **Blend Mode** is **None** (the default).

The order of layers within the Layered Texture Attribute Editor is important since you want the light file texture to blend on top of the brick texture. Make sure the brickTexture is first (the right-most texture).

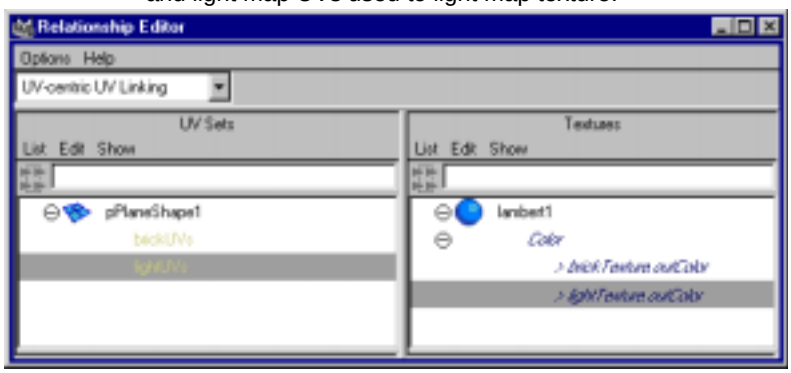
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Connect the UVs to the textures

1. Open the Relationship Editor in UV-Centric mode (**Window > Relationship Editors > UV Linking > UV - Centric**).
2. Select the plane to update the Relationship Editor.
3. Click the lightUVs UV Set in the left column, and click the texture items in the right column to compare results. See the following examples.

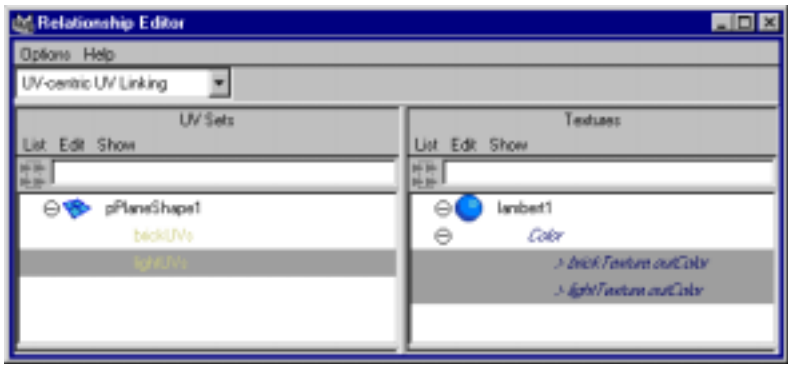
Example 1

Shows brick UVs used to map brick texture
and light map UVs used to light map texture.





Shows light map UVs used to map both textures.

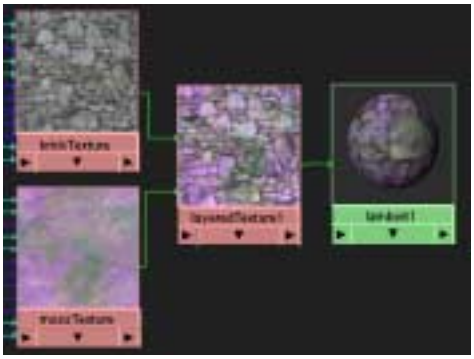




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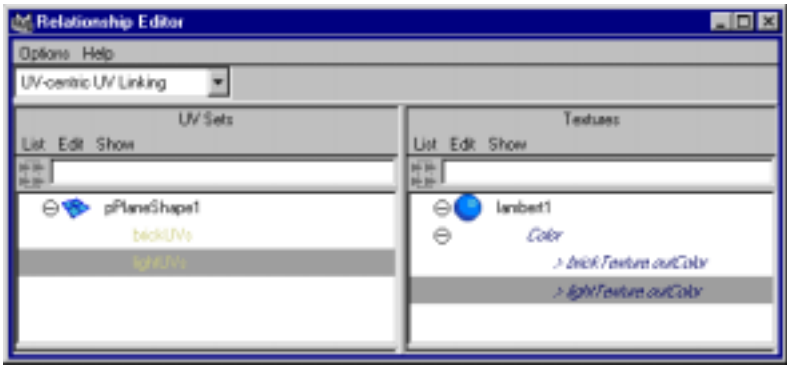
Example 2

These next few images show what happens when you change the overlaying texture by mapping another texture and selecting the lightUVs set in the Relationship Editor.

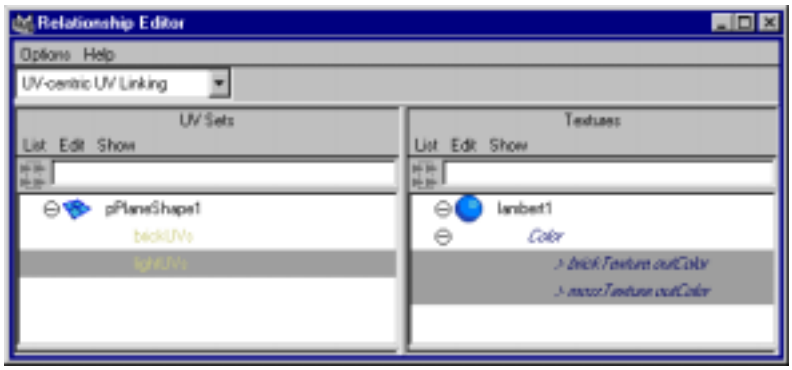


Double-click the texture swatch to open its Attribute Editor and select another file texture.

Rename the new file texture.









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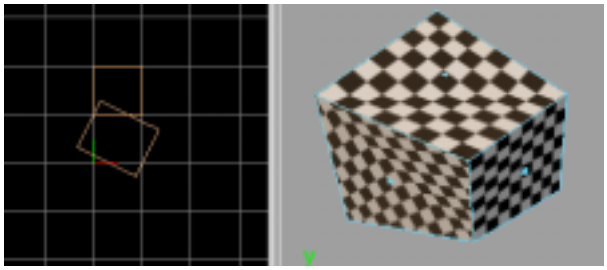
USING THE TEXTURE VIEW

This lesson provides information on how to use the Texture View to manipulate texture coordinates once you have mapped textures onto polygonal objects.

Loading selected faces

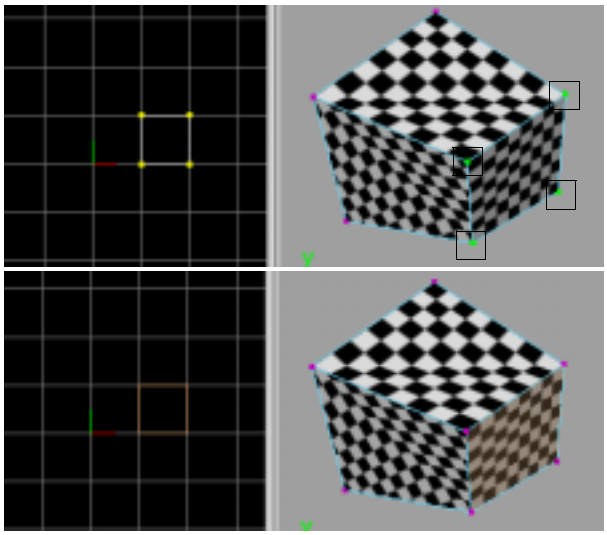
You can load selected faces into the Texture View whether they are texture-mapped or not. This includes faces determined by selected polygonal shapes, edges, and vertices. To do this, you simply select a face either by clicking on it in the view, or select UVs and use one of the View and Select menu items.

In this example, the faces of a cube are mapped with a checker texture. The faces are selected in the view.



UVs is chosen from the marking menu, and the UVs are selected in the view.

And from the Texture View, **View > View Contained Faces** and **Select > Select Contained Faces**.



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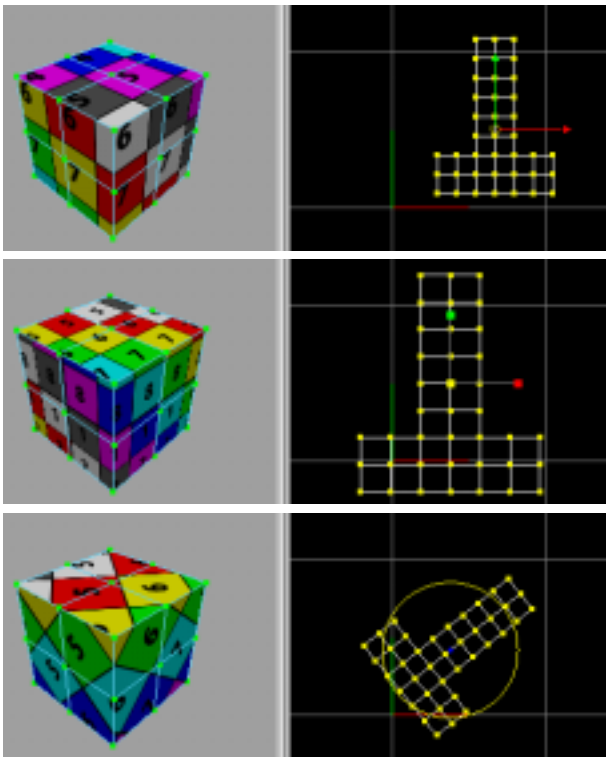
Transforming in the Texture View

You can use Maya's standard transformation tools (Move, Scale, and Rotate) in the Texture View.

Using transformation manipulators in the Texture View

The following examples show what the transformation tool manipulators look like in the Texture View.

Select UVs in the Texture View, then select the transformation tool you want to use and drag to transform the UV texture coordinates.





Move



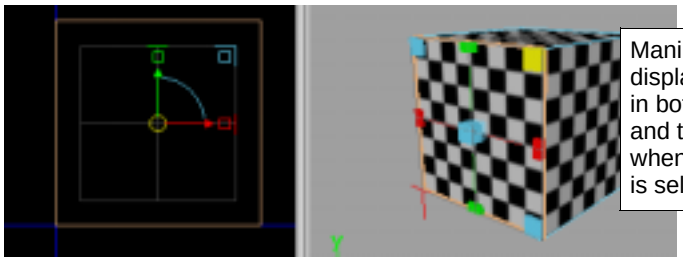
Scale



Rotate

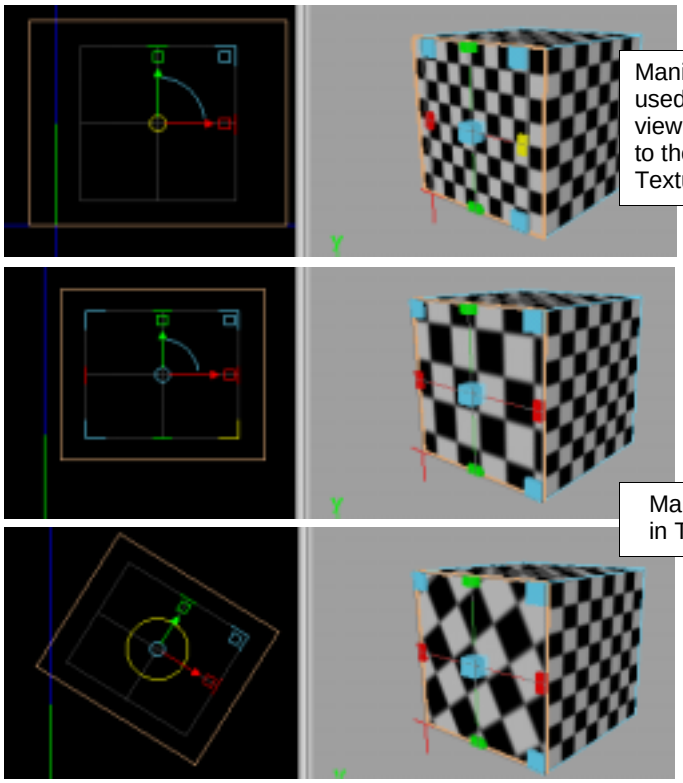
Using mapping manipulators in the Texture View

When you use one of the mapping techniques, the manipulators that display in the view also display in the Texture View. You can use these manipulators to transform mapped textures. See the following planar mapping examples.



Manipulator handles display on selected face in both the modeling view and the Texture View when the manipulator is selected.

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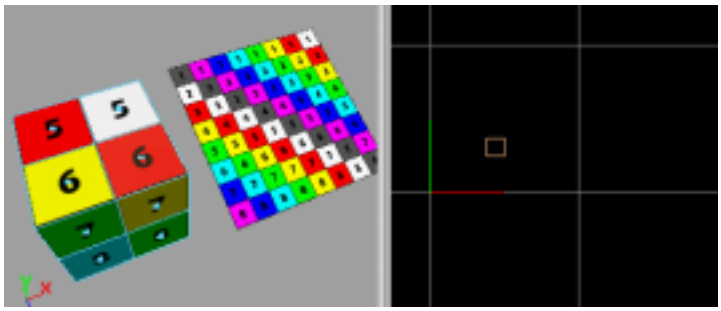
Copying and pasting UVs

Using the **Copy UVs** and **Paste UVs** options in the Texture View's **Edit** menu, you can select the UV coordinates for one or several faces and copy those to other faces on another object.

Copy and paste UV texture coordinates onto faces

The following shows a polygonal primitive cube and primitive plane mapped with a texture. A face from the cube is selected and copied to a face on the plane and then flipped to fit the face.

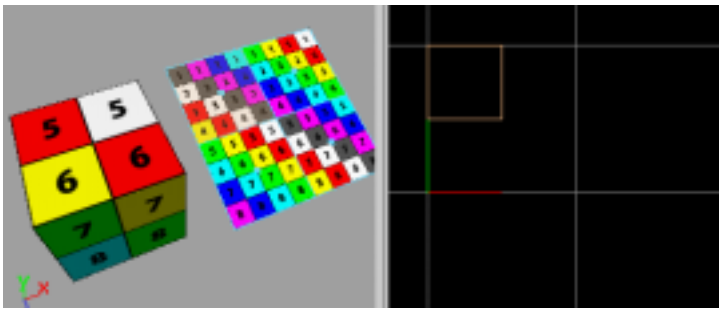
1 Select the face of the cube you want to copy to the face of the plane.



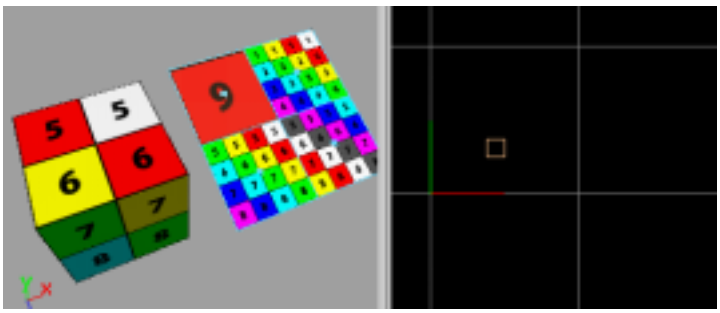
2 In the Texture View, select **Edit > Copy UVs**.

3 Select a face on the plane.

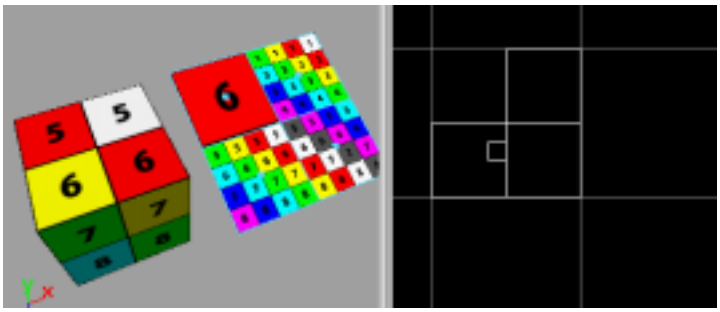
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4 In the Texture View, select **Edit > Paste UVs**.



Use the **Flip UVs** options to apply the texture correctly if necessary.



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LIGHT MAPPING FOR GAMES

In a games environment, light mapping can be used to calculate the applied lighting to any part of a scene and then convert this to a simple texture. This is much more efficient and creates a nice look for the scene.

Mech Mutiny is a game production developed by Alias|Wavefront to demonstrate our completely integrated games and interactive solution. The following uses a scene file from this production.

Setting up

1. Select **File > Open Scene > mineStart.ma**.
2. Change the layout to a Hypershade and perspective panel. Select **Panels > Saved Layouts > Persp/Hypershade**.
3. Press **6** to view the scene in shaded texture mode.
4. In Hypershade, **RMB** and select **Create > Materials > Lambert** from the pop-up menu, then click in Hypershade.

or

Drag-drop a **Lambert** shader from the **Create > Materials** folder of the Visor panel to the Hypershade panel.

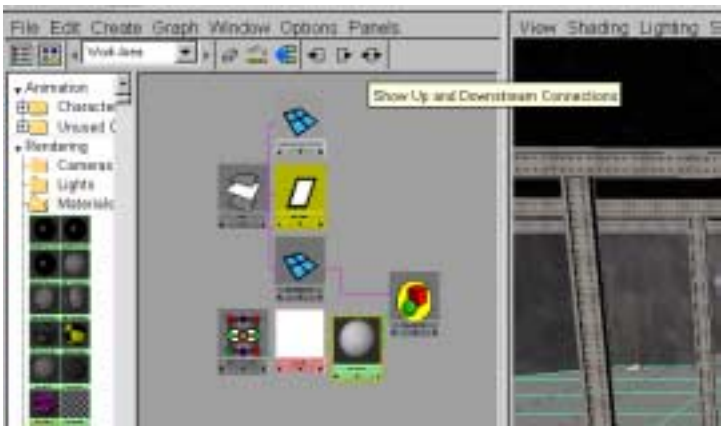
Map a Ramp texture to the Lambert material

You now need to create a simple texture on this new shader so you can remap it with light and shadow— light mapping will not work unless there is already a texture assigned to the shader.

A **Ramp** texture is mapped to the **Color** attribute of the Lambert material.

1. Select the new Lambert material icon in the Hypershade panel, and open the Attribute Editor (**Ctrl-a**).
2. Click the small checkered button to the right of the **Color** heading. The **Create Render Node** window displays.
3. Click the **Ramp** button to map a Ramp texture to the material's color.
4. Delete any two colors from the ramp by clicking the small box (with a cross inside) to the right of the ramp. Modify the remaining color to white.
5. To apply the new shader to the floor of the scene, **MMB-click** on the material (or texture) and drag it over the to the floor object in the perspective view.
6. Select the polygonal floor object and **Shift-select** the new Lambert material.
7. In Hypershade, click the **Show upstream and Downstream connection** icon at the top-right corner. This displays a view of all connected nodes related to these two items.

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Create a file texture based on light and shadow

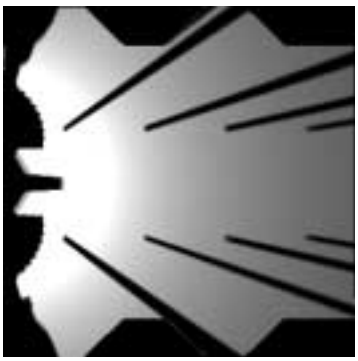
The following shows you how to create a file texture based on the light and shadows of the floor surface.

1. From **Hypershade**, select both the new **Lambert SG node** (the Shader Group) and the polygonal surface (**floor object**). The icons turn yellow, indicating they are selected.
2. In the Command Line, type the following MEL command then press Enter:

```
convertSolidTx -sh 1
```

ConvertSolidTx (or **Edit > Convert to File Texture**) converts the white Lambert texture with applied light and shadow on the floor area to a single image file. The **–sh 1** flag turns shadows on (the default is off).

After a few seconds a new image icon (which is 64 pixels square) displays in Hypershade and clearly defines the shadows and variation in lighting on the floor. The image itself is 256 pixels square.



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Tips

- If you need to vary the resolution of this new light map, search the **Help > MEL Command Reference** section and click on the letter **c** to locate the **convertSolidTx** command. All the options for this command are clearly outlined here.
- Although some basic convertSolidTx options are available in Hypershade 's Edit menu (**Edit > Convert File to Texture**), shadow or resolution options are not included. These options can be useful, however, when converting such items as procedural textures.

3 In the Visor panel, select **Render > Materials > roomFloor2** and **MMB-drag-drop** this floor shader into the Hypershade panel.

Connect the new light map

Now you have to connect the new light map to this shader to efficiently view the lighting in your scene.

1 Select the **roomFloor2** shader and the light map icons in the Hypershade panel, then click the **Show Upstream and Downstream Connections** icon again.

2 Select the green connection line between the file texture and the material—it should turn yellow to let you know it is active—and delete it using the **Delete** key.

Combine the light map using a layered texture

Adding a *layered texture* in Hypershade combines the light map with the main floor texture.

1 **RMB** and select **Create > Textures > Other > Layered Texture** and click in the Hypershade panel.

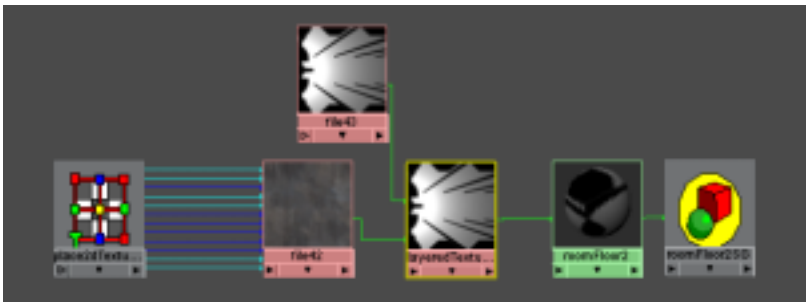
2 **MMB-drag-drop** the new image file onto the layered texture.

3 An option window displays to let you select where you want the image connected—choose **input color > input [0]**.

4 Repeat this for the original floor image file and connect it to **input color > input [1]**.

5 Connect the **outColor** of the layered texture to the **color** of the Lambert material using the same method (**MMB-drag-drop** the layered texture onto the Lambert material node in Hypershade).

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6 Assign this shader to the floor by dragging the material node over the polygonal floor surface in the perspective view. The display changes, but does not yet result in the desired effect.

Assign new UVs to the surface

At this point, you have a clean map of the new light-mapped texture. You now have to assign a clean new set of UVs to the surface.

1 Select the geometry (**floor object**).

2 Select **Edit Polygons > Texture > Planar Mapping** ❐.

3 Make sure **Fit to Best Plane** and **Create New UV Set** are both selected.

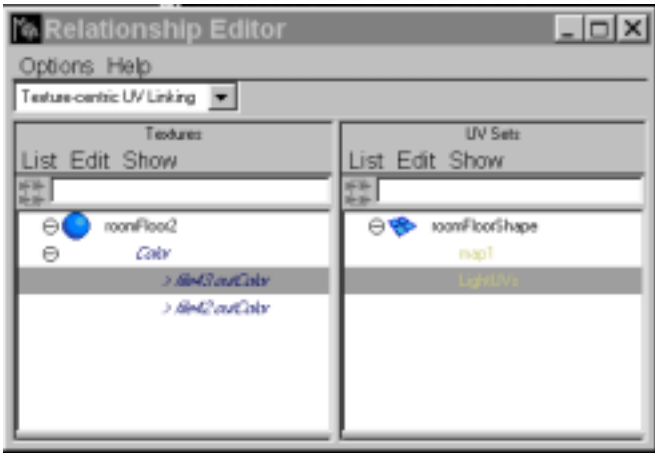
4 Type an appropriate name for the new UV set, such as **LightUVs**, then click **Project**.

Map the new shader

All that remains is to indicate how you want this new shader to be mapped.

1 Make sure you have the floor geometry selected and open the UV Linking window (**Windows > Relationship Editors > UV Linking > Texture Centric**).

Shader information is located in the left column, and polygonal surface UV information in the right column.



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Tip

If you look in the Hypershade panel, you can see the names of both the light map image and the original floor texture file. These correspond to those listed in the UV Linking window.

2 Click the light map image name, **file43outColor,** and then the new UV set, **LightUVs**. The shaded display in the perspective view now has clean shadows.

Change the Blend Mode

The last thing to do is reveal the original floor texture as well as the light map.

1 Select the new layered texture and open its Attribute Editor (**Ctrl-a**).

2 Notice that the **Blend Mode** attribute is set to **Over** by default.

3 Select the left-hand blue icon in the layered shader (which should be the light map file) and change the **Blend Mode** to **Add**.

The floor texture is combined with the light map as one texture. The perspective view now displays clean lighting and shadows on the original floor surface.

In the following, notice the difference between the scenes. The scene on the top only has the light map, while the scene on the bottom has the light map combined with the floor texture.





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Getting help

Maya provides several options when using the Blend Mode in the Layered Texture, such as Multiply, Subtract, Saturate. If you are familiar with compositing, you will recognize these layering options.

If you are unsure, refer to the help section (**Help > Library**). The quickest way to access the information you need is to:

- click the **Search** button
- type **layered** in the search box
- press **Enter**

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