

**3ds max<sup>®</sup> 7**  
**discreet<sup>®</sup>**

**new features**  
**guide**



12810-010000-5040A

October 2004

**Copyright © 2004 Autodesk, Inc. All rights reserved.**

This publication, or parts thereof, may not be reproduced in any form, by any method, for any purpose. AUTODESK, INC., MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING THESE MATERIALS, AND MAKES SUCH MATERIALS AVAILABLE SOLELY ON AN "AS-IS" BASIS. IN NO EVENT SHALL AUTODESK, INC., BE LIABLE TO ANYONE FOR SPECIAL, COLLATERAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF PURCHASE OR USE OF THESE MATERIALS. THE SOLE AND EXCLUSIVE LIABILITY TO AUTODESK, INC., REGARDLESS OF THE FORM OF ACTION, SHALL NOT EXCEED THE PURCHASE PRICE OF THE MATERIALS DESCRIBED HEREIN.

Autodesk, Inc., reserves the right to revise and improve its products as it sees fit. This publication describes the state of this product at the time of its publication, and may not reflect the product at all times in the future.

**Autodesk Trademarks**

The following are registered trademarks of Autodesk, Inc., in the USA and/or other countries: 3D Props, 3D Studio, 3D Studio MAX, 3D Studio VIZ, 3DSurfer, 3ds max, ActiveShapes, ActiveShapes (logo), Actrix, ADI, AEC Authority (logo), AEC-X, Animator Pro, Animator Studio, ATC, AUGI, AutoCAD, AutoCAD LT, AutoCAD Map, Autodesk, Autodesk Envision, Autodesk Inventor, Autodesk (logo), Autodesk Map, Autodesk MapGuide, Autodesk Streamline, Autodesk University (logo), Autodesk View, Autodesk WalkThrough, Autodesk World, AutoLISP, AutoSketch, backdraft, backdraft, Biped, bringing information down to earth, Buzzsaw, CAD Overlay, Character Studio, Cinepak, Cinepak (logo), cleaner, Codec Central, combustion, Design Your World, Design Your World (logo), EditDV, Education by Design, FLEXIm, gmax, Heidi, HOOPS, Hyperwire, i-drop, Inside Track, IntroDV, Kinetix, MaterialSpec, Mechanical Desktop, NAAUG, ObjectARX, ObjectARX, PeopleTracker, Physique, Planix, Powered with Autodesk Technology (logo), ProjectPoint, RadioRay, Reactor, Revit, Softdesk, Texture Universe, The AEC Authority, The Auto Architect, VISION\*, Visual, Visual Construction, Visual Drainage, Visual Hydro, Visual Landscape, Visual Roads, Visual Survey, Visual Toolbox, Visual Tugboat, Visual LISP, Volo, *WHIP!*, and *WHIP!* (logo).

The following are trademarks of Autodesk, Inc., in the USA and/or other countries: AutoCAD Learning Assistance, AutoCAD LT Learning Assistance, AutoCAD Simulator, AutoCAD SQL Extension, AutoCAD SQL Interface, AutoSnap, AutoTrack, Built with ObjectARX (logo), burn, Buzzsaw.com, CAiCE, Cinestream, Civil 3D, cleaner central, ClearScale, Colour Warper, Content Explorer, Dancing Baby (image), DesignCenter, Design Doctor, Designer's Toolkit, DesignProf, DesignServer, Design Web Format, DWF, DWFit, DWG Linking, DXF, Extending the Design Team, GDx Driver, gmax (logo), gmax ready (logo), Heads-up Design, jobnet, lustre, ObjectDBX, onscreen onair online, Plans & Specs, Plasma, PolarSnap, Productstream, Real-time Roto, Render Queue, Visual Bridge, Visual Syllabus, and Where Design Connects

**Autodesk Canada Inc. Trademarks**

The following are registered trademarks of Autodesk Canada Inc. in the USA and/or Canada, and/or other countries: discreet, fire, flame, flint, flint RT, frost, glass, inferno, MountStone, riot, river, smoke, sparks, stone, stream, vapour, wire. The following are trademarks of Autodesk Canada Inc., in the USA, Canada, and/or other countries: backburner, Multi-Master Editing. The following are trademarks of Autodesk Canada Inc., in the USA, Canada, and/or other countries: backburner, Multi-Master Editing.

**Third-Party Trademarks**

All other brand names, product names or trademarks belong to their respective holders.

© 2005 Microsoft Corporation. All rights reserved.

ACIS © 1989–2005, Spatial Corp.

AddFlow Copyright © 1997–2005 Lassalle Technologies.

Certain patents licensed from Viewpoint Corporation.

InstallShield™ Copyrighted © 2005 InstallShield Software Corporation. All rights reserved.

Licensing Technology Copyright © Macrovision Corp. 1996–2005.

Portions Copyrighted © 1989–2005 mental images GmbH & Co. KG Berlin, Germany.

Portions Copyrighted © 2000–2005 Telekinesys Research Limited.

Portions Copyrighted © 2005 Blur Studio, Inc.

Portions Copyrighted © 2005 Intel Corporation.

Portions developed by Digimation, Inc. for the exclusive use of Autodesk, Inc.

Portions developed by Lyric Media, Inc. for the exclusive use of Autodesk, Inc.

Portions of this software are based on the copyrighted work of the Independent JPEG Group.

JSR-184 Exporter Copyright (c) 2004 Digital Element, Inc.

QuickTime © 1992–2005, Apple Computer, Inc.

REALVIZ Copyright © 2005 REALVIZ S.A. All rights reserved.

This product includes Radiance software (<http://radsite.lbl.gov/radiance>) developed by the Lawrence Berkeley National Laboratory (<http://www.lbl.gov>). Copyright © 1990–2005 The Regents of the University of California, through Lawrence Berkeley National Laboratory. All rights reserved. Wise Installation System for Windows Installer © 2004 Wise Solutions, Inc. All rights reserved.

**GOVERNMENT USE**

Use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR 12.212 (Commercial Computer Software-Restricted Rights) and DFAR 227.7202 (Rights in Technical Data and Computer Software), as applicable.

<b>Introduction</b> .....	<b>v</b>
<hr/>	
<b>1 User Interface</b> .....	<b>1</b>
Main User Interface Changes .....	2
Toggle Dialog Visibility .....	6
Resizable Dialogs .....	8
Paint Selection Region Method .....	9
<hr/>	
<b>2 Scene Management</b> .....	<b>11</b>
Array Preview .....	12
Clone and Align .....	13
Quick Align .....	15
Object Display Culling .....	16
Snaps Toolbar .....	17
Walk Through Viewport Navigation .....	18
Flat Shaded View .....	20
Mobile 3D Graphics File Exporter .....	21
The JSR-184 Standalone Player Application .....	24
<hr/>	
<b>3 Modeling</b> .....	<b>25</b>
Editable Poly Enhancements .....	26
Mesh Painting .....	30
Edit Poly Modifier .....	33
Poly Select Modifier Enhancements .....	36
Skin Wrap Modifier .....	37
Skin Wrap Patch Modifier .....	39
Skin Morph Modifier .....	40
Accurate Bone Mirroring .....	45
TurboSmooth Modifier .....	46
Unwrap UVW Enhancements .....	47
VertexPaint Improvements .....	50
Assign Vertex Color .....	51
<hr/>	
<b>4 Materials</b> .....	<b>53</b>
Normal Maps .....	54
Camera Map Per Pixel .....	61

---

<b>5</b>	<b>Animation</b>	<b>65</b>
	character studio	.66
	Biped	.67
	Crowd	.68
	Physique	.68
	Custom Attributes	.69
	Parameter Editor	.69
	Parameter Collector	.72
	Reaction Manager	.76
	Expose TM Helper	.79

---

<b>6</b>	<b>Rendering</b>	<b>81</b>
	mental ray	.82
	User Interface Changes	.87
	mental ray Shaders	.90
	Render Shortcuts	.91
	Render To Texture	.92

The *3ds max 7 New Features Guide* is intended to guide current users of **3ds max**® through major new features added in this version of the software.

This guide attempts to explain concepts and features in a graphic and immediate way; it assumes a good, prior knowledge of the software.

Each feature is explained so that users can start using it as soon as possible. Some details and some minor features might not be present in this guide. After reading this guide, you will be able to explore the new features and start using them quickly.

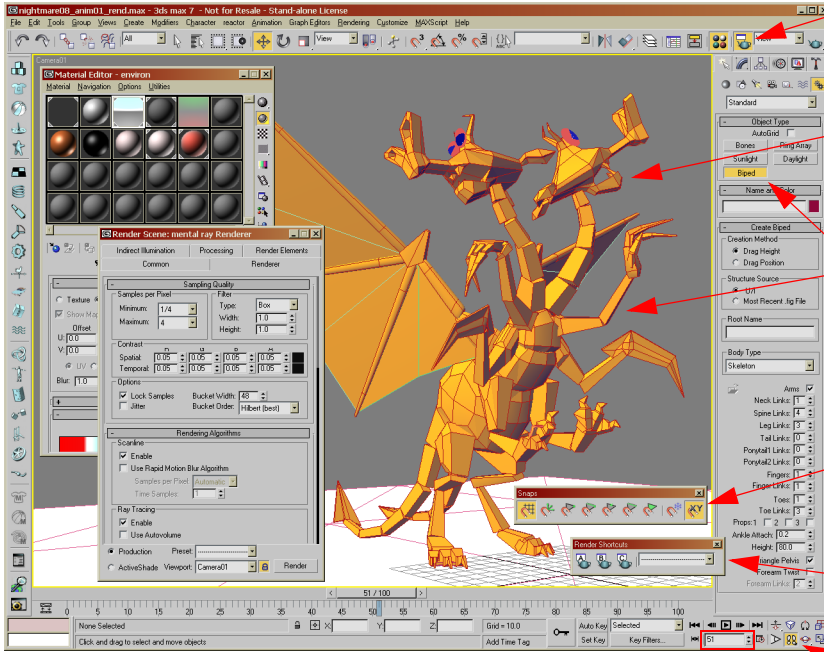
This guide is not a substitute for the online reference and the tutorials. The *3ds max 7 User Reference* documents all feature details; if you have no previous knowledge of the software, you'll want to start learning the program by following the tutorials.



*Main User Interface Changes* .....2  
*Toggle Dialog Visibility* .....6  
*Resizable Dialogs* .....8  
*Paint Selection Region Method* .....9

## Main User Interface Changes

This is a summary of the main user interface changes, as well as changes or improvements to commonly used tools.



Toolbar buttons that open dialogs now act as toggles to let you know whether dialogs are already open.

DirectX material support has been enhanced, and Standard materials can now be translated to DirectX shaders.

Many improvements for characters modeling and rigging: normal mapping, paint deformations for organic modeling, better custom attributes, expose transform helper object, and the entire character studio toolset is now included.

Enhancements to snaps include a new toolbar with the most common used settings.

A new toolbar lets you quickly save and recall up to three rendering presets.

In 3ds max 7, a new spinner has been added to advance through the frame numbers in your timeline.

The new Walk Through scene navigation mode let you explore a scene like a first person camera, as commonly used in video games.

## Performance

In this version of 3ds max, we have worked to improve the speed and performance of many of the tools. Features such as TurboSmooth, Object Display Culling, and Direct 3D Redraw help you get your job done faster. In the newly included character studio, solving crowd simulations has also been optimized and is now up to 10 times faster.

## Copying and Pasting Materials, Maps, Bitmaps, and Colors

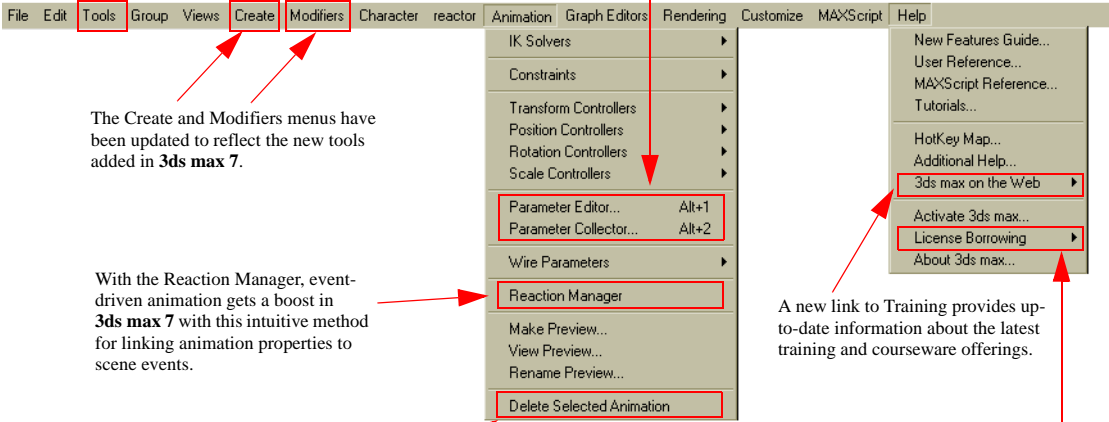
Extending the already intuitive drag-and-drop method for propagating materials, maps, and colors, you now have the ability to copy and paste to your heart's content. A set of right-click pop-up menus in the Material Editor (and elsewhere in the 3ds max user interface) let you copy, paste, and otherwise manage materials, maps, bitmaps, and colors.

## Menus

New features have been added to the Create, Modifiers, Animation and Help menus.

Two new tools are available: Quick Align and Clone And Align.

Parameter Collector lets you sort and present animatable parameters so that, with a click or two, you can create, access, and key specialized parameter sets.



The Create and Modifiers menus have been updated to reflect the new tools added in 3ds max 7.

With the Reaction Manager, event-driven animation gets a boost in 3ds max 7 with this intuitive method for linking animation properties to scene events.

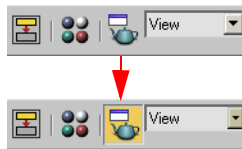
Deletes all animation keys for all selected objects, as well as any sub-object animation. Each object remains in its state at the frame in which you use this command

A new link to Training provides up-to-date information about the latest training and courseware offerings.

From within 3ds max, this new feature allows you to borrow a network license, or return a license you have already borrowed.

## Toggle Dialogs

You can now use shortcut keys to toggle the visibility of dialogs. When a menu is selected, the toolbar button is “sticky”; that is, it stays down and is highlighted.



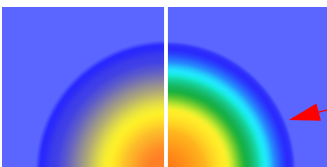
Menus will mimic this behavior with a small checkmark beside the entries that open dialogs.

See the Toggle Dialog Visibility topic for more information and a list of dialogs that are affected.

## Soft Selection Colors

3ds max 6

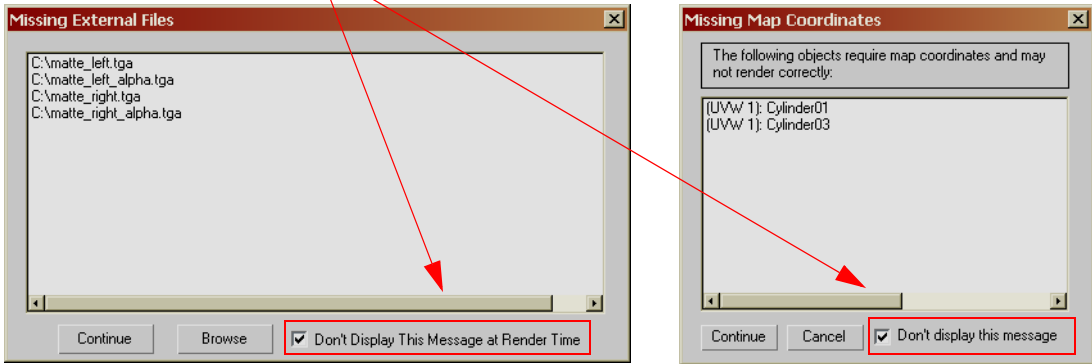
3ds max 7



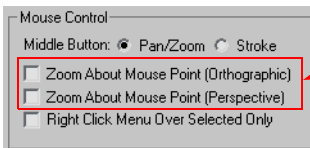
Soft selection colors have been changed to appear more vivid, with a denser rainbow of color.

## Render Missing Maps Dialog

You can now set the Missing External Files and Missing Maps Coordinates dialogs not to appear every time you render. This applies to the current session only: if you quit, reset, or load another file, the dialogs will return.

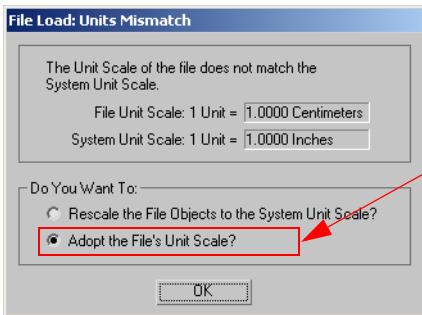


## Viewport Mouse Control Preferences



The Zoom About Mouse Point options are now off by default in Preferences > Viewports.

## File Loaded Units Mismatch



The default for this dialog is now to adopt the incoming file unit setup. This setting persists between the current and future 3ds max sessions until you reset your system unit.

## MPEG File Format Support

3ds max 7 now supports MPEG (Moving Picture Experts Group) format as an input file. MPEG files can be used anywhere bitmap formats are used, without exceptions. The important thing to know is that MPEG is supported as an input file format only. It's not available when saving a bitmap or a sequence.

## Command Line New Options

This is a summary of the new options added to command line rendering (*3dsmaxcmd.exe*).

### Basic Options

-workPath:<pathname>            Work path

### Render Parameters

-stillFrame *or* -sf            Indicates that this is a still frame render; no frame suffix will be added to output filename

-continueOnError            If an error is encountered, an attempt to continue is made

-videopostJob:<1/0>            Apply Video Post to the scene

### Render Flags

-renderElements:<1/0>            Toggle render elements

### Backburner Job Submission

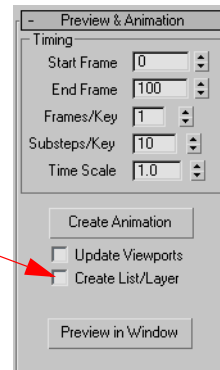
-waitLoad:<integer>            Timeout (minutes) for max to load

-waitUnload:<integer>            Timeout (minutes) for max to unload

-waitRender:<integer>            Timeout (minutes) for max to render

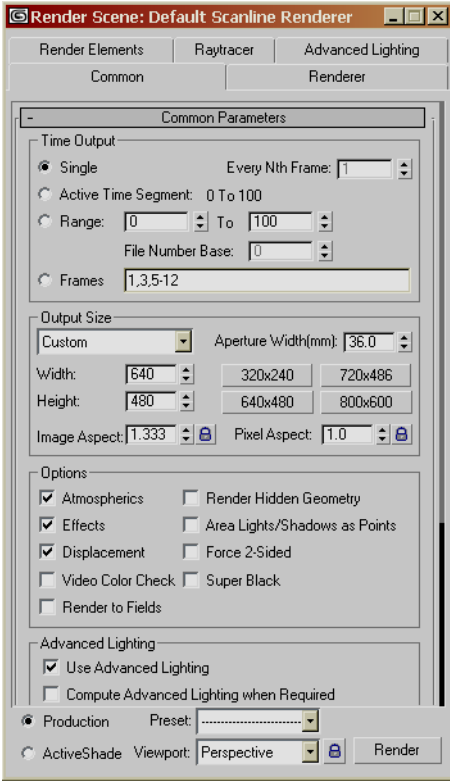
## reactor List Controller

reactor can now add a List controller that lets it apply its dynamics-simulation keys to a new track, instead of overwriting the destination object's animation controller and losing existing animation keys.



## Toggle Dialog Visibility

To avoid desktop clutter, you can toggle the visibility of various dialogs in **3ds max**. You now have the ability, in most cases, to close a dialog with the same command used to open it. In general this applies to any combination of input methods, including menu, toolbar button, and keyboard shortcuts. If a dialog is available from a menu, a check mark appears next to the respective command while it's open. If a dialog is minimized, invoking its command opens the dialog, and invoking it a second time closes the dialog.



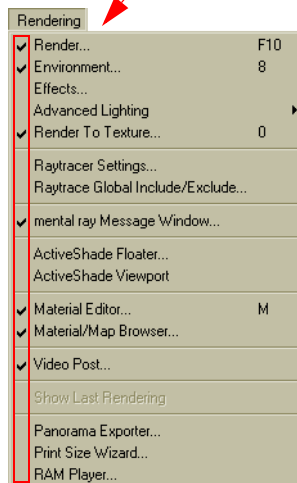
Click the shortcut key to open and close the dialog. The same shortcut key both opens and closes the window.

For UI elements that do not have a default keyboard shortcut assigned, you can create your own shortcuts on the **Customize > Customize User Interface > Keyboard** panel.

When a dialog is open, its toolbar button is "sticky," that is, it stays down and is highlighted.



If a dialog is available from a menu, a check mark appears next to the respective command while it's open.



This new feature is available for the following dialogs, with one exception: Particle View. Particle View has always been toggled by its keyboard shortcut (6), but is not toggled by the Modify panel > Particle View button:

UI Element	Shortcut Key	UI Element	Shortcut Key
Asset Browser	no default	Parameter Editor	ALT+1
Bone Tools	no default	Parameter Collector	ALT+2
Channel Info Editor	no default	Reaction Manager	no default
Clone and Align dialog	no default	Rename Objects	no default
Display Floater	D (Schematic view)	Render Dialog	F10
Environment and Effects	8	Render to Texture	0
Grid and Snap Settings	no default	Rigid Body Property Editor	no default
Layer Manager	no default	Selection Floater	no default
Light Lister	no default	Spacing Tool	SHIFT+I
Material Editor	M	Transform Type In	F12
Material/Map Browser (modeless)	no default	Video Post	no default
mental ray Messages Window	no default		

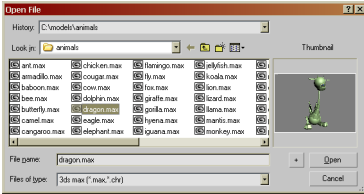
You can use **CTRL+~** to toggle all currently open dialogs. The first time you use it, it closes all open dialogs. The second time, it reopens those dialogs.

## Resizable Dialogs

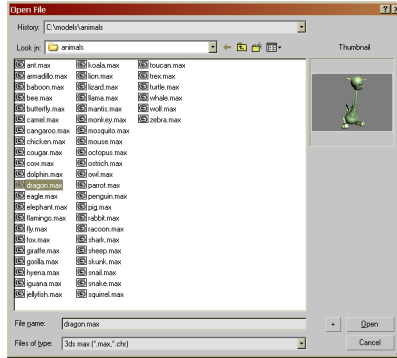
3ds max 7 allows many common dialogs to be resized for easier selection or browsing. Each dialog retains its new size during the current session.

### File I/O Dialogs

Almost all file I/O and path-selection dialogs can now be resized.



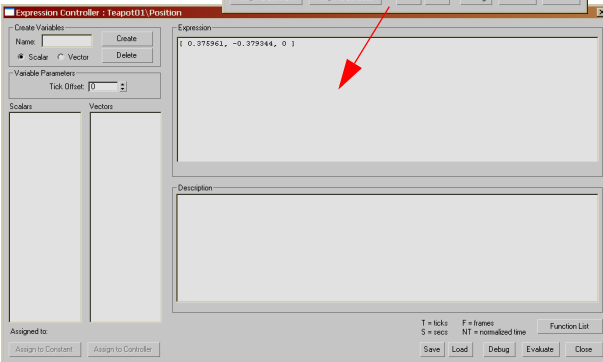
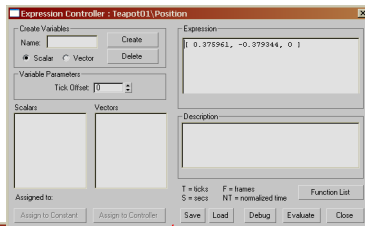
Drag the lower-right corner to resize the dialog.



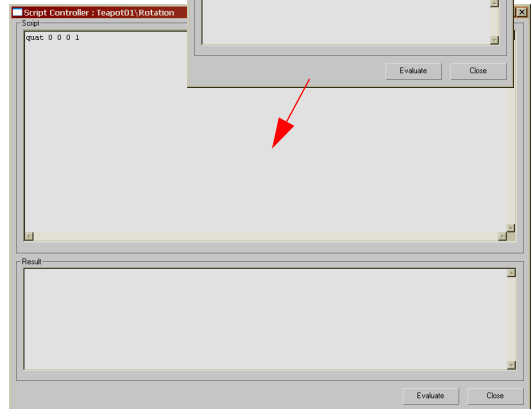
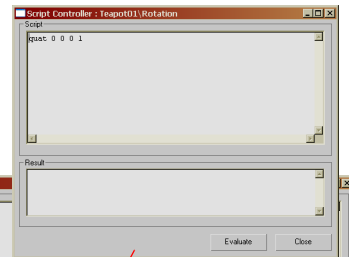
## Controller Dialogs

Two controller dialogs can also be resized.

### Expression Controller



### Script Controller

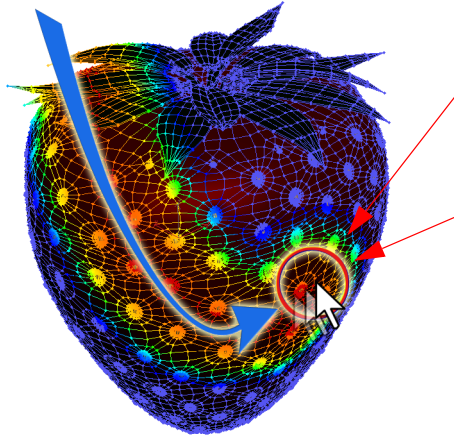


## Paint Selection Region Method

A new selection method allows you to select objects while dragging the mouse in the viewport. It works on both objects and sub-objects and is especially useful when trying to select areas in high-density geometry.



The Paint Selection method is available at the bottom of the Selection Region flyout on the main toolbar.



Like all other region-selection methods, the circle (brush) defining the affected area appears when you click and drag the mouse.

The brush defines the area affected by the selection. The selection is immediate and interactive, unlike other region-selection methods where you have to finish drawing the area before the selection takes place.

If Soft Selection is enabled, as in the illustration above, it affects surrounding sub-objects. Painting on complex meshes with Soft Selection enabled may slow down the feedback and cause irregular selections. For more precise selection, disable Soft Selection temporarily.

Paint Selection respects the Window/Crossing Selection toggle. In Window mode, only objects *within* the selection are selected. In Crossing mode, all objects within the region plus any objects *crossing* the boundaries of the region are selected.

To change the brush size, right-click the Paint Selection icon on the toolbar. The Preferences dialog that opens lets you change the Paint Selection Brush Size.

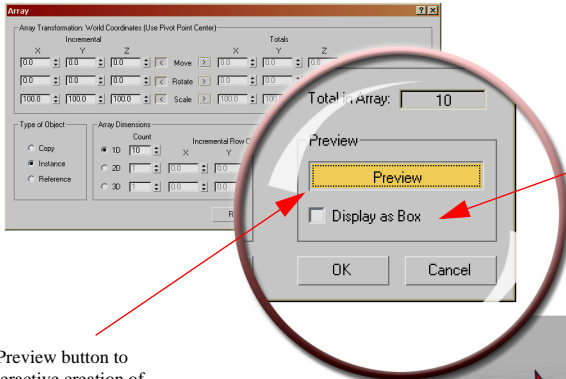
Also check out the new Paint Soft Selection available for Editable Poly objects and the new Edit Poly modifier.



*Array Preview* .....12  
*Clone and Align* .....13  
*Quick Align* .....15  
*Object Display Culling* .....16  
*Snaps Toolbar* .....17  
*Walk Through Viewport Navigation* .....18  
*Flat Shaded View* .....20  
*Mobile 3D Graphics File Exporter* .....21  
    *The JSR-184 Standalone Player Application* .....24

## Array Preview

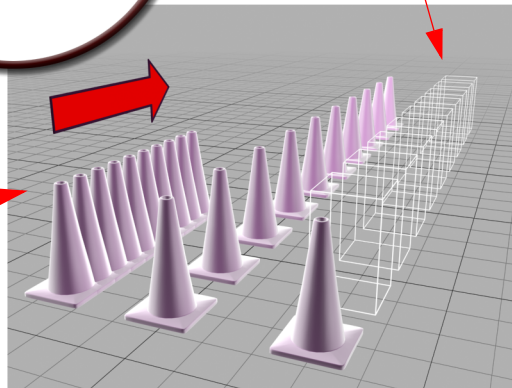
A new option on the Array dialog lets you preview the array in the viewports in real time. When Preview is enabled, modifications to the array parameters interactively update the array.



If the array is large, system performance may be affected. Use Display as Box to show only the bounding boxes of the objects being created.

Click on the Preview button to enable the interactive creation of the array. Click again to disable it.

When on, Preview updates the array interactively when you modify parameters such as the X spacing.

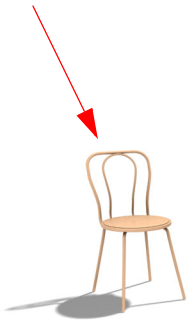


Because the Array dialog is modal, you cannot zoom, pan or rotate the viewports. Set your viewport point-of-view *before* you create the array so that you can preview all or most of the array.

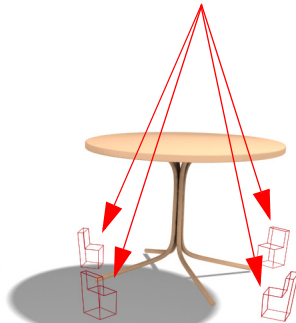
## Clone and Align

This new tool, available from the Tools menu, clones selected objects to locations specified by other objects in the scene. For example, you can use placeholders for a chair object to keep the scene simple, and then use the Clone and Align tool to position a copy of the final chair at each target placeholder position.

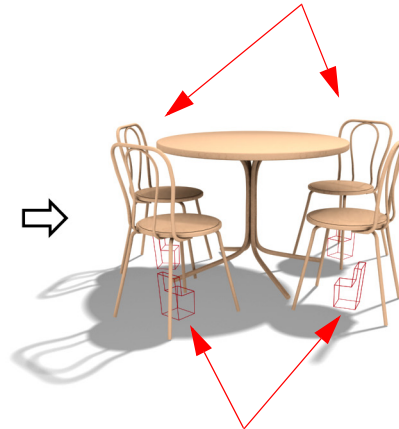
The chair is the source object.



These placeholders are the target objects, placed and oriented appropriately.



Clone and Align creates clones of the chair, positioned and aligned like the placeholders.



Since this is a clone operation, the original chair remains untouched.



The placeholders remain in the scene after the clones are created. They are not replaced by the clones.

Options similar to the Align tool let you specify which characteristics of the target objects the clones inherit. You can use any combination of the targets' position, orientation, and scale. Additionally, position and orientation can use offset values.

The cloning operation uses the current Reference Coordinate System and Transform Coordinate Center.

If multiple objects (for example, the faucet components) are selected as the source, the current Transform Coordinate Center changes the way the clones are created.



Using Pivot Point, each object is individually aligned to each target, and they will end up overlapping each other.

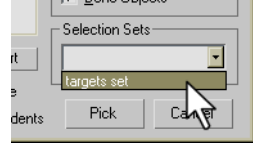


Using Selection Center, the objects maintain their original relative positions.

## User Interface

Select the source object before using Clone and Align. From here, you can select the target objects.

For quick selection, you can use Pick List to choose from a list of objects in the Select by Name dialog. You can organize the target objects using selection sets.



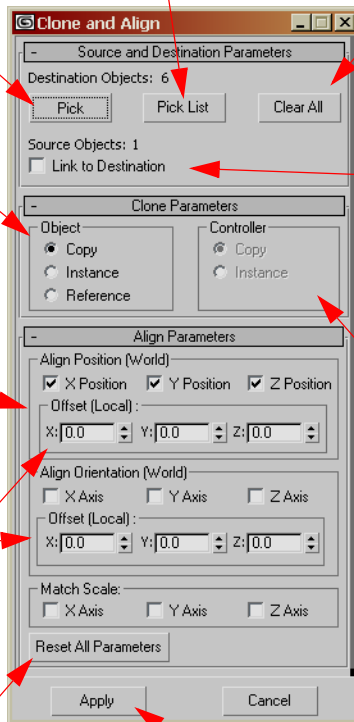
Use Pick to select the target objects one at a time. Clone and Align creates a clone as soon as you pick an object.

Clones can be copies, instances or references of the source object.

Here you can set the position, orientation and scale settings that the clones inherit from the target objects. These options are similar to the ones in the Align tool.

You can specify offsets for position and orientation, allowing for adjustments of the clones. The offsets are in the target's local coordinates.

Reset All Parameters sets everything in the Align Parameters rollout back to default values.



Clear All removes all the objects from the Targets list. You can then pick objects again using Pick or Pick List.

This option links each clone to the relative target object once the clones are confirmed when you click Apply.

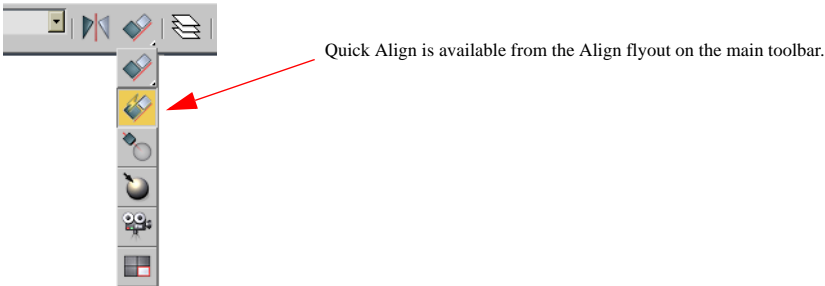
If the source objects are in a hierarchy, these options become available. They let you choose whether children controllers should be copies or instances. If controllers are instanced, moving one child object moves all the children in the cloned hierarchy.

Click Apply once the clone parameters are final. Until you click Apply, the clones displayed are for preview only and are temporary. The preview is interactive, and changes to the parameters affect the clones in real time.

Once the clones have been created, they become independent objects. You cannot edit the Align parameters for the created clones. Like Mirror and Align, the tool is interactive only while the objects are being cloned. After that, they are a snapshot, and if changes are needed, you might need to re-create the clones.

## Quick Align

Quick Align bypasses the Align dialog and aligns the selection to a target object using the pivot points. Only the position (X, Y and Z) is matched. Orientation and scale remain unchanged.

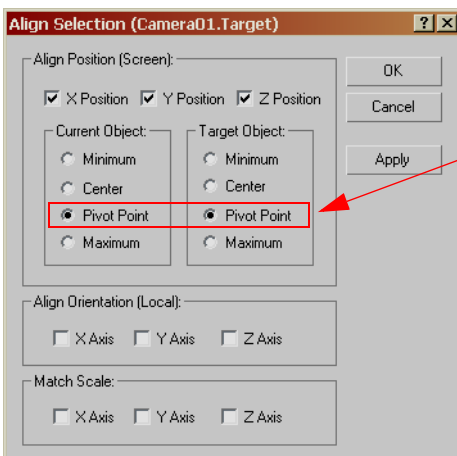


Quick Align works at sub-object levels as well. The center of the selection is aligned to the pivot of the target object.

## Improvements to the Align Dialog

In 3ds max 7, the settings of the Align dialog have been improved. By default, X, Y, and Z Position are on, so you immediately see position alignment the first time you use the tool. The X, Y, and Z check boxes for Position, Orientation and Scale are “sticky,” maintaining their last settings when you close and then reopen the dialog.

The Align dialog settings are “sticky” per session, that is, they remain until you close or reset 3ds max.



In addition to the changes mentioned above, the Align dialog is now set to Pivot Point by default.

## Object Display Culling

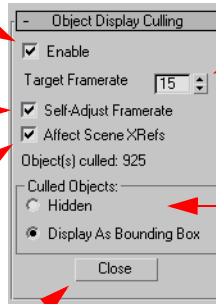
Object Display Culling is a utility that improves viewport performance in complex scenes with numerous objects by hiding less-important objects as you work. When enabled, this utility improves viewport feedback while zooming, rotating, and panning by temporarily hiding less-important objects or displaying them as boxes. You can turn on Object Display Culling from the Views menu, or by using the shortcut ALT+O.

Used in combination with the Adaptive Degradation settings, Object Display Culling helps you more easily navigate complex scenes with thousands of objects.

Toggles the utility for the scene. The settings in this dialog are saved with the scene and are used again when the file is reloaded.

Allows the utility to lower the frame rate temporarily if the target frame rate can't be achieved.

Scene Xrefs can be included or excluded from the culling.

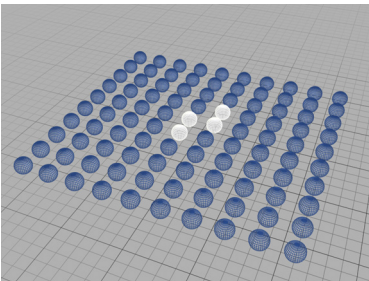


Sets the desired target frame rate (fps). **3ds max** culls objects as necessary to achieve this frame rate. Higher frame rates cause more objects to be culled. Choose a number based on the scene complexity and the your computer/graphics card speed.

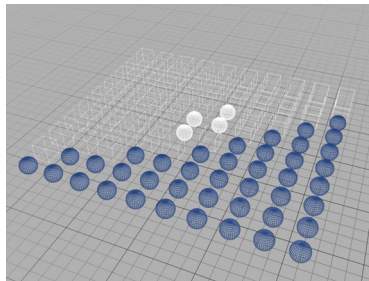
Specifies whether the culled objects should be hidden or displayed as boxes. Hiding objects increases efficiency, but can make viewport navigation a bit confusing with very complex scenes.

Closing the rollout does not disable the utility. Object Display Culling is active while you work on the scene and the culling remains visible in the viewport.

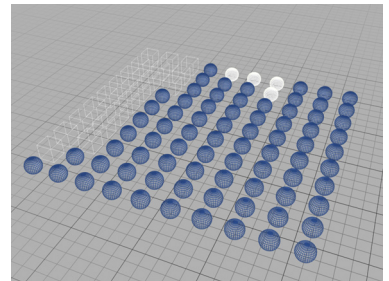
## Viewport Example



This is a simplified scene used to illustrate how the culling works. In reality, you would use this utility in scenes with many more objects than are in this example.



With culling enabled, while navigating through the scene, distant objects are hidden or displayed as boxes. Selected objects remain visible.



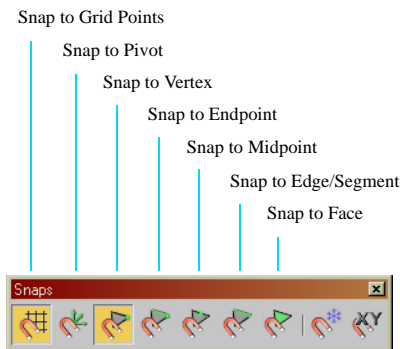
After you have navigated the viewport, objects remain culled. Selecting other objects or performing a different operation forces a reevaluation of the scene and restores some or all of the culled objects.

## Snaps Toolbar

Improvements have been made to the **3ds max** snapping engine. This allows for snapping of sub-object gizmo pivot points, includes a magnet feature that lets objects and gizmos snap to intended targets more reliably, and allows artists to assign hot keys to various snapping options and use a keyboard shortcut to cycle through the snap types.

Also new in **3ds max 7** is the Snap Preview Radius setting, which lets you preview a snap before it actually happens.

The new Snaps toolbar contains the most commonly used settings for quick access.



Note: You can turn on more than one snap type at the same time.

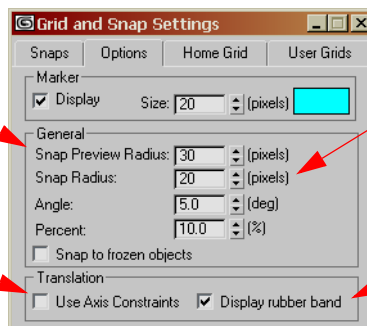
When on, snaps are constrained to the current axis constraints. This button is also available on the Axis Constraints toolbar.

When on, snaps are also active on frozen objects.

## Snap Options Tab

The snap strength now uses two radii. Snap Preview Radius is the outer radius. Snap is active, but only the marker moves, showing you where it will snap when you click or release the mouse button.

Use Axis Constraints also appears on a button on the Snaps toolbar (above), and on the Axis Constraints toolbar.

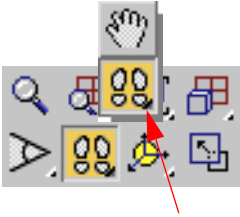


The Snap Radius should be smaller than the Preview Radius. When you get within the range of the Snap Radius, the item you are dragging will actually snap to the point identified by the marker.

The rubber band is a visual aid showing a line connecting the old and current position when moving something with snaps enabled.

## Walk Through Viewport Navigation

3ds max 7 includes a new way to navigate the scene in Perspective and Camera viewports. This system is similar to the first-person camera commonly used in videogames.



Click and hold the Pan View button to choose the new Walk Through navigation system. Click on the viewport to activate the mouse and keyboard controls.

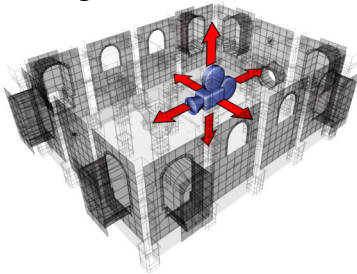
*Prince of Persia, courtesy of Ubisoft*



Models of interiors, such as rooms and corridors, are difficult to navigate using the common zoom and pan camera commands. This new system allows you to move more easily through the model, as if you were inside the scene. You can experience the scene like the final user (the game player).

## Basic Keyboard and Mouse Controls

### Camera Tracking

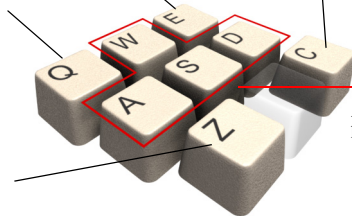


Q is the acceleration toggle. Pressed once, it speeds up camera movement. Pressed again, it returns the speed to normal.

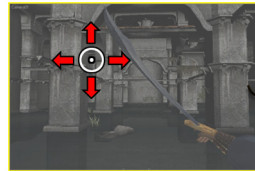
Z is the deceleration toggle. Pressed once, it slows down camera movement. Pressed again, it returns the speed to normal.

E moves the camera up.

C moves the camera down.



### Camera Panning



Click and drag the mouse to pan (rotate) the camera in the viewport.



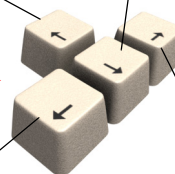
Moves camera forward or up (using SHIFT).

Moves camera backward or down (using SHIFT).

ASDW and the arrow keys have the same effect.

Moves camera left.

Moves camera right.



## Other Keyboard Controls

Other keyboard shortcuts are available for controlling different aspects of Walk Through Viewport navigation. Several additional commands are not assigned to keyboard shortcuts by default. To customize your keyboard settings, use the Keyboard panel of the Customize User Interface dialog. All Walk Through navigation commands are in the WalkThrough group.

---

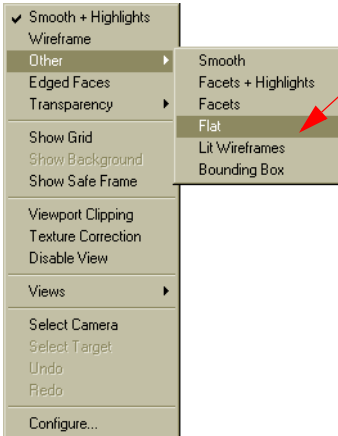
[	Decrease step size. Can be used repeatedly.
]	Increase step size. Can be used repeatedly.
ALT+[	Restore default step size.
SHIFT+Space	Level the view horizontally.
<not assigned>	Decrease rotation sensitivity.
<not assigned>	Increase rotation sensitivity.
<not assigned>	Lock horizontal rotation.

---

## Flat Shaded View

This new viewport shading method displays objects using their pure diffuse coloring. Lights (both direct and ambient) and their colors are ignored, and surfaces with uniform color look the same from any angle.

This shading method is useful when using Vertex Paint or Render to Texture.



Flat has been added to the viewport right-click menu.



A scene displayed with Smooth+Highlights shows the effect of lighting on the surfaces.



Using the new Flat shading option, lights are ignored, and every surface assumes the diffuse color or texture of its material.



If the Flat shading mode makes some objects difficult to see, turn on the Edged Faces option.

## Mobile 3D Graphics File Exporter

The JSR-184 Exporter, available as an option in the Export or Export Selected dialog, creates a standard .m3g file used by devices supporting the Mobile 3D Graphics API for Java 2 Micro Edition standard (JSR-184).

M3G files can then be used to display the exported scene on devices such as mobile phones.

The Mobile 3D standard supports materials, textures, skinned meshes, morphing meshes, lights, animation, and more, but considering the limited hardware on which the scene might be displayed, it's better to export simple scenes or single models.

Some options in this exporter are related to the standards described in the JSR-184 (Java Specification Request) documentation. If you use this exporter you are probably already familiar with the terminology. Explaining the details of JSR-184 is beyond the scope of this guide.

More technical details about exporting JSR-184 scenes can be found in the *3ds max 7 User Reference*.

### Exporting A Scene

A few steps are necessary to successfully export a scene to an M3G file. First, you need to select the objects, cameras, and backgrounds, then customize a number of settings and refine the textures used by the materials.

A standalone JSR-184 player is provided so that you can preview the exported file. This player simulates the target devices where the scene will ultimately be displayed. You can find the player in Start > Programs > discreet > 3ds max 7 > JSR-184 Player.

To Export, choose Export from the File Menu, and then specify JSR-184 (\*.M3G) as the output format. The JSR-184 Export dialog appears after you click Save.



A mobile phone supporting the JSR-184 standard can display the exported scene.

## Exporter Options

This dialog allows you to customize the JSR-184 scene, by selecting the objects to export, and to manage other aspects of the export process.

Creates a new empty JSR-184 scene by emptying the list on the second panel.

Adds all the objects in the 3ds max scene (left panel) to the JSR-184 scene.

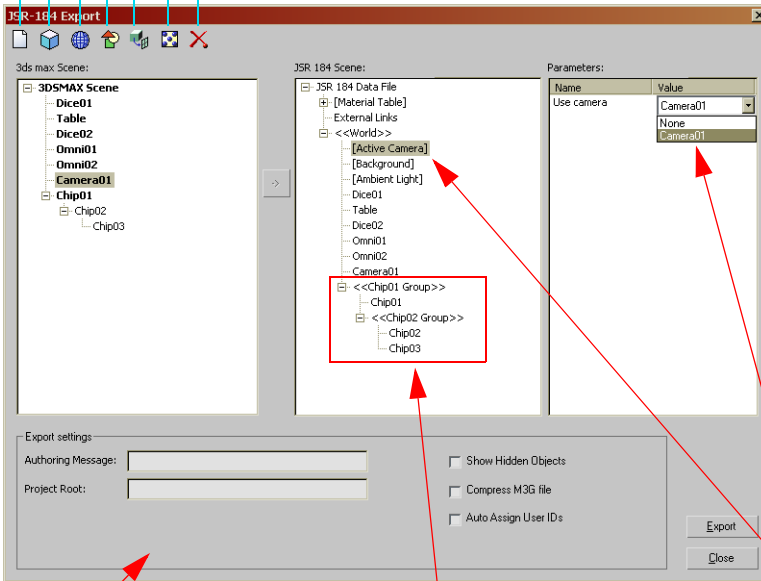
Creates a new World object in the JSR-184 scene.

Creates a new empty group in the JSR-184 scene.

Converts a plane to a sprite (only 1x1-segment planes can be converted).

Launches the Texture Tool (enabled when a map is selected).

Removes the highlighted object from the JSR-184 scene.



### The three panels:

#### 3ds max Scene

Lists all the objects available for export in the current scene. Hierarchies are shown as collapsible trees.

#### JSR-184 Scene

Lists the objects that will be exported. The format of this list is similar to the way JSR-184 handles a scene. Refer to the reference or the JSR-184 specification for technical details.

#### Parameters

Depending on the object selected in the JSR-184 Scene, this panel displays the specific object data. Some of the parameters can be edited.

This group sets global scene options.

JSR-184 does not support hierarchies; the exporter creates nested groups to achieve a hierarchical structure.

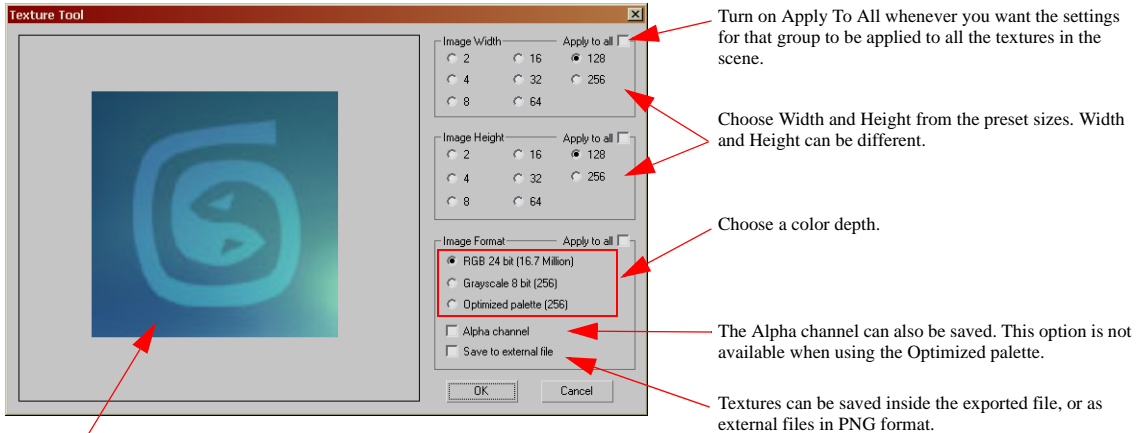
An active camera needs to be assigned to give the JSR-184 scene a starting point of view.

The Material Table in the JSR-184 Scene panel lists the materials and maps in the scene. When a map is selected, the Texture Tool button on the toolbar is enabled. See the next page for details.

A World object is a list of scene objects. By default, the scene contains a single World object, but you can have more than one World object in a JSR-184 scene, and can choose which World to display in the Player application.

## Texture Tool

The JSR-184 standard requires maps to be limited in size. Width and height must follow the “power-of-two rule”, and texture sizes must be less than or equal to 256x256. The Texture Tool lets you quickly change all the textures in your JSR-184 scene to meet these standards.



The texture preview shows you the updated bitmap as you select the options to the right.

## JSR-184 Limitations

The limits imposed by the JSR-184 standard prevent exportation of many features supported by 3ds max.

Some of the limitations include:

- Integer precision: This limits the accuracy of small meshes of only a few units in size. For best results, use relatively large meshes. Scaled objects also might exhibit precision problems.
- Linear interpolation: Smoothly curved paths defined by only a few keys are not supported.
- Texture sizes are limited to “power of two” sizes, to a maximum of 256x256 pixels.
- No support for shadows.

## Export Log File

A log file reporting object information and possible warnings or errors is created every time you export a scene. This log file is saved in the same directory as the M3G file. It is an HTML file and can be open in Internet Explorer.

## For Developers

The source code for both the exporter and the player are on the Premium Sparks Web site for developers who would like to extend the functionality of the tool.

## The JSR-184 Standalone Player Application

To allow you to preview your exported *.m3g* files, a standalone player has been included. You can find the player in the discreet > **3ds max 7** Start Menu group.

This is a generic JSR-184 player, and can be configured to simulate the display capabilities of mobile devices.

The Java™ 2 Runtime Environment must be installed for the player to work. You can install it from the main installer panel of the **3ds max 7** installation CD.

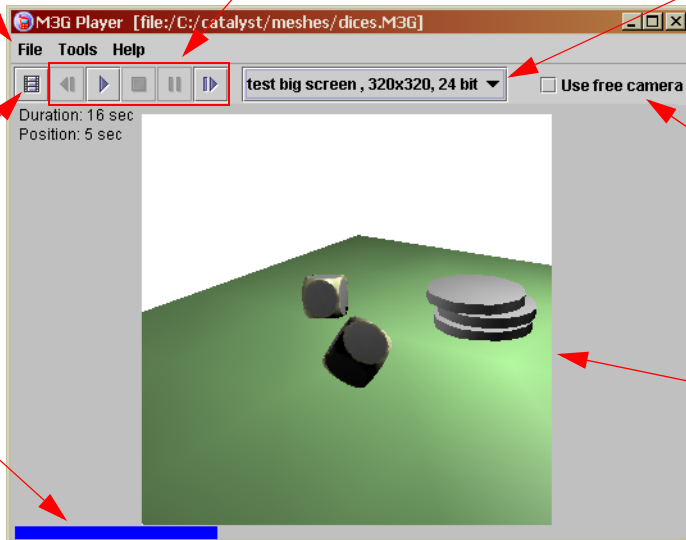
Use the File menu to open a new file or reopen a recently viewed file. Use the Handset tool to create new presets for player devices.

These are standard playback controls to play, stop, and pause the animation. You can also step backward and forward a frame at a time through your animation.

This drop-down list contains the presets for mobile device screen settings.

You can choose which World to display if more than one World is defined for the scene.

The progress bar shows the animation playback progress.



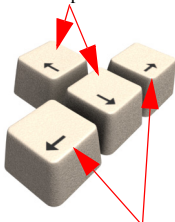
By default, the initial point of view is the one of the active camera, as defined during the export. To be able to move the point of view, turn on Use Free Camera. See below for details.

The player display size changes depending on the device you select from the drop-down list. Create a new device profile for each screen size and color depth you need.

## Free Camera

Enable Use Free Camera to navigate the scene using the keyboard.

Pan the camera up and down.

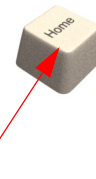


Pan the camera left and right.

Move the camera forward and backward.



Move the camera left and right.



Restore the camera's original position.

<i>Editable Poly Enhancements</i> .....	26
<i>Mesh Painting</i> .....	30
<i>Edit Poly Modifier</i> .....	33
<i>Poly Select Modifier Enhancements</i> .....	36
<i>Skin Wrap Modifier</i> .....	37
<i>Skin Wrap Patch Modifier</i> .....	39
<i>Skin Morph Modifier</i> .....	40
<i>Accurate Bone Mirroring</i> .....	45
<i>TurboSmooth Modifier</i> .....	46
<i>Unwrap UVW Enhancements</i> .....	47
<i>VertexPaint Improvements</i> .....	50
<i>Assign Vertex Color</i> .....	51

## Editable Poly Enhancements

Once again, we've added new features to Editable Poly, making it even more flexible and powerful.

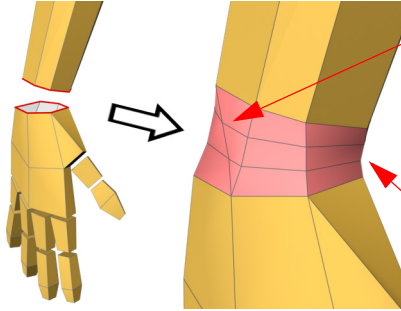
### Bridge

Bridge can be used to connect borders or polygons, and is available only at those sub-object levels.

Click Bridge to start a bridge operation by selecting polygons or borders. The bridge is created using the last dialog settings.



Click to open the Bridge settings dialog and create a bridge interactively.



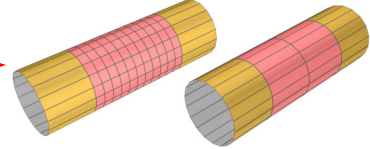
An example of a bridge between two borders. Note how the bridge works even when the borders have different numbers of vertices.

The bridge can be tapered to smoothly follow the direction of the connected surfaces.

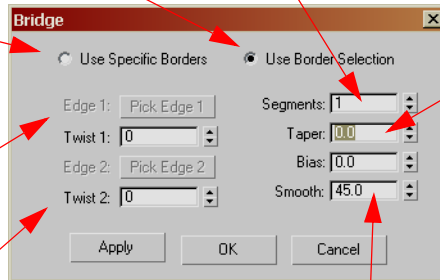
When you use the Bridge button, the software bridges pairs of selected borders or polygons automatically. Use the dialog for the first bridge to set the correct parameters, and then create multiple bridges quickly with simple selections in the viewport.

Use Border/Polygon Selection uses the currently selected elements to create the bridge. This is the default, and the easiest way to use this tool.

Segments divides the bridge into equal segments along its length. Note that you need to specify more than one segment when you use Taper.



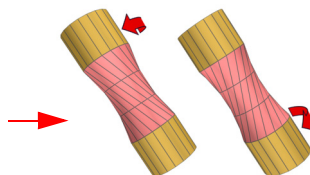
Use Specific Borders/Polygons enables the Pick buttons below and you can select the desired sub-objects from the viewport.



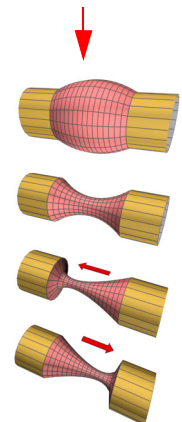
Taper and Bias control the tapering of the bridge. Bias shifts the maximum taper effect toward the start or end of the bridge.

While the dialog remains the same, the text changes to Polygon when used at the Polygon sub-object level.

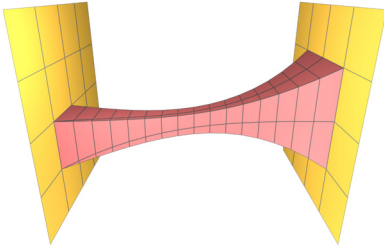
Twist 1 and 2 rotate the order of the edges at the two ends of the bridge, allowing you to correct the best-guess initially created by the tool.



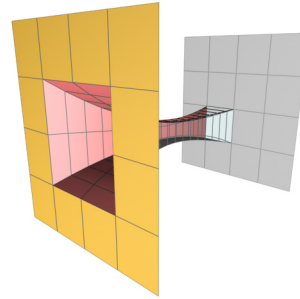
Smooth specifies the angle threshold for the automatic smoothing of the bridge surface.



In the previous example, we used Bridge between two borders. When used with polygons, Bridge connects the edges of the two selected polygons (or clusters), and deletes the selected polygons. As with borders, the selection edges can have a different number of vertices.



**Connecting facing polygons.** Adding a bridge deletes the selected polygons.

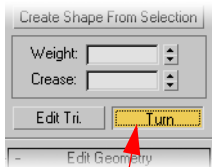


**Connecting opposing polygons.** In this case, the bridge creates a hole on the surface.

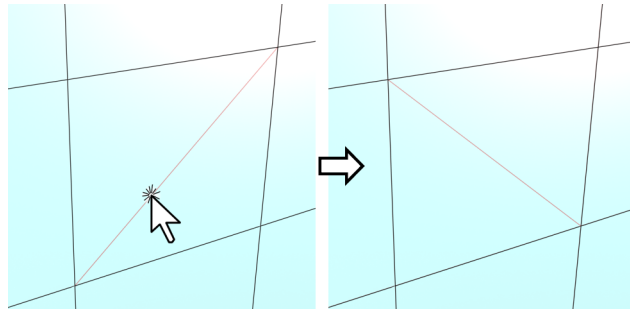
Using Bridge on polygons facing the same direction or coplanar polygons creates self-intersecting bridges.

## Turn

This feature is similar to the one that already exists in Editable Mesh. With a single mouse-click, it changes the direction of a diagonal within a poly. Turn is available at all sub-object levels except Vertex.



In Turn mode, all polygon diagonals become visible. A single mouse-click changes the diagonal direction.



Turn is a quick and effective way to re-triangulate quadrilateral polygons. For polygons with more than four edges, it might be counterintuitive, and the Edit Triangulation tool is a better choice.

## Relax

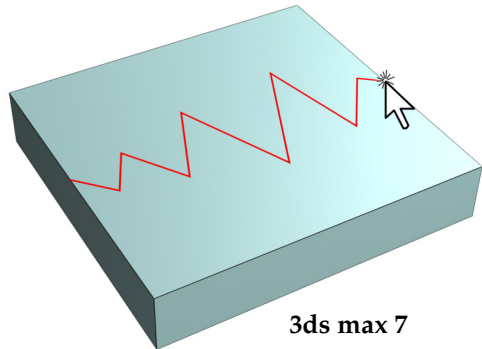
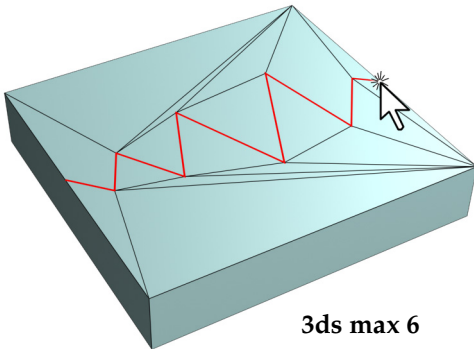


The functionality of Relax in Edit Poly is exactly the same as the Relax modifier. The options are the same, too.

It's available at all sub-object levels as well as at the object level. When in sub-object mode, it works only on the current selection.

## Clean Cuts

Cutting within a polygon no longer creates visible extra edges.



While the extra edges are invisible, the faces are still triangulated. Verify that the cut doesn't create overlapping faces (usually visible as a shading artifact in the surface). It might be helpful to turn off Edges Only on the Object Properties dialog so you can see the triangulation while cutting.

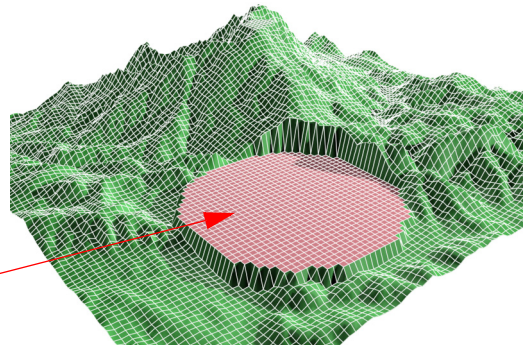
## Make Planar to X, Y, or Z

Make Planar now has the option to average the alignment of an object or selected group of sub-objects along a specific axis (using the object's Local Coordinate system).



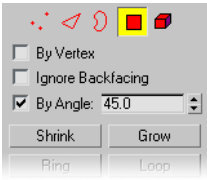
Make Planar still works as before, averaging the selection orientation.

X, Y, and Z make the selection planar and averaged to the selection center along the local X, Y, or Z axis.



In this example, the selected faces have been made planar to Z, creating a horizontal, flat surface from part of a rough mesh.

## Coplanar Polygons Threshold

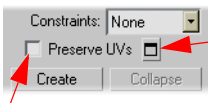


As in Editable Mesh, a planar threshold angle value allows the selection of coplanar polygons.

The By Angle option is available only at the Polygon sub-object level.

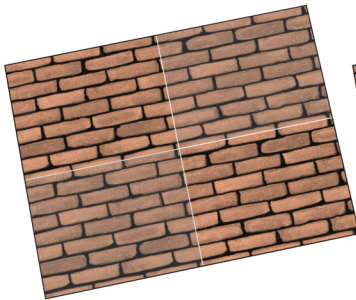
## Preserve UVs

This option allows you to edit an already mapped mesh without changing its UV coordinates.

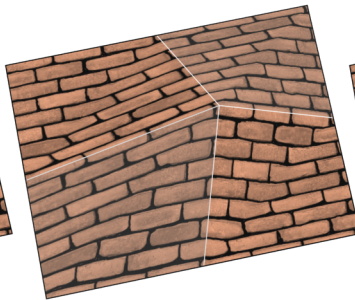


The Settings button opens a dialog where you can filter the Texture and Vertex Color channels available for the mesh. By default, all UVs are preserved.

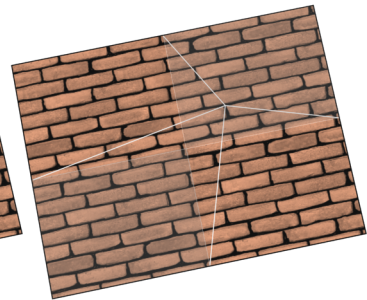
Turn the option on or off here.



In this example, we have a surface with an existing UV mapping.

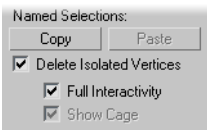


Editing a vertex changes the UV coordinates as well, and the texture stretches.



With Preserve UVs on, the vertex moves, but the UV coordinates remain unchanged.

## Delete Isolated Vertices



This option is available at any sub-object level, except Vertex. It's also available in Mesh object.

In previous versions of **3ds max**, if you deleted edges or polygons, you were prompted to delete the vertices that remained isolated. This option lets you set the preferred behavior and the dialog does not appear any more.

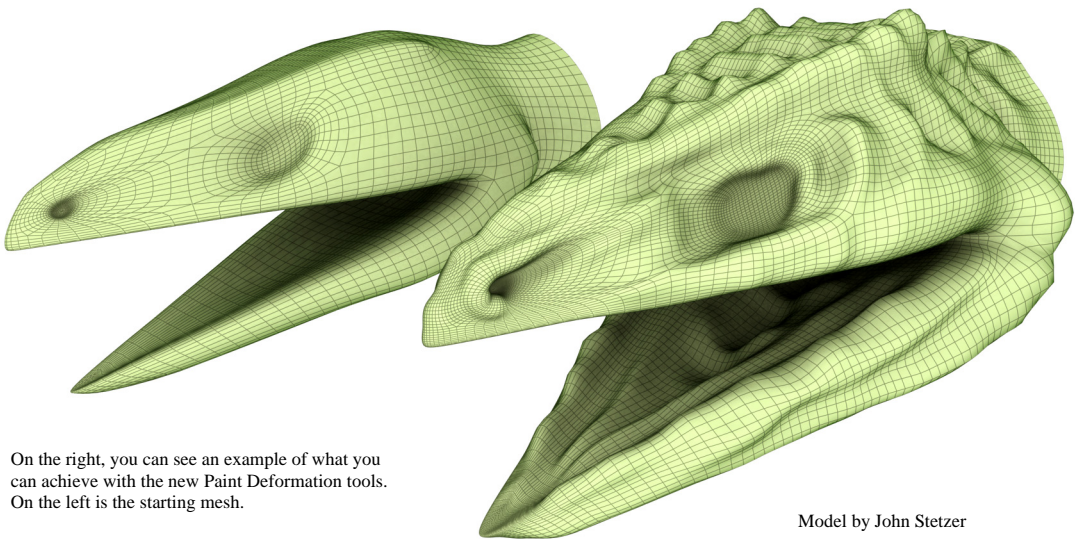
## Mesh Painting

The ability to paint on a mesh, opens the doors to other interesting features. In this version of **3ds max**, we introduce Paint Deformation and Paint Soft Selection.

Paint Deformation uses brush strokes to deform the surface by pushing or pulling vertices. This is a very quick modeling tool for detailing a mesh.

Paint Soft Selection uses the brush strokes to set the vertex influence, allowing for greater control over the shape and falloff of a selection. You are no longer restricted to a fixed falloff distance and curve.

Both are based on the existing mesh painting feature, introduced in **3ds max 5**, and therefore have many common elements. You can customize the brush for both Paint Deformation and Paint Soft Selection with the Painter Options dialog. This includes changing the brush shape, support for pressure sensitive devices, mirrored operations, and much more.



On the right, you can see an example of what you can achieve with the new Paint Deformation tools. On the left is the starting mesh.

Model by John Stetzer

## Paint Deformation

This can be considered a retouching tool, but it is useful for creating organic shapes. The feature is accessible from a new rollout at the bottom of the Editable Poly command panel.

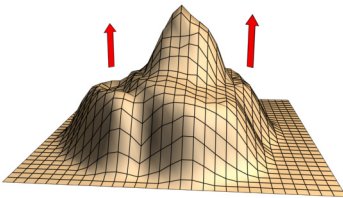
These three buttons are the tool's three modes of operation. They are mutually exclusive.

**Push/Pull** moves vertices in or out of the surface (depending on the Push/Pull Value) of each brush stroke.

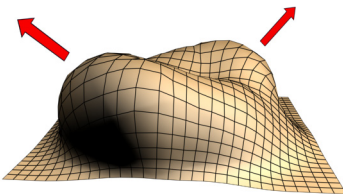
**Relax** works like the Relax modifier on the vertices affected by the brush strokes.

**Revert** uses brush strokes to gradually undo changes since the last Commit.

Original Normals



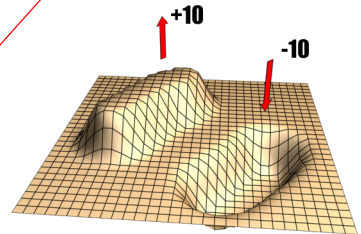
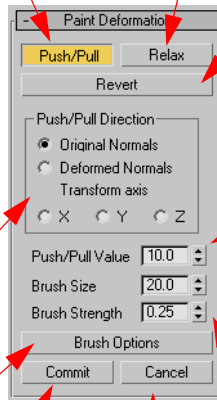
Deformed Normals



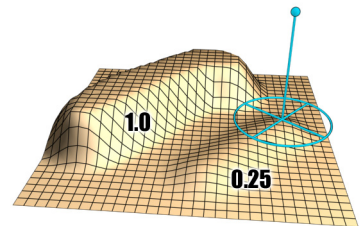
This group controls the direction of the displacement when pushing or pulling vertices. Direction is re-evaluated after each brush stroke.

This opens the brush configuration dialog common to all 3ds max paint tools. This dialog controls brush shape, mirror, and pressure sensitivity settings.

Commit confirms the edits, and the original mesh is replaced. You can continue painting after Commit.



Push/Pull Value controls the displacement. Negative values push the vertices in, and positive values pull the vertices out.



Size/Strength controls the brush diameter and strength. When Strength is 1.0, displacement is the amount set in Push/Pull Value.

Push/Pull Value limits the maximum displacement in a single stroke. Multiple strokes will result in geometry being displaced up to the maximum value in Push/Pull for each stroke. You can phase your work using this limit to focus on bigger details first, and then on smaller ones.

Press ALT while painting to invert the Push/Pull Value (For example, +10 becomes -10), and CTRL to temporarily enable Revert.

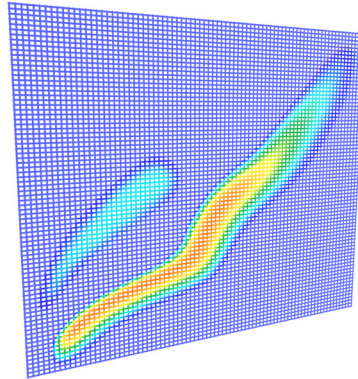
In sub-object mode, the Push/Pull, Relax and Revert buttons will work on the whole object if no sub-object is selected, and be limited to the sub-object selection if one is present.

## Paint Soft Selection

Painting soft selection using the mesh painting tools allows for irregular-shaped selection with controlled weights. This feature is available on the Soft Selection rollout of Editable Poly objects.

Using a pressure-sensitive device, like a tablet, makes soft-selection painting a natural process and gives you the best control over the painting process.

Paint partial weights using a combination of Selection Value and Brush Strength.



Use Blur and Revert to get accurate weighting retouching of the selection.

Get increased control over the selection falloff using a combination of brush shape and strength.

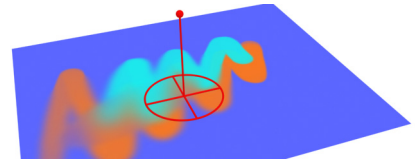
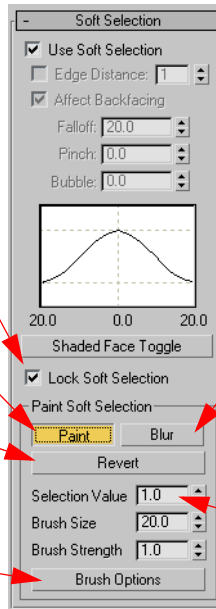
There are no changes to the way soft selection works when painting is not used, but the two selection methods cannot be used at the same time. You can use Paint Soft Selection to modify existing selections or soft selections.

Lock Soft Selection activates automatically when a paint selection is initiated. This flag is used to switch between painted and standard soft selections. Standard soft selection controls are disabled when this flag is On.

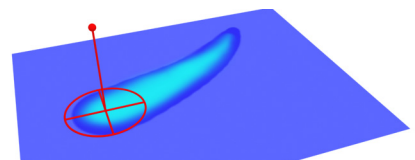
Turn on Paint to start painting the soft selection on the mesh. You can change the brush settings at any time, and even use the keyboard to change the Size (ALT+SHIFT) and Strength (CTRL+SHIFT).

Revert uses the brush to restore the selection the previous state. Consider it a way to selectively undo your selection.

This opens the brush configuration dialog common to all 3ds max paint tools. This dialog controls brush shape, mirror, and pressure sensitivity settings.



Use Blur to transfer your brush into a blur tool to smooth the selection. Perfect smoothness is hard to achieve when painting weights by hand. Above, an illustration of Blur at work.



Selection Value is the maximum weight that can be painted, with 1.0 being fully selected. Above, an example of an area painted with a selection value of 0.25.

Remember that pressing CTRL while painting temporarily enables Revert.

## Edit Poly Modifier

The Edit Poly modifier is new in **3ds max 7**. It has almost all of the tools available in the base Editable Poly objects, including the new features detailed in the previous Editable Poly topic, and further enhances your ability to animate your edits.

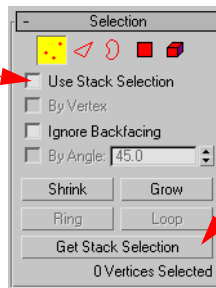
The only things missing from Edit Poly when compared to base Editable poly objects are the Subdivision Surface rollout (use the MeshSmooth modifier), Vertex Colors editing (use VertexPaint modifier), and the Full Interactivity option, since it's always on.

Other than performing regular editing of a poly mesh, two very important uses make this modifier a powerful asset: mesh detailing and animation.

### Use Stack Selection and Get Stack Selection

Use Stack Selection automatically selects the sub-objects passed up by the stack for each sub-object mode. When on, this option disables all the other options in this rollout.

This is useful for passing animated sub-object selections up the stack, such as selections created with a Volume Select modifier.



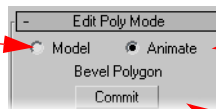
Get Stack Selection selects the same sub-objects that are passed up by the stack for each sub-object mode on an instantaneous basis. You can then modify the selection, for example, with Shrink or Grow.

It's also a quick way to restore the initial selection if you want to undo selection changes.

### Modes Of Operation

Edit Poly has two modes of operation: Model and Animate.

In Model mode, you can edit your poly mesh as desired, using all the tools available.



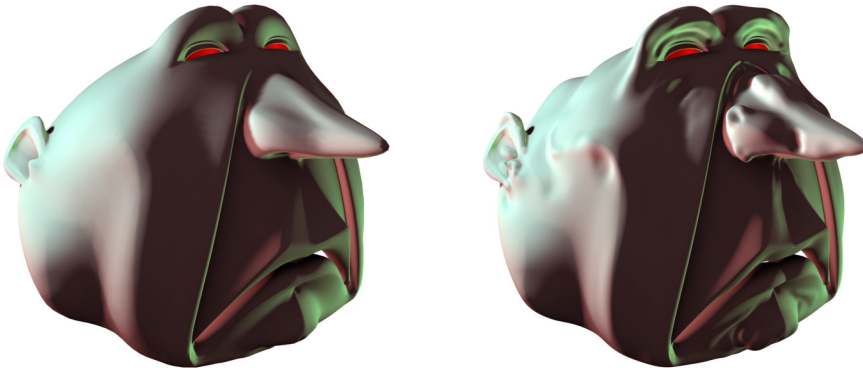
In Animate mode, with Auto Key or Set Key on, you can use a subset of tools and animate parameter changes.

See Animation below for details on the other options of this rollout.

### Mesh Detailing

One use of Edit Poly is mesh detailing, especially when taking advantage of the new Paint Deformation tools.

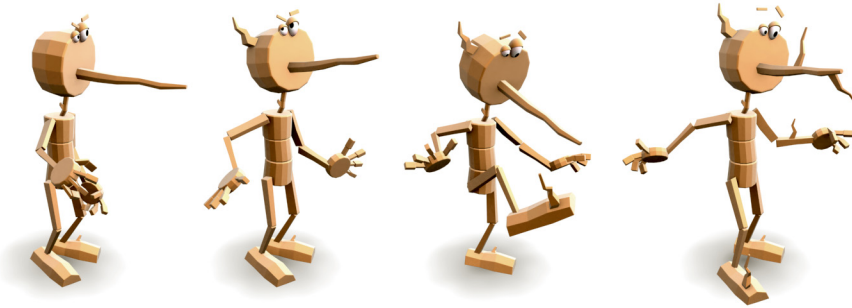
You can apply any number of Edit Poly modifiers to the stack to add layers of details to the mesh, while retaining the base object for overall shape deformations.



The creepy character above shows the smoothed original mesh (left), and the result after just a few minutes of editing with Paint Deformation using two Edit Poly modifiers to create larger and smaller details. MeshSmooth is used in between the modifiers to increase the mesh density.

## Animation

This powerful feature lets you animate edits to a mesh. Only one type of operation at a time can be animated, but you can use multiple modifiers to animate different operations.

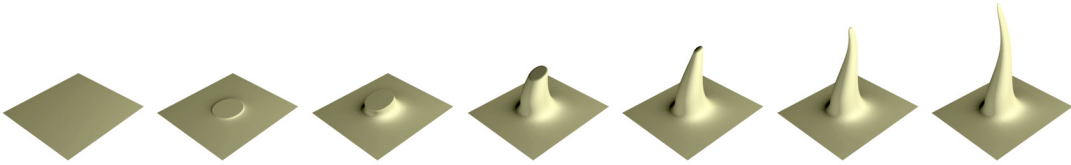


Branches sprout from Pinocchio's wooden body.

In the User Reference you will find a detailed list of the features that can or cannot be animated. For example, Bevel, Extrude, Chamfer and all transforms (move/rotate/scale) can be animated. Non-animatable features are unavailable in Animate mode.

Remember that only one operation can be animated for each Edit Poly modifier on the stack. One operation means one extrusion, or one chamfer, or one sub-object transform, for example. However, you can create multiple keyframes for an operation within a single modifier instance. For example, you can animate the Extrusion Height as much as you like.

Using multiple modifiers, you can create animations of more complicated operations.



An animated branch created using multiple Edit Poly modifiers, beveling and transforming a single polygon.

### Working in Animate Mode

The controls on the Edit Poly Mode rollout show you the current editing operation. Only this operation can be animated. If you start another operation, the current one is baked into the mesh, and the new one becomes current and animatable.

Make sure you animate the operation, test it by scrubbing the time slider, and then add another Edit Poly modifier to animate the next one.

Also, make sure you are in Auto Key or Set Key animation mode. Animating an operation is similar to any other animation in 3ds max. Move the time slider to the desired frame, and then edit the operation settings.

When animating with Set Key, be sure to turn on Modifiers only on the Set Key Filters dialog. By default, keys for all the modifier tracks will be created.

You can have as many keyframes as you desire, but only within the same operation.

Make sure you are in Animate mode and Auto Key or Set Key animation is enabled, otherwise keys are not recorded.

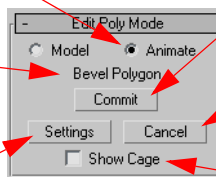
Use Commit to bake the current operation results into the mesh. This discards any animation created for the current operation.

Select a sub-object and choose a tool, or start transforming it. The name of the operation appears.

Cancel voids the current operation and reverts the mesh to its previous status.

Use Settings to open the current operation parameters dialog. This is the way you edit an already animated Edit Poly operation.

Show Cage displays the mesh before the current operation as a reference.



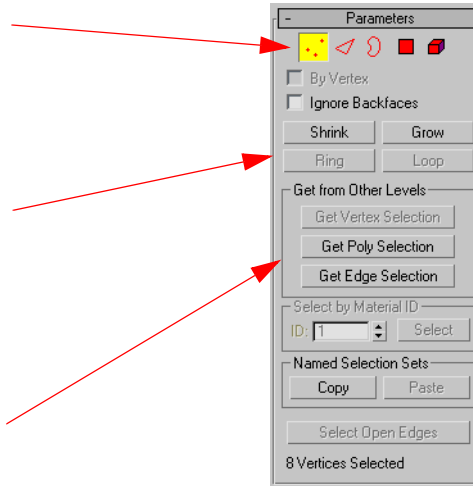
## Poly Select Modifier Enhancements

The Poly Select modifier can now modify a sub-object selection with the Grow, Shrink, Loop, and Ring functions. Also new is the ability to convert one sub-object selection to another quickly in touching or enclosed mode.

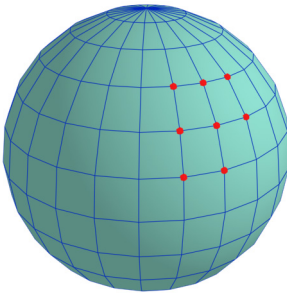
Use CTRL or CTRL+SHIFT when changing sub-object levels to convert the current selection in Touching or Enclosed mode. See the example below.

As with Editable Poly, Poly Select now has Shrink, Grow, Ring, and Loop.

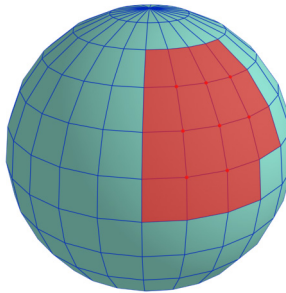
Get from Other Levels works as before (touching mode).



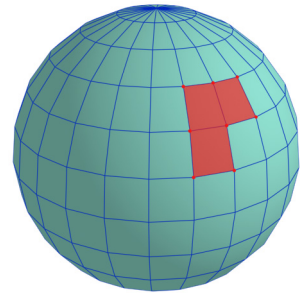
CTRL and CTRL+SHIFT converts the selection from touching or enclosed mode. Let's see an example:



This is our starting selection at the Vertex sub-object level. We want to convert it to Polygon by clicking the Polygon sub-object button.



With CTRL, the converted selection includes all the objects *touching* the original selection.



With CTRL+SHIFT, the converted selection includes only sub-objects fully *enclosed* by the original selection.

Poly Select also takes advantage of the new Paint Soft Selection feature, explained in the Editable Poly topic.

## Skin Wrap Modifier

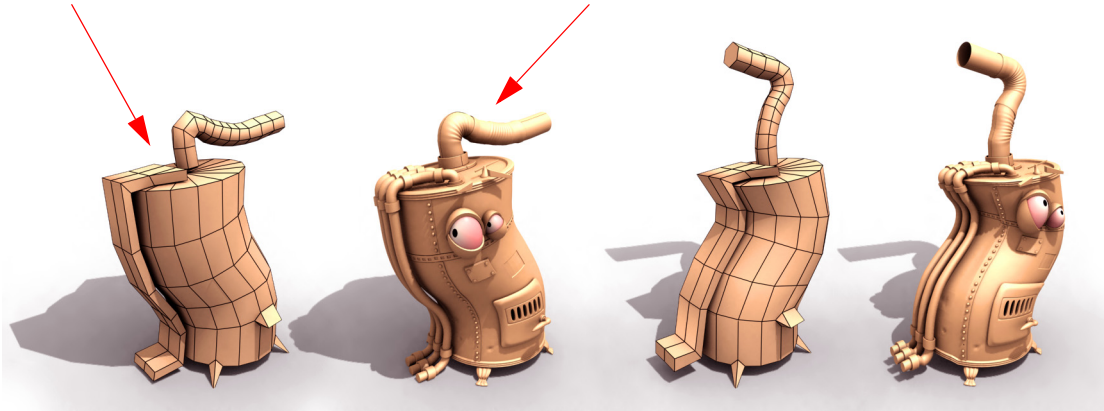
Skin Wrap is a new skinning system that uses a low-resolution mesh to drive the deformation of a high-resolution mesh. The low-resolution mesh can be skinned or animated with other tools.

This method is very quick to set up, compared to skinning the high-resolution mesh directly. It also allows for changes or additions to the high-resolution mesh without having to re-skin.

This system is less accurate for skinning details than other systems, but it can be extremely useful to set up secondary characters, because you can create different high-resolution characters deformed by the same low-resolution mesh.

In this sample, the low-resolution mesh (control object) is animated by the bones and easier to skin because of its lower number of vertices.

The high-resolution mesh (base object) uses Skin Wrap to bind its deformation to the control object, which is still in the scene, but is not rendered.



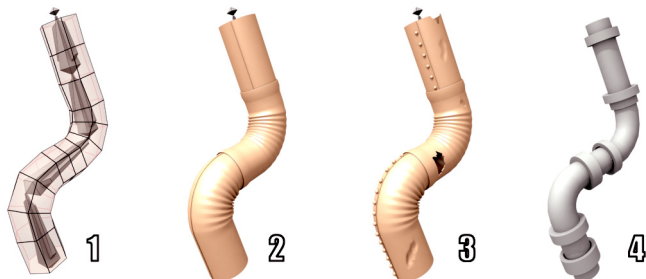
You can obtain greater accuracy by converting the Skin Morph influence to Skin modifier weights, and then tweaking the weights.

Another example of its usage is facial animation. A very-low-resolution mesh of the face can be used to drive the high-resolution face movements like cheeks, eyebrows and jaw. By doing this, you can leave the detailed animation of mouth shapes and eyelids to morph targets.

Here you can see the advantages of Skin Wrap. After the control object is skinned and animated (1), you can use it to deform the high resolution duct (2).

The duct can be modified by adding details, and you can edit the mesh without having to adjust the skinning (3).

Last but not least, the same control object can be used to deform a similarly proportioned object (4).

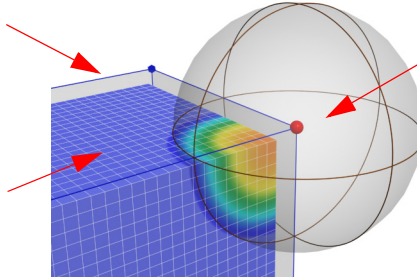


## Vertex Influence

Skin Wrap works by using the vertices of the control object to influence the vertices of the base object. Each vertex has a volume of influence that you can see and adjust.

The control object is the low-resolution mesh.

The base object is the high-resolution mesh. Skin Wrap is applied to this object.



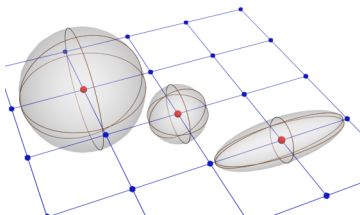
Each vertex of the control object influences the vertices of the base object. The radius, the falloff, and the scale of each influence can be customized.

*This is a conceptual illustration of how Skin Wrap works. It's not what you see in the viewport.*

## Skin Wrap User Interface

Add the modifier to the base object (high res), then select one or more control objects. With Add activated, you can pick objects from the viewport or with the Select by Name dialog.

Blend to Base Mesh and Blend Distance change the deformation method so that the base objects' vertices proximity to the faces of the control object is taken into account.

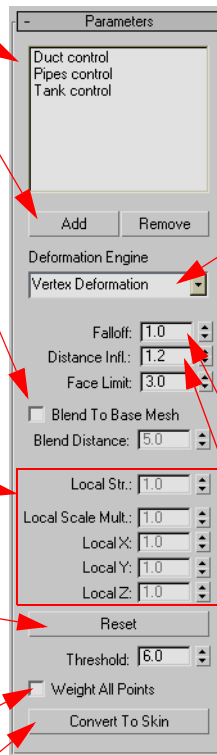


Local parameters are available only at the Control Vertices sub-object level. They are multipliers that can change the selected vertices strength and influence distance.

Reset recalculates the influences. This is done automatically when the modifier is first applied or when changes to the meshes are detected. Some other parameter changes require Reset to be performed manually. Use Reset only in the mesh resting position.

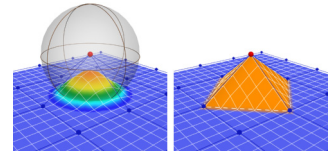
Weight All Points forces all base object vertices to be influenced by the control object.

Convert To Skin assigns new weights to an existing Skin modifier. See the reference for more information.

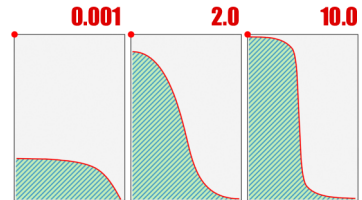


**Vertex deformation**  
Falloff=2.3

**Face deformation**  
Falloff=0.001



There are two deformation engines. The default one, Vertex, uses the vertex influence as described above. Face deformation uses the control mesh faces as the reference. Vertex deformation is a more flexible and generic method for most rigging tasks.



Falloff sets the decay of the influence by offsetting a curve. Small values have a more uniform effect, while high values affect more of the vertices closer to the vertex.

Distance Influence is the global radius of the influence for each vertex of the control mesh (see illustration at top of page). This value affects all vertices. Individual vertices can be scaled using the local settings.

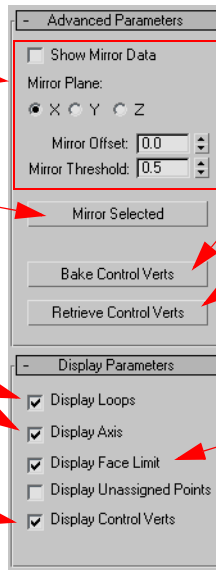
## Advanced and Display Parameters

Mirroring the vertex settings is similar to the method available in the Skin modifier. Here you can enable and set up the mirror plane.

Click here to mirror the selected vertices' settings to the matching vertices on the other side of the plane.

Loops are the circles showing the vertex influence. Axis shows the vertex normal. Loops are displayed using the vertex orientation.

This option highlights the vertices of the control mesh to make them easier to spot in the viewport.



Bake Control Verts copies the control object vertex information (currently stored by the modifier) to the actual control mesh as vertex data. Changes to the mesh topology will invalidate this data.

Retrieve Control Verts restore the vertex information saved to the control mesh, and sets them as current values for the modifier.

Vertices outside the Face Limit threshold are not highlighted when this option is enabled.

Vertices in the base mesh that are not influenced can be highlighted by enabling this option.

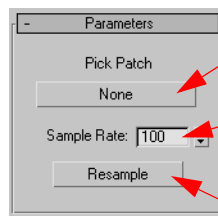
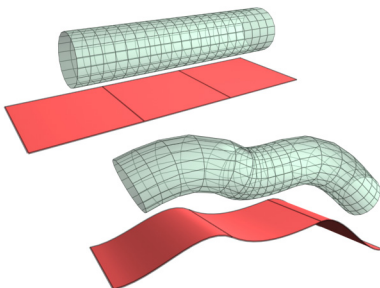
It's important to note that it's best to animate the control mesh first, so adjustments can be made and tested by scrubbing the time slider.

Also remember to use Reset only at a frame where the mesh is in the rest position, or influences will be calculated based on the current deformed mesh.

## Skin Wrap Patch Modifier

This modifier deforms a mesh based on a patch surface. It's a very simple implementation without detailed controls, yet it can provide some quick and useful effects with minimal effort.

The mesh deformation is based on the position of the mesh with respect to the patch surface normals.



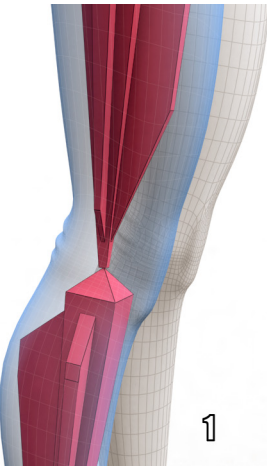
Select the patch to use as the control object.

Sample Rate defines the accuracy of the deformation. A higher value provides more accurate deformation, but the process is a bit slower.

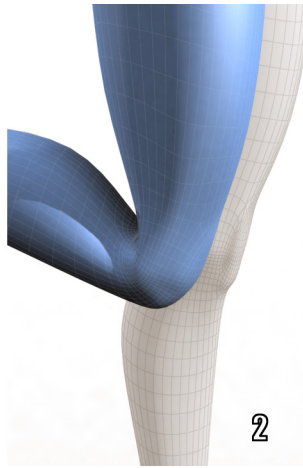
Use Resample to re-process the base object after you change the Sample Rate or modify the base object (transforms or geometry).

## Skin Morph Modifier

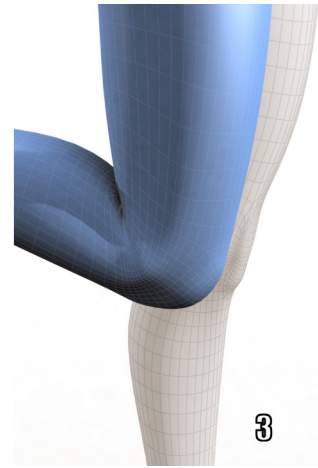
Skin Morph is a modifier similar to Morpher, but the influence of each morph target is driven by the angle between bones instead of a keyframed value.



In this example, we correct a knee deformation. The knee is rigged with Skin using the default envelopes.



The deformation needs corrections. The knee is squeezed, the kneecap didn't move, and the muscular mass loses volume.



With Skin Morph, we modified the mesh while the knee is bent to create a natural deformation. Now, the correct shape is used every time the knee bends.

Skin Morph is commonly used above Skin in the stack to correct the deformations that Skin envelopes and vertex weights alone can't handle. Once a morph has been created for a specific bone's angle, the modifier automatically uses it every time that bone approaches that angle, proportionally and weighted if other morphs exist.

Correcting deformations is not the only use for this tool. You can also use Skin Morph to add effects related to poses, like bulging of muscles or stretching of wrinkles.

### Workflow

1. Rig your model with bones, Skin (or Physique) to get to an acceptable rigging solution starting point. Don't worry about trying to get the best possible deformations; this is why we introduced Skin Morph.
2. Animate the rig to hit the extreme poses for all joints. The animation can be deleted later, but you need it now to set up the correct deformations.
3. Joint by joint, select the control bone and create morphs at the extreme positions (can be maximum bend, or maximum stretch).
4. Enter Edit mode, select each morph created, move to the correct frame, and adjust the vertices to the correct shape.
5. Exit Edit mode and scrub the time slider to test the fixes.
6. Re-enter Edit mode and repeat the process, tweak the current morph or move to another.

You might also want to consider using reference meshes for difficult deformations. See later in this topic for more information.

## Skin Morph Parameters and Local Properties

Use these two rollouts together to create your morphs. Select a bone or morph on the Parameters rollout and then edit it on the Local Properties rollout.

This list displays the bones and the morphs belonging to them. Morphs are associated to specific angles between bones.

Note that only the rotating bone needs to be added, not its parent.

Name morphs appropriately. Names help identify the morphs and their purpose.

The number in parentheses is the current percentage of each morph influence, based on the bone's angle. Scrub the time slider to see the influence at any time. See Working With Morphs, later in this topic, for details.

Add Bone lets you select and add one or more bones from a list.

Pick Bone lets you pick bones directly in the viewport.

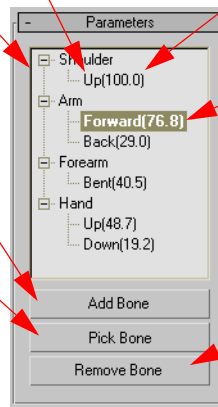
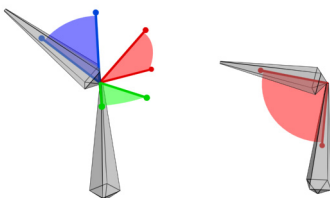
Create Morph is enabled when a bone is selected in the parameters list. Morphs are created for the current bone only.

Edit mode enters the Points sub-object level and let you adjust the vertices of the selected morph.

Individual morphs can be enabled or disabled.

Use this field to rename the highlighted morph.

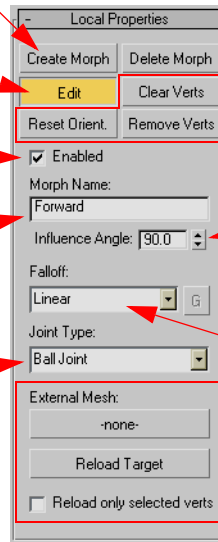
Ball joints take into consideration the angle for each axis (below, left), while Planar joints only the angle on the plane between the bones (right).



Bones and morphs in this list can be selected, and based on the selection, the Local Properties rollout updates. All the controls in the Local Properties rollout are for editing morphs, and are available only when a morph is selected, except Create Morph.

Remove the highlighted bone and all its morphs from the list.

Deletes the highlighted morph.



Clear Verts, Remove Verts and Reset Orientation are explained later in the topic, in Working With Morphs.

Influence Angle is the range around the morph orientation at creation time where the effect of the morph is progressively used. See Working With Morphs for details.

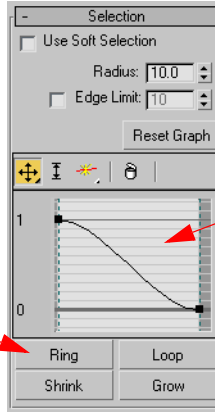
Falloff is the curve used to set the intensity of a morph influence as it approaches 100 percent. It can be one of the presets (Linear, Sinual, Fast, Slow) or Custom. When Custom is chosen, the G button (Graph) becomes available. Clicking it opens a graph editor where you can customize the falloff curve.

The usage of external meshes and their relative controls is explained later in this topic.

## Soft Selection

The soft selection in this tool is different from the one found in other mesh tools. Soft selection can be used at the Points sub-object level, to help adjusting the deformation.

Ring, Loop, Shrink, and Grow have been added.



Radius is the size of the soft selection. Same as Falloff in the other soft selection tool.

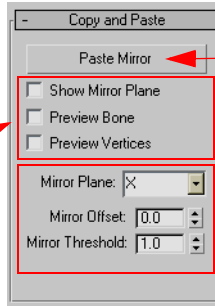
The main enhancement is a full-featured curve editor, giving you better control than only using the Pinch and Bubble settings.

For information on using the new soft-selection painting, see the Using External Meshes section, later in this topic.

## Copy and Paste

For symmetrical rigs, this tool lets you mirror the morphs assigned to one bone to the matching bone on the other half of the model.

Turn on these options to see the mirror plane, highlight the matching selected bones, and to see the vertices' projections (small red dots).



Once the mirror plane and the other settings are correct, click here to mirror the morph data.

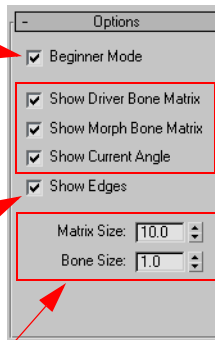
Use these settings to place and orient the mirror plane correctly.

## Options

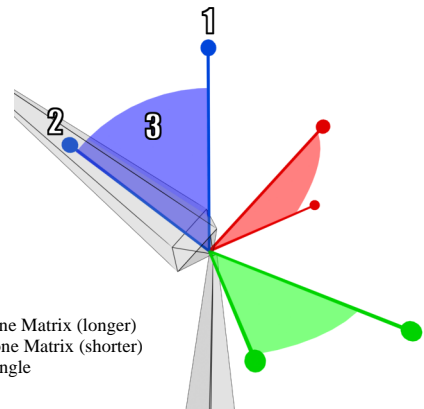
Beginner mode forces you to create morphs manually before editing deformations. When off, the software creates morphs automatically if no morph at 100% exists for the currently selected bone orientation. Vertices can be edited without entering Edit mode.

Edges connecting vertices that can be morphed are highlighted in orange. For vertex editing, it might be better to turn off this feature.

Matrix Size and Bone Size reduce or enlarge the modifier related gizmos.



You can enable or disable the display of the driver bone matrix (local axis of the parent bone), morph bone matrix (local axis of the rotating bone), and the angles between them.

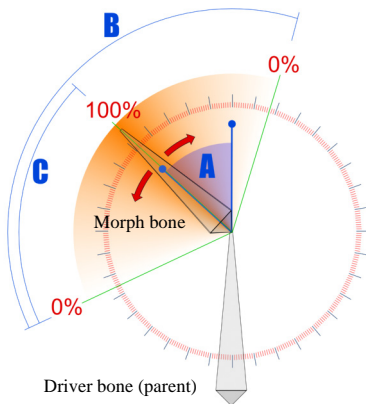


- 1) Driver Bone Matrix (longer)
- 2) Morph Bone Matrix (shorter)
- 3) Current Angle

## Working With Morphs

Now that we have seen the user interface and we know what Skin Morph can do, let's go back and make some sense of all this information.

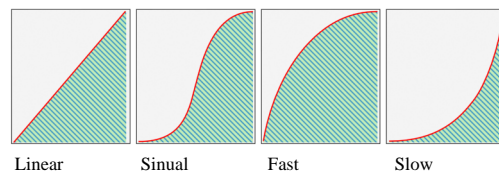
First, it's important to understand how morphs influence the mesh based on the angle between bones. We'll focus on the angle between the X axis which is parallel to the length of the bones.



**A** is the angle between the Driver and the Morph bones at which the morph has been created. This is referred as the Morph Orientation. At this point, the morph has 100% effect.

**B** is the Influence Angle. Half of this angle (**C**) before and after the Morph Orientation is the threshold where the morph starts its progressive influence.

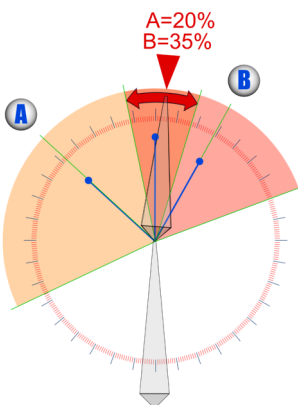
As the Morph bone approaches the angle (**A**), the influence increases based on the Falloff settings. Falloff presets are shown below, but you can design your own by choosing Custom.



A morphs is identified by its orientation angle. This is why it's important to name each morph appropriately in the list, because it would be hard to recognize it based only on the bone's orientation, especially if several morphs are assigned to the same bone.

When you create multiple morphs, each one influences the mesh based on the proximity of the morph bone to its original orientation. All the influences are shown as a percent value in the morphs list.

It's important to manage overlapping morphs using the Influence Angle and Falloff settings. The sum of the influences' percentage can be greater than 100, and at that point conflicts or overshooting of vertices is possible.

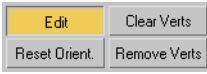


In this example, the influence angles of two morphs (**A** and **B**) overlap. At the current bone orientation, they both influence the mesh by an amount that might be acceptable or even desirable, depending of the kind of correction done by the morphs.

In cases where the overlap is more consistent, it's possible that both morphs have high influences at the same time, causing excessive distortions on the mesh.

To solve those issues, you can reduce the Influence Angle value of one or both morphs, or adjust the Falloff with a shallower curve at the beginning (as in the Slow preset).

By managing these overlaps it's possible to create something similar to a progressive morph in the Morph modifier. This is sometime necessary, because morphs created only at the extreme positions can cause imperfect deformation in the middle positions



By now, it should be clear by now what Reset Orientation does. When selected, the selected morph is assigned to a new orientation of the Morph bone.

Clear Verts repositions the selected verts, removing any adjustments made, but keeping them as part of the morph. Each morph works on a subset of vertices.

Remove Verts repositions them to the original position, and removes them from the morph subset of vertices.

## Using External Meshes

Using an external mesh is useful when the morph requires a lot of adjustments, and working within the modifier with all those viewport elements might become confusing.

An external mesh is a copy of the current deformed mesh that you can edit separately and then use to automatically reposition the vertices.

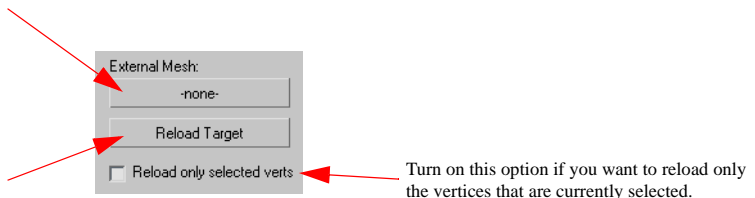
The easiest way to create an external mesh is to take a snapshot of the rigged mesh at the position that needs fixing, and then move it elsewhere in the scene.

You can create as many external meshes as you need for the various positions. Once used to create the morphs, they are no longer necessary and can be deleted.

Working with external meshes gives you access to all the Editable Poly or Editable Mesh tools, and also the new Paint Deformation and Paint Soft Selection. See the Editable Poly Enhancements topic for more information.

Click to designate the external mesh for the current morph. One mesh per morph can be used.

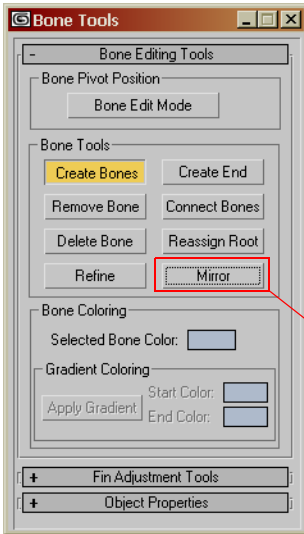
Changes to the external mesh are not automatically transferred to the morph. Use Reload Target any time you modify the external mesh.



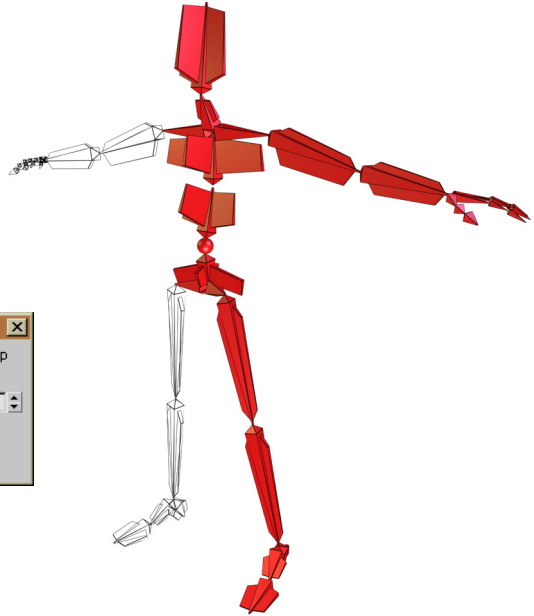
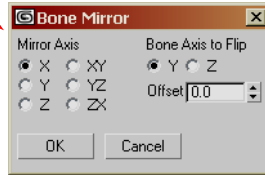
Turn on this option if you want to reload only the vertices that are currently selected.

## Accurate Bone Mirroring

Use the Mirror button in the Bone Tools to create mirror copies of selected bones without changing the sign of the bones' scale. Instead, this tool flips one of the bone axes: Y or Z.



The mirroring honors the currently active coordinate system.



## TurboSmooth Modifier



Turbosmooth is a new modifier based on the MeshSmooth modifier that retains only the most commonly used functionality. TurboSmooth focuses on what people predominantly require from smoothing and optimizes those functions for speed.

Other speed improvements have been achieved by caching, and outputting a mesh object instead of a poly object.

Even if you do need to use all the features of the MeshSmooth modifier, you can use the TurboSmooth modifier to create a temporary, approximate substitute to improve viewport response while working on the scene.

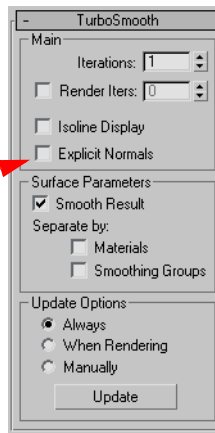
### User Interface

TurboSmooth does not allow you to select a subdivision method, as in MeshSmooth. It uses NURMS. →

Explicit Normals allows normals calculation during the smoothing process, which is faster than calculating them from the resulting mesh. Normals quality is also higher when this option is turned on.

If TurboSmooth is the top modifier in the stack, turning on Explicit Normals will generally produce faster results.

If other modifiers are higher than the TurboSmooth modifier in the stack, they might recalculate the normals. If this is the case, leave this option off.



← In TurboSmooth, you cannot manage vertices and edges at the sub-object level. Removing this and other less-used options is what makes TurboSmooth much faster but still useful for most cases.

## Unwrap UVW Enhancements

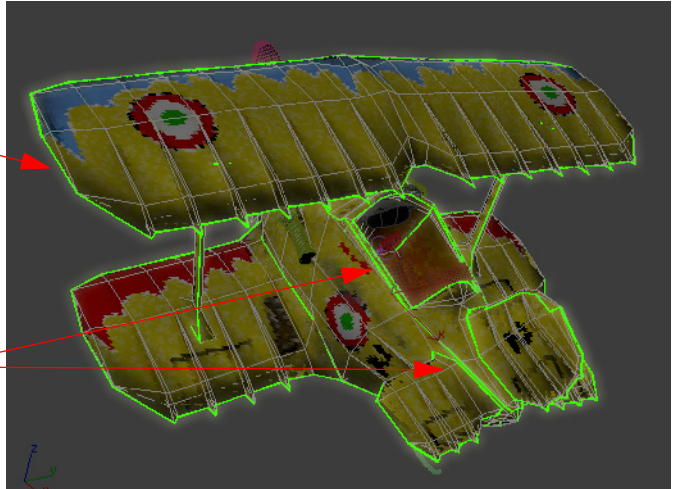
Unwrap UVW has been improved with new features that make it even more flexible.

### Open Edges Display

This new option shows the edges of mapping clusters in the Unwrap UVW editor directly in the viewport.

Edges are shown in the viewport using the same color as in the Edit UVWs window. They are enhanced in this illustration for clarity.

Seeing the edges on the actual model helps in designing the best possible mapping by matching the element's edges with the model's geometric creases.

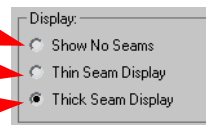


Edges are visible only when the Unwrap UVW modifier is active. This option is on by default. You can find it on the Modify panel, in the Parameters rollout.

Disables the display of the open edges.

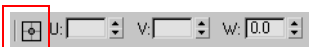
Enables the display of the open edges as thin lines.

Use Thick Seam Display to make edges more visible. Lines may otherwise be hard to see.

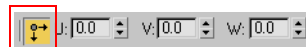


### Absolute/Relative Toggle

An Absolute/Relative toggle has been added to the transform type-in on the Edit UVWs status bar. Previously, all transforms were absolute.



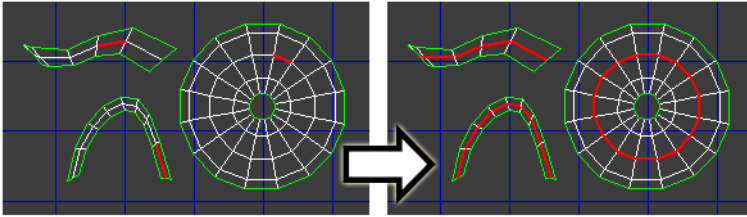
By default, transforms are absolute. Values in the U,V,W fields represent the current position in the UVW space.



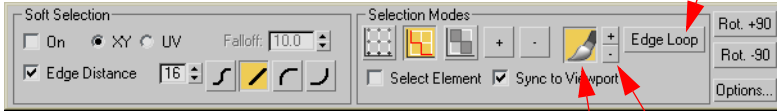
In relative mode, U,V,W values represent the offset from the original position, and reset to zero when the operation is complete.

### Edge Loop

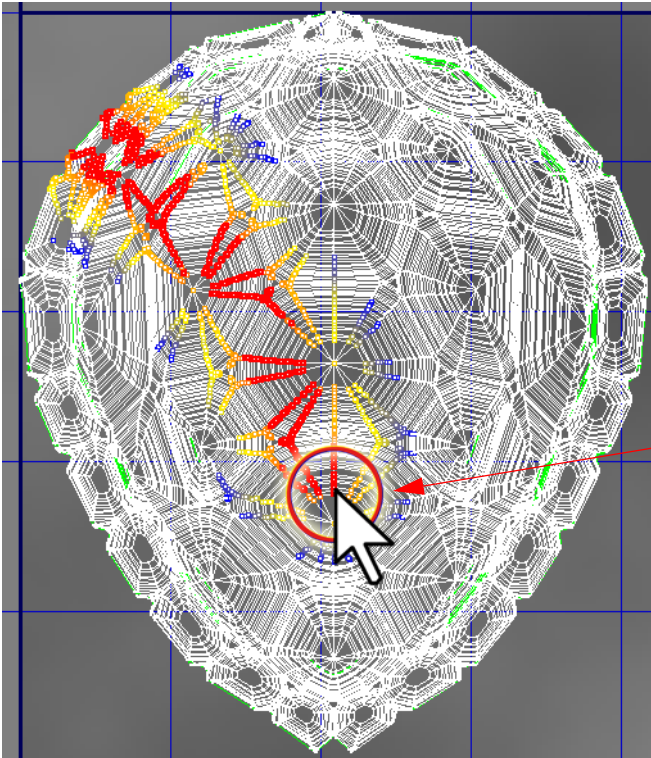
Edge Loop selects segments in a loop, similar to Loop selection in Editable Poly.



Select one or more edges, and then click Edge Loop. The selection is extended to the adjacent edges.



### Paint Selection

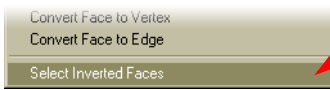


Use + and - to increase or decrease the size of the selection brush.

Click this button to enable Paint Selection. When enabled, you can select elements by simply painting with the mouse over the UV editor viewport.

The selection brush size is represented by a dotted circle similar to the new Paint Selection available for objects and sub-objects.

## Select Inverted Faces



A new option in the Select menu selects all the inverted faces in the UV space. Inverted faces have normals that point away. Most of the time, this is an undesirable situation resulting from one of the mapping methods or caused by user error.

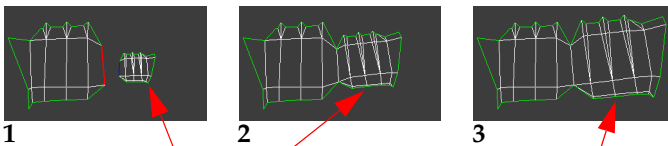
However, sometimes this is exactly what you want to see, for example, when using a map which is only half of the design, and then mirroring and overlapping the UV coordinates of half of the faces.

This option is available only in Face selection mode.

## Scale Cluster

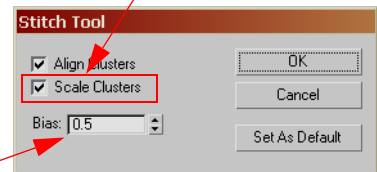
A new option in the Stitch Tool dialog lets you choose to rescale the entire stitched cluster, rather than selected edges only.

The new Scale Cluster option is on by default.



With Scale Cluster enabled, the whole cluster being stitched is resized.

Bias controls the scale of the whole cluster.

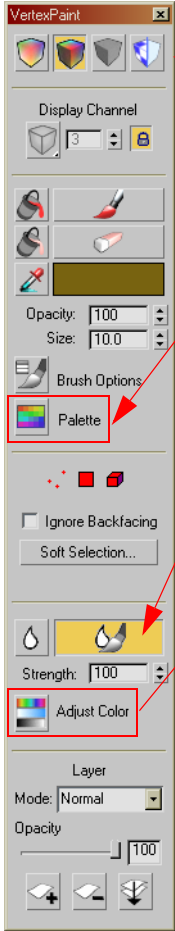


## Optimized Pack UVs

The behavior of the Pack UVs tool has been improved and generates better results than in the past.

## VertexPaint Improvements

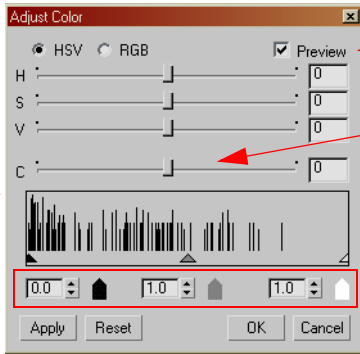
Improvements in the VertexPaint modifier include new controls in the Adjust Color dialog, a Blur Brush, and the a color palette. New controls in the Adjust Color dialog allow you to change contrast and gamma of the color of the selected vertices.



The state of the view buttons toggles to show which display mode is currently active.

The Palette is explained below.

The Blur brush lets you apply blurring by using the same brush techniques and settings that you use to apply color. This tool respects sub-object selection and the Blur Strength setting.



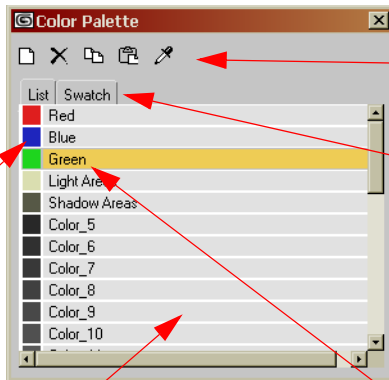
Turn on Preview to adjust the colors in real time in the viewport.

Use this slider to adjust the contrast.

Use the numeric controls for shadow, gamma, and highlights to adjust the color range. Use the histogram as a reference.

### The Palette

The Palette lets you store and reuse common or project-related color sets. The current colors are saved between sessions.



The toolbar let you create, delete, copy, paste and pick colors from the screen.

You can see colors in a List (left) or Swatch view (below). In Swatch view, the color names appear as tooltips.



Double-click a color swatch to open up the Color Selector dialog.

Colors can be saved to a file and reloaded. Right-click the colors window to access Save As and Load commands.

In List view, you can rename a color by clicking its name twice.

## Assign Vertex Color

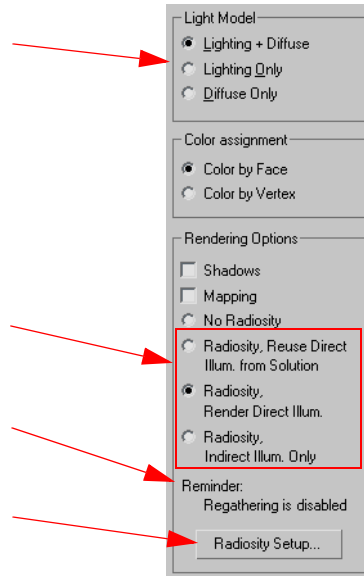
It's easier now to bake a radiosity solution into a mesh using the Assign Vertex Color utility, or the Assign Vertex Color rollout of the VertexPaint modifier.

The Light Model options have been renamed:  
Lighting is now Lighting + Diffuse  
Shaded is now Lighting Only  
Diffuse is now Diffuse Only

The Rendering Options group has options specific to radiosity. This functionality provides a more accurate baking of the radiosity solution.

Regather can affect the result when direct illumination is rendered. This message is just a reminder of the current setting for Regather in the Radiosity options.

You can access the Radiosity panel of the Render Scene dialog from here to modify any setting before starting the Assign process.





*Normal Maps* .....54  
*Camera Map Per Pixel* .....61

## Normal Maps

This topic covers the use and creation of Normal Maps. Within this topic we will also cover additional new and enhanced features about mapping, modeling, and rendering, since they are closely related to normal mapping.

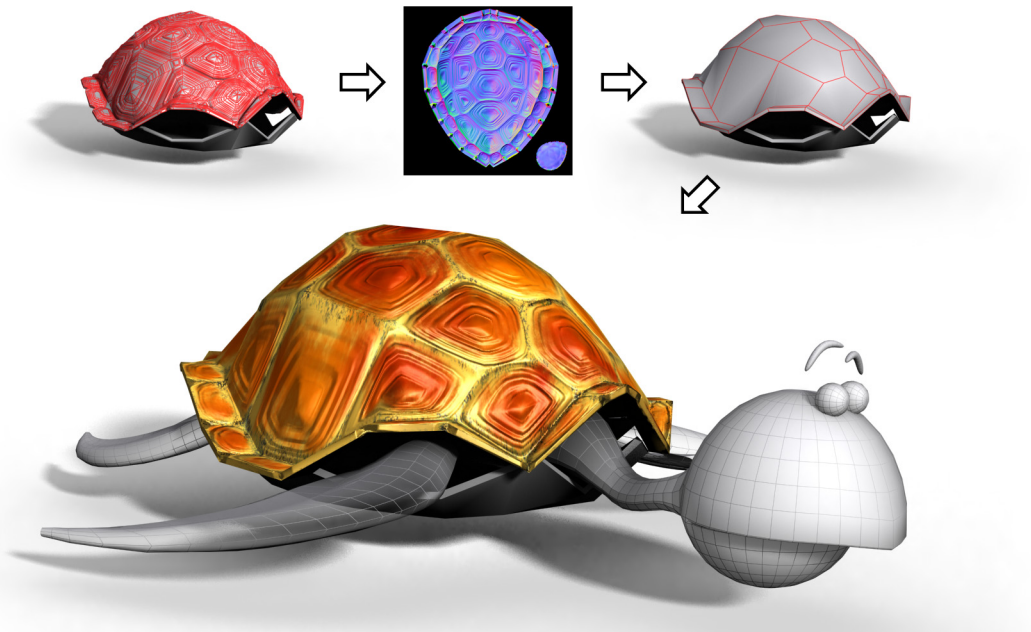
### What Are Normal Maps?

Think of a normal map as an enhanced bump map. It uses the RGB information from a texture to change the direction of an object's surface normals, but with greater accuracy and flexibility than a simple grayscale bump map.

Normal mapping is now a standard procedure used in the videogames industry as a way to simulate details on low-polygon models. Since normal maps are supported by display drivers, models with normal maps can be viewed in real time in viewports.

A high-density mesh can be used to create the normal map.

The map is then used on a low-polygon version of the same object.



The result is a low polygon object with an appearance very close to the detailed original.

The benefits of normal mapping is not limited to video games. It lets you create the illusion of extra geometry in real-time. Normal mapping can also be used effectively in rendered scenes to minimize the overall number of polygons, resulting in improved memory usage, render time, and scene navigation.

## Using Existing Maps

Let's start by describing how to use existing maps for viewport display or rendering. As we have seen, these maps use colors, not just grayscale textures, so a new map type, called Normal Bump, has been added to the list of available types, and should be used as the material Bump map.

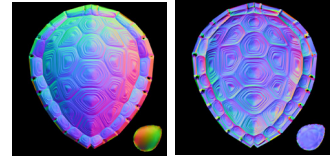
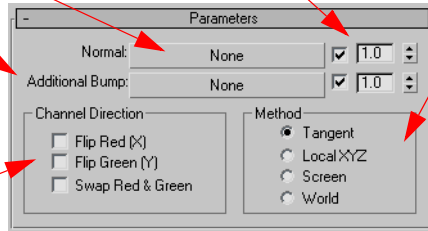
Use this button to assign the Normal map.

Use these multipliers to increase or decrease the relative effect of each map.

Method specifies how to use the RGB information in the Normal map.

An additional standard (grayscale) bump map can be added. The resulting bump is a combination of both maps.

Use these options to adjust the use of the Red and Green channels.

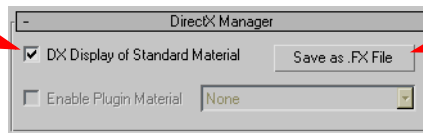


World

Tangent

If you are using the DirectX 9.0 and Pixel Shader 2.0 as the display driver, you will be able to see the Normal Bump map, thanks to the new option, DX Display of Standard Material.

When you turn on this option, the current standard material is visible as a DX shader.



You can also save the standard material as an FX file.

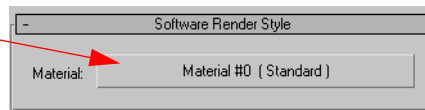
Remember to enable the Show Map in Viewport toggle to see the DX material properly. In DX material display mode, it turns pink.



Options to use DX Display and to save the selected standard material as an FX files are also available from the Material menu.

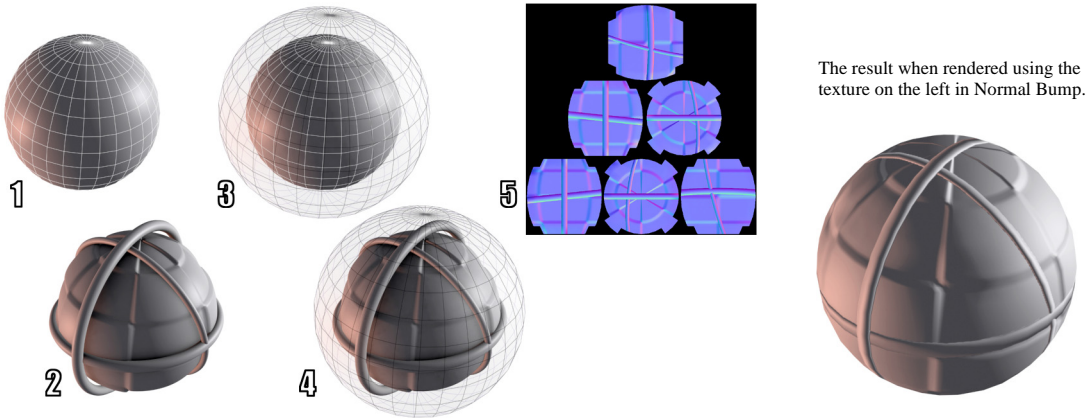
Alternatively, you can use the DirectX 9 Shader material (if your display driver is Direct3D), now enhanced and fully supporting standard materials for software rendering.

The Software Render Style rollout of the DirectX 9 Shader material now needs only a reference to a standard material. All the old options have been removed.



## Creating Normal Maps

There are various tools that work together to create normal maps. Let's look at a typical workflow and introduce them.

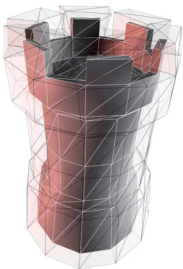


- 1 - Start with a low-polygon object that is as close as possible in shape to the high-polygon version.
- 2 - Prepare the high-polygon version of the object. External objects can be added as well when it's easier than modifying the object itself.
- 3 - Add a Projection modifier to the low-polygon object. The modifier displays a cage that can be enlarged and edited.
- 4 - Overlap the high-polygon objects and the external objects. Make sure the cage shape and size includes all the necessary geometry.
- 5 - Use Render To Texture and the new Normal Map element to create a raytraced texture based on the Projection modifier cage.

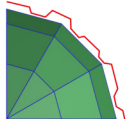
## Projection Modifier

Let's start looking at the Projection modifier. While this modifier can be automatically applied by the Render To Texture process, sometimes it has to be added manually and adjusted to tweak the result for maximum quality. It's important to understand how it works to decide whether to fine-tune the process manually or let Render To Texture do the work for you.

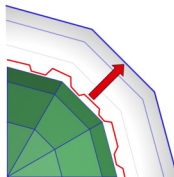
The function of the modifier is to use ray tracing to project information from one mesh to another. The cage represents the volume and the direction of the raytracing process.



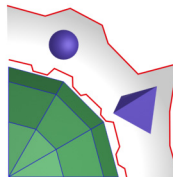
Example of a cage applied to a more complex object.



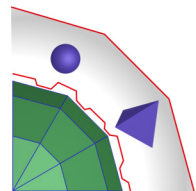
In this example we have a low-polygon object (in green) and a high-polygon object (outlined in red).



The Projection modifier cage can expand to define the limit for the raytracing.



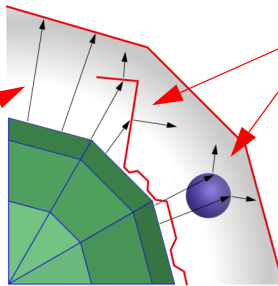
If external objects are added, the cage adapts. You can edit the cage manually the same way you edit a mesh.



If the cage is not the desired shape and projections are not what you want, reset it and shape it manually as desired.

You can use the modifier interface to let the cage automatically wrap the objects, or to reset it and edit it manually. A good cage is the foundation for a good projection.

In an example similar to the previous one, we see how the raytracing process works.



Rays are traced from the low-polygon object surface. Their intersections with the other objects within the cage are used to generate the normals.

Rays that do not intersect with other objects cannot generate normals data. You have the option to mark those areas in color. Read the Render to Texture section for more information.

## Projection Modifier User Interface

The Selection and Soft Selection rollouts give you the necessary tools to edit the cage and manage the sub-object selections.

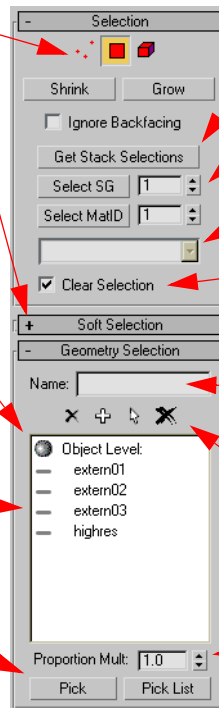
Although it looks like Vertex sub-object level, it's actually cage-editing mode. You can edit the cage as you edit a mesh or a poly object at the vertex level.

The Polygon and Element sub-object levels do not allow cage editing. They are used only to create and name sub-object selections.

Since the cage limits the volume of the raytracing, the objects that you want to use for the projection need to be added to this list. Objects not listed here, even if they intersect the cage volume, are ignored.

There can be different levels in this list. Objects can be listed based on sub-object selections.

Use Pick to select the objects from the viewport, or Pick List to choose them from a list of scene objects.



Get Stack Selections determines what is passed up from the lower modifiers in the stack.

Selection can be made by smoothing group or material ID.

If a Multi/Sub-Object material is assigned to the object, the sub-material names appear here.

Clear Selection, when off, selects sub-objects cumulatively.

Use Name to name the current sub-object selection and add a new level to the list.

The toolbar lets you delete the highlighted object in the list, add new levels, select the level sub-objects, or remove everything from the list.

Proportion multiplier is used with sub-object selections to set a size for their maps in relation with the others.

When using sub-objects or material IDs selection levels, you can restrict certain objects to affect the normals only for parts of the surface. It's common in low-polygon modeling to use material IDs for different areas of the same object.

## Projection Modifier User Interface (Continued)

The cage is visible by default. Once finalized, you can turn it off, as its mesh display can be distracting when focusing on other tasks, such as defining sub-object selections.

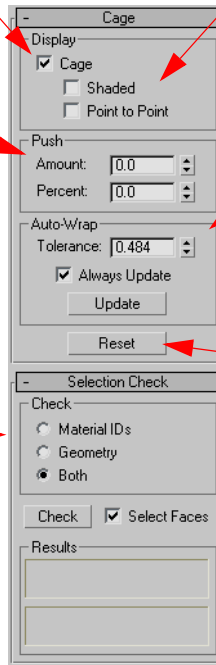
The Push group enlarges or shrinks the cage as a whole. When using Amount, each vertex of the cage is pushed by the same value. When using Percent, the push is proportional, and vertices further away are pushed more than the ones closest to the object.

This rollout provides a method to check for errors in the sub-object or material IDs selections. Click Check, and the fields below report the number of material IDs or faces that are assigned to more than one selection.

The cage display is by default a wireframe mesh. When editing the cage mesh it might be useful to use a shaded (semi-transparent) view of the mesh, or enable the point-to-point option, which connects the matching vertices of the mesh and the cage.

Auto-Wrap adjusts the cage to encompass new objects as they are added to the list. Enable Always Update to do automatic updates, or do it manually when desired. Tolerance is the distance of the cage from the geometry.

Use Reset to restore the cage to the original shape, the same as the base object.



The Projection modifier used in this context (Normal map generation with Render to Texture) is only one of the many uses of this powerful tool. So far, we've described how to project high-polygon mesh normals onto a low-polygon mesh, but you can project other types of data from one mesh to another. Projections can be used interactively.

The Projection rollout has the necessary options and the commands to execute projections interactively. See the *3ds max 7 User Reference* for more information.

## Render To Texture

Render To Texture is the step that renders the actual normal map texture. In the most simple case, you don't need to explicitly use the Projection modifier, and can let Render To Texture apply it to the object for you. This is similar to how it manages UVW mapping, by automatically adding an Automatic Flatten UVs modifier to the object. However, you'll often create your own UV mapping and will want Render To Texture use that instead of applying its own.

The same goes for the Projection modifier. It can apply UV mapping for you, using default settings, but you need to be prepared to add mapping manually and tweak it when you are looking for specific results.

## New Options

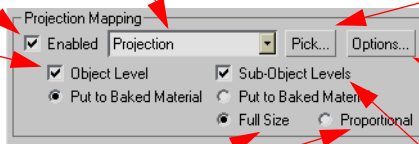
One of the major changes is the addition of a Projection Mapping group on the Objects To Bake rollout.

Enables projection mapping.

The drop-down lists the available Projections for the object.

Pick let you choose the objects to include for the projections. These are the objects that you would add to the Geometry Selection list if you added the Projection modifier manually.

Enables the rendering of the Object Level of the Projection modifier.



Opens the Projection Options dialog. See next page.

When sub-object selections are rendered individually, this option lets you choose the sizing of each. See also the Proportion Multiplier in the Geometry Selection rollout of the Projection Modifier.

Enables sub-object projections. When enabled, one texture is created for each defined sub-object selection.

## NormalsMap Texture Element

Add the NormalsMap texture element to create the normals rendering. Because normal textures go into a sub-texture of the Normal Bump map, you have an option to add Normal Bump and texture together.

If the original material already has Normal Bump, the list of the target slots shows both Normal Bump sub-maps.

The Shell material is used the same way as in previous versions of **3ds max**. Remember to enable the rendering of the baked material if you want to render the normal mapped object.

## Projection Options

This box shows the name of the highlighted object in the Render To Texture Objects To Bake List when in Individual, All Selected, or All Prepared mode. The settings on this dialog determines which objects are listed.

Synch All is available only in Individual mode. When selected, it applies the current settings to all the other objects in the Objects To Bake list.

Crop Alpha removes antialiasing from the alpha channel.

The default projection method is Raytrace, but you can set it to match the UV coordinates (in this case, both objects should have similar UV mapping).

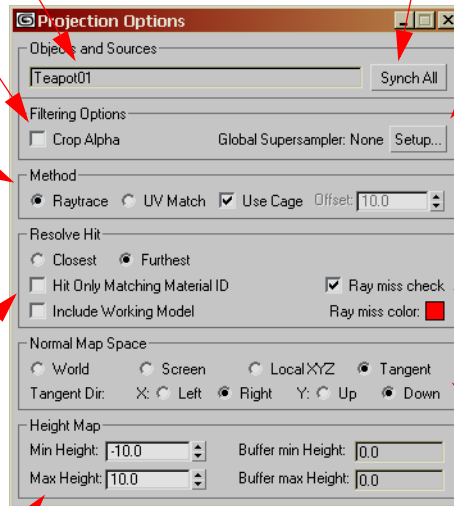
Also, the cage can be disabled, and a simple offset from the surface is used.

Projected rays can be configured to consider the closest or farthest intersection, and to ignore geometry with a different material ID.

Include Working Model adds the source object to the list of objects to raytrace.

The raytracing process can also create a Height Map and save it in the rendered image Alpha channel. The option to enable this is found in the NormalsMap specific Render Element Unique Settings.

Here you can optimize the range. Run the process once so the minimum and maximum distance can be recorded. These then appear on the right and used as a reference for fine-tuning the grayscale map.



Opens the Renderer tab of the Rendering dialog to let you set or change the global supersampling settings. Supersampling is important for smooth edges in the Normal map.

Turn on Ray Miss Check to mark rays that do not intersect geometry with the color specified.

Normal maps can record the normal direction as an absolute value in World space, Screen, Local XYZ, or as deviations relative to the local coordinates or surface tangents (default).

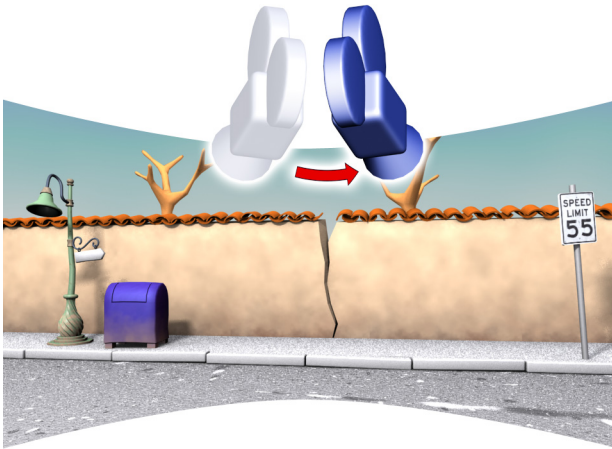
## Conclusion

Raytraced Normal Mapping creation is not an easy task. It might take a while to understand exactly how all the aspects of this process fit together, especially since it involves interaction between many tools. But once you understand how it works, this system is extremely flexible and powerful, and it gives you the ability to generate all your normal maps quickly and efficiently.

## Camera Map Per Pixel

This map is a new and powerful way to project maps onto a model. Specifically, it was designed to allow matte painters to add details to a rendered image and then to bring that modified image back into the scene.

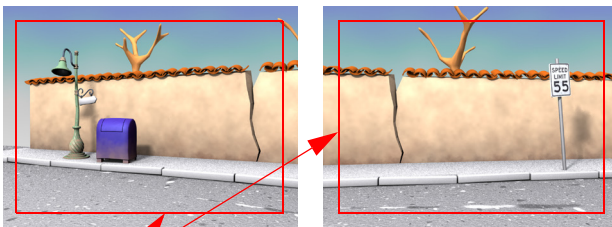
The most powerful feature of this new map is the ability to blend different matte paintings seamlessly into the scene, allowing for the wide background matte painting to be seen through a panning camera.



To understand how to use this new map, we need to look at an example. The map itself is just a part of the process to achieve the effect, and deconstructing the example is the best way to learn.

### Initial Setup

This image represents our scene: a wide background, and a camera panning left to right. The starting scene has only some basic procedural texturing. The goal is to let the matte artists improve it with 2D tools, and then use their files to reconstruct the scene background.



Panning camera field of view

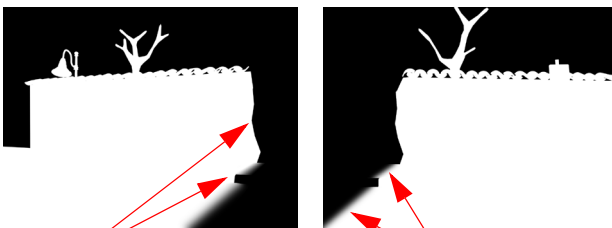
Static camera's wider fields of view

### Step 1

The first step is to choose two or more points of view from the panning camera that slightly overlap. Together, these points of view should cover the whole background.

In our case, two points of view are enough: one at the beginning and one at the end of the pan.

We then make two fixed clones of the camera at those frames, enlarge their fields of view a few degrees (we'll explain the reason for this shortly), and render two high-resolution images from the two cameras.



Mask matching existing edges

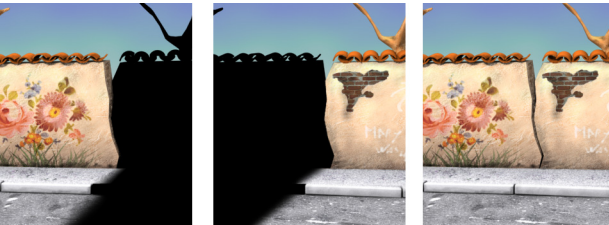
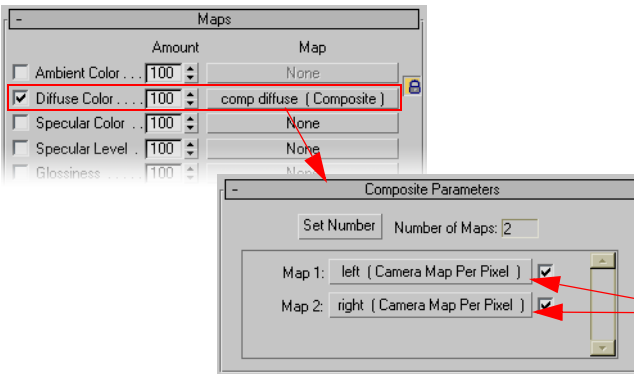
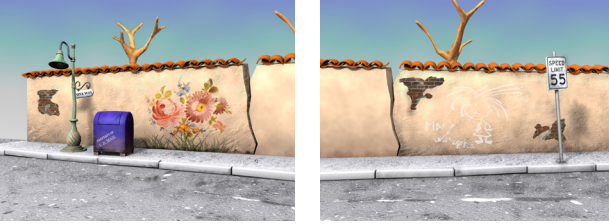
Blurry mask for flat surfaces

### Step 2

The second step is to create the masks, or alpha channels, to separate the areas that each matte paint covers.

Whenever possible, follow a hard edge of the background model.

If there is no edge, use a blurred mask to fade the two matte paintings into each other. Details in those areas should be patterns that can be blended.



### Step 3

Matte painters can now take the high-resolution images and modify them, using the masks as a guide for the area covered and the blending areas.

If the camera is panning, but not moving in space, even objects that appear 3D from that point of view can be painted.

Shadows and lighting can be adjusted too.

For moving cameras, see later in this topic.

### Step 4

With the matte paintings finished, it's now time to use them in the scene with Camera Map Per Pixel.

The scene needs to be modified. All the objects that need to use the new matte must be assigned a single material: 100 percent self-illuminated, with a Composite map assigned as the Diffuse map.

All the lights in the scene should be turned off or deleted. Lighting is now embedded in the projected map.

Advanced Lighting and Exposure Control should also be turned off.

The Composite map will have as many maps as the matte paints (and fixed cameras) created for the scene coverage. Each map will be a Camera Map Per Pixel, using the matching camera/matte/mask elements. See the User Interface page for details.

### Step 5

Check the individual projection from the final point of view of the panning camera, looking for perfect matte coverage and blending.

Sometimes small areas might not be covered, and the mattes need to be redone with a larger field of view, or aimed at a different location.

To avoid having to create the mattes twice, it might be a good idea to first test the coverage with some quick mattes, perhaps using the images with a pattern overlay.

### Final Result

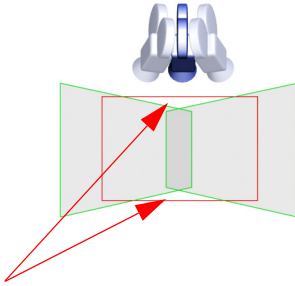
And here is the final result, with the two matte paints seamlessly covering the entire background.

Note that this tool is for creating backgrounds. Other objects in the scene are unable to cast shadows on the self-illuminated objects.

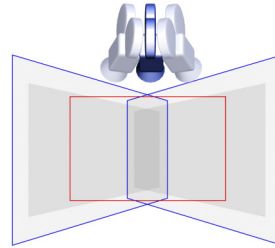
Background scenes created this way can be used for compositing.

## The Field of View

The area covered by a panning camera includes small areas not completely covered by the fixed cameras used to create the mattes. This is why we need to render a bit more all around.



In a scene similar to our example, you can see that the left and right static cameras' fields of view do not cover what the panning camera sees when it's moving between them.



Increasing the static cameras' fields of view slightly gives us the coverage needed. With more complex camera moves, it might be better to use a third static camera rather than increasing the field of view too much.

## Considerations For Moving Cameras

Within certain limitations, this technique can be applied to moving cameras as well, but they add a level of complexity.

First, since these maps are projected from the static cameras onto the scene objects, if any object is in front of another, its projection also appears on the rearmost object. You can solve this by using two projections and blending them behind the object in front, or by removing the front object and then compositing.

Occluded surfaces are also a problem. Surfaces not visible from one point of view become visible when the camera moves. You need to plan your camera projections appropriately, and might need to use more complex masks.

## Other Possible Uses

You will probably find other ways to use this tool. For example, a simple box or pyramid can be mapped by two opposed cameras placed so that two sides are visible from each camera. A moving camera will then be able to fly around the object and see it from any direction.

But if the object is a complex model, the problems of projections of foreground objects to background ones, or occluded surfaces can be difficult to manage, and other mapping solutions might be better suited.

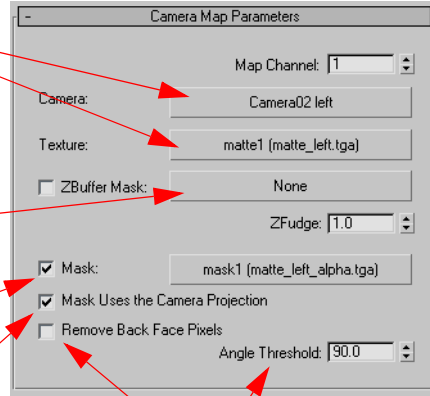
## User Interface

Specify the camera and the matching texture that was originally created using that camera for rendering. Do not change any of the camera parameters used for the projection, otherwise it might not match the scene. Make sure your textures are not tiled, or they will not project correctly.

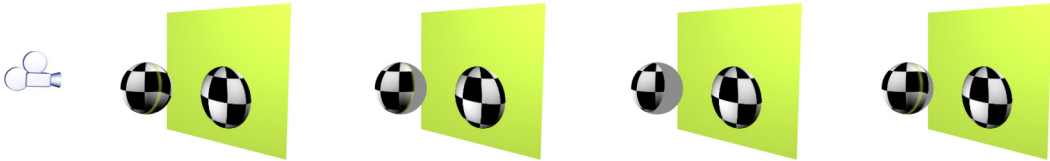
The ZBuffer Mask is an RPF or RLA file that can be used to mask surfaces based on their distance from the camera. It can help solve some specific situations.

The Mask checkbox and slot is for the matte mask. White areas are visible, black areas are not.

The mask can use the same projection as the texture, as we saw in the example, or use the object UV coordinates. In this case, the mask has to be created as a UV mapped mask with other techniques.



Remove Back Face Pixels excludes the surfaces facing away from the camera. Angle Threshold sets the angle at which the normals are considered as facing away. See the images below.



In this example we see a simple map projected back into the scene objects from the same camera that created the original texture.

With Remove Back face Pixels enabled, the projection excludes the faces on the other side of the camera.

Example with Angle Threshold set at 75.

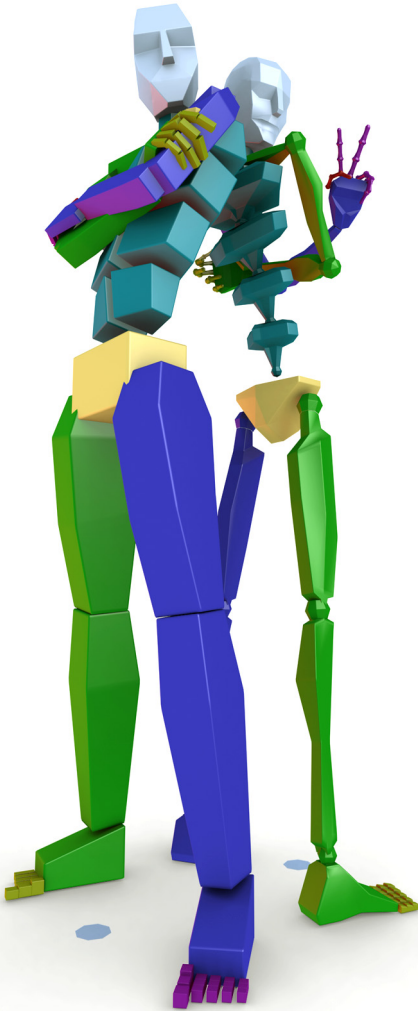
Example with Angle Threshold set at 110.

All cameras in the scene use the same rendering aspect ratio. Make sure you render all the images for the mattes and for the final rendering using the same ratio.

<i>character studio</i> .....	66
<i>Biped</i> .....	67
<i>Crowd</i> .....	68
<i>Physique</i> .....	68
<i>Custom Attributes</i> .....	69
<i>Parameter Editor</i> .....	69
<i>Parameter Collector</i> .....	72
<i>Reaction Manager</i> .....	76
<i>Expose TM Helper</i> .....	79

## character studio

**character studio** has been available as a separate plug-in for **3ds max** for quite some time, and is a mature product, currently at version 4.3. From this version of **3ds max** forward, it's included as part of the application.



**character studio** is a complex system comprised of three components: Biped, Physique, and Crowd.

**character studio** adds a wealth of character-animation functionality to **3ds max**, and has proven very successful for a variety of users, from the big game developer to the single user who does not have the time to create his own character rigs.

### Documentation

It's not officially a new feature, and most users are probably already familiar with **character studio**. Extensive documentation, samples, discussion boards exist and cover all aspects of it.

The complexity of **character studio** can't be summed up in a few pages, and in this new features guide we can't cover all of its capabilities.

If you are a new **character studio** user, the next pages provide an overview of the components and features.

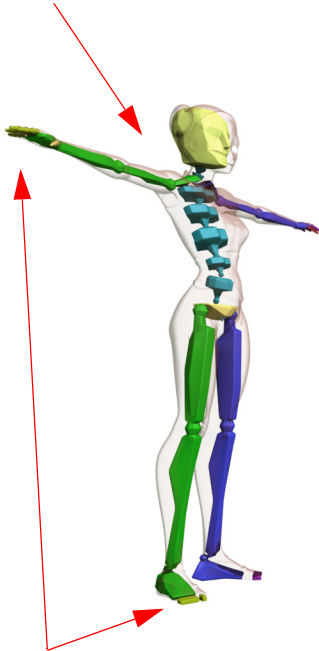
For more in depth documentation, have a look at the *3ds max 7 User Reference*, where you will find plenty of information about the features. You can also go through the tutorials and a case study about the crowd system on the Tutorials CD.

Above, you see Biped, the distinctive, prefabricated character rig of **character studio**. It exists in two forms: classic (in front), and skeleton, to represent the character as a volume or as more basic structure.

## Biped

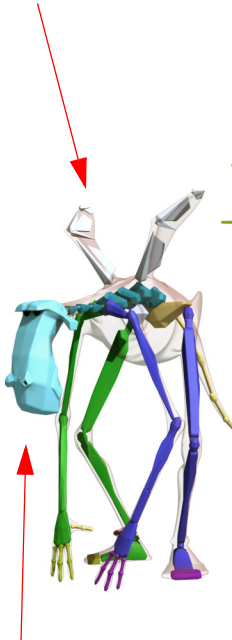
The major and most recognizable component of **character studio** is Biped, a generic rig for human-like characters, but flexible enough to be customized and fit into characters of a variety of shapes, including quadrupeds, or birds with reverse knee orientation.

The default Biped is proportioned like an average human being.



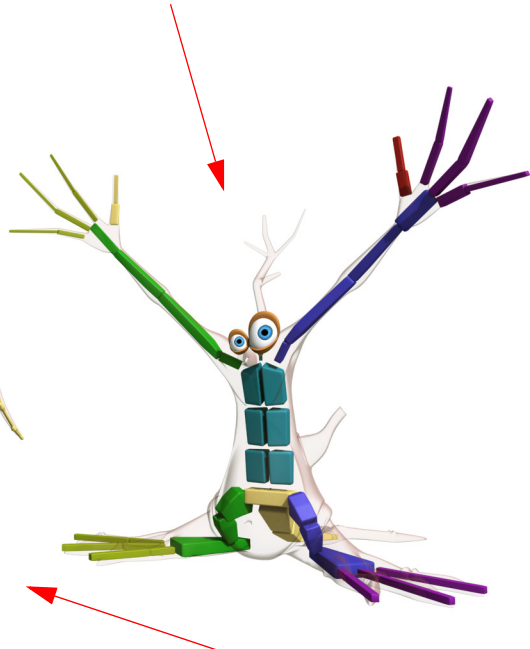
You can customize the number of fingers on the hands and feet, the number of neck, spine, tail and forearm segments, and other parts.

You can attach extra objects or bones to the basic Biped, such as these wings.



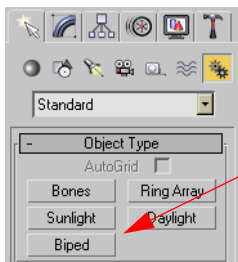
Customization can go beyond simple scaling of the skeleton components. In this case, the head is reshaped to match the character's head, so that you can perform accurate animation with only the skeleton visible.

Biped works with different body types. Just scale its components and pose it appropriately.



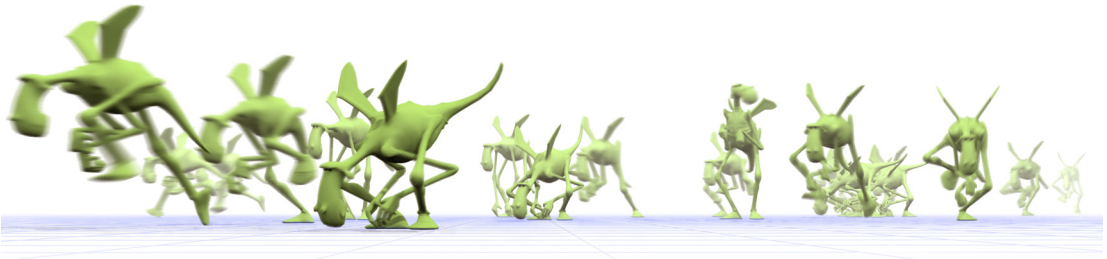
IK on both legs and arms allows for the use of Biped on quadrupeds. This character was designed to switch between two- and four-legged walks at any time.

Biped includes a wealth of features. The rig automatically balances itself when you bend the spine. You can animate walks with footsteps placed on the floor. Motion capture clips can be loaded, mixed with the powerful Motion Mixer, and edited to create new animation sequences.



To create a Biped, activate Create panel > Systems > Biped and drag in a viewport as you would to create any other object in **3ds max**. Once the default Biped is created, you can customize it and fit it into your character.

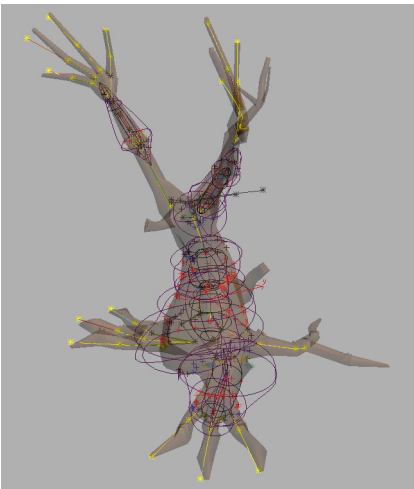
## Crowd



The Crowd system can create hordes of characters or simple objects based on specific behaviors that you set.

When used with characters, the motion of each individual character is created by mixing specific motion clips prepared in advance. These clips give the character the ability to turn, stop, and restart, so that it can participate in the crowd and avoid hitting other characters.

## Physique



Physique is a modifier similar to Skin, but with extra features like tendons and bulges to better control how the underlying skeleton affects the mesh.

It also gives you more control over the envelope deformations.

Envelopes are affected by a set of splines, called links, that smooth the deformation at the joints.

Physique is not required when using Biped. It's just an alternative skinning system. You can also use the standard Skin modifier.

## There's More

We've barely scratched the surface of **character studio**. There is a lot more that can be done, like loading and cleaning motion capture data, managing clips, mixing them, and creating accurate transitions. We invite you to read the comprehensive documentation provided in the reference and the tutorials to find out more!

## Custom Attributes

Custom Attributes have received an overhaul in this release, improving the way they are created, managed and assigned to scene objects.



You will find two tools in the Animation menu: Parameter Editor and Parameter Collector.

Parameter Editor enhances the Add Parameter dialog from previous versions, while Parameter Collector is a new tool.

## Parameter Editor

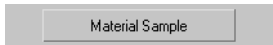
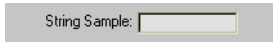
The Add Parameter dialog is rearranged, extended, and renamed to Parameter Editor to reflect added functionality.

It is now the place where you can create, edit and manage custom attributes for all objects.

You can now add parameters to specific animation tracks of an object, edit their appearance, and rearrange them.

## New Parameter Types

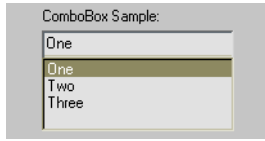
The following Parameter Types have been added:

Type	Description	UI
Angle	A floating-point value with default range of 0.0 to 360.0.	Standard spinner or slider
Material	Displays a button that opens the Material/Map Browser to select a material or a map.	
Percent	A floating-point value with default range from 0.0 to 100.0.	Standard spinner or slider
String	Provides a text field for string input.	
WorldUnits	A floating-point value with default range from 0.0 to 9999999.0 displayed using the Display Unit Scale settings.	Standard spinner or slider

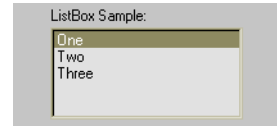
## New UI Types

Two new UI elements have been added for the Array parameter type: ComboBox and ListBox.

ComboBox

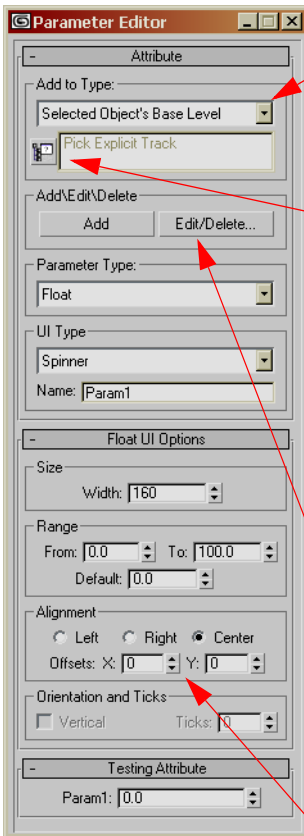


ListBox

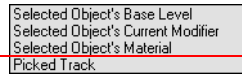


## Parameter Editor User Interface

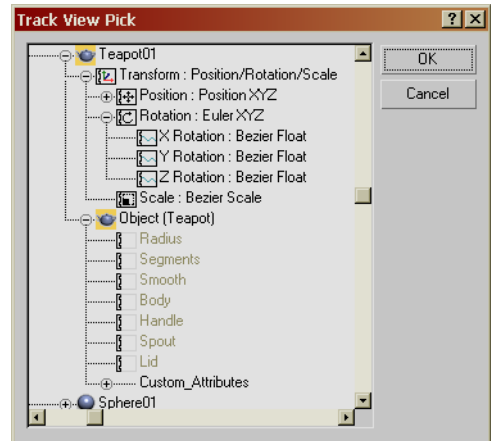
Parameter Editor is an improved version of the Add Parameter dialog. Here we describe only the differences and the new options.



The selection of the level at which the custom attribute is assigned has been moved to the top. A new level choice, Picked Track, allows you to apply a custom attribute to a specific track.



When Picked Track is active, the dialog below appears and allows the selection of the track. Non-assignable tracks are unavailable. The Pick Explicit Track button also brings up the same dialog. It's available also if an object is not selected, and you can select a track from other objects in the scene, or global tracks.



Edit/Delete opens a dialog displaying attributes for the current selection level that can be modified or deleted. This dialog is described on the next page. The Edit/Delete button is unavailable if no custom attributes exist for the current selection.

Offsets gives you the ability to move the control for exact positioning.

## Edit Attributes/Parameters Dialog

This dialog lists the attributes for the current object level or track, and works together with the Parameters Editor.

With this dialog active, highlight the parameter you wish to edit, and then change the settings in the Parameter Editor dialog.

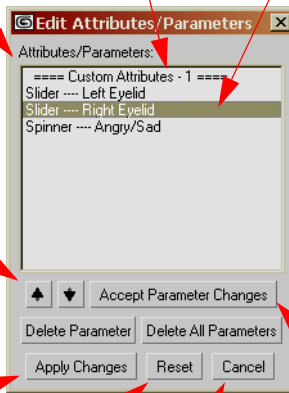
The parameters shown are the ones specified at the selection level in the Parameter Editor dialog (Base Object, Current Modifier, Material, Picked Track).

Custom Attributes for a base object are collected in containers. You might have more than one container. See Collapsing An Object, later in this topic.

Choose the attribute to edit from the list. The Parameter Editor displays the attribute parameters and allows you to change them. The level to which they are assigned and that the Parameter Type can't be changed. Only appearance, default values and limits (depending on the parameter type) are editable.



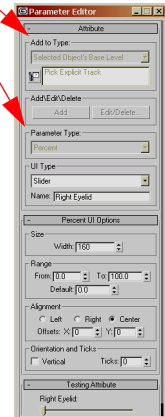
Move the selected parameter up or down in the list using these arrows. The order is the one used when displaying the parameters on the command panel, as seen above.



All changes (to any parameter and to the order of the parameters) are temporary until you click Apply Changes. Only then are the changes applied and the command panel updated.

Reset undoes all the changes since the last selection of Apply Changes. The dialog remains open.

Cancel closes the dialog. Remember to select Apply Changes to confirm the edits, or every change since the last Apply Changes will be lost.



Changes to any individual parameter are temporary until you click Accept Parameter Changes. This allows you to keep the changes to that parameter and edit another one. But changes are still not applied to the original attributes until you click Apply Changes.

Remember that deletions and other edits are temporary, and attributes are deleted only when you click Apply Changes.

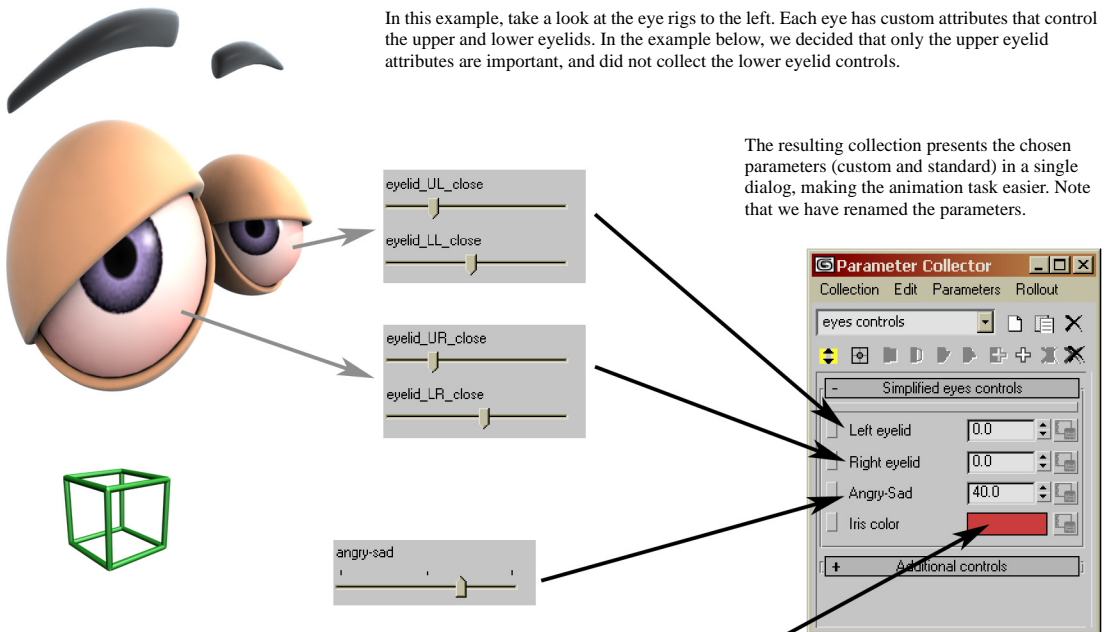
If you delete all parameters, the attribute container is removed as well.

## Parameter Collector

Parameter Collector is a new tool that groups custom attributes and animatable tracks, and presents them to the user in a more meaningful way.

You can assign custom attributes to the base object, a modifier, or a track. Working with the “raw” custom attributes might make sense to a Technical Director creating a rig, but the animator may want a more friendly view of those attributes: coherent, in context, and easy to use.

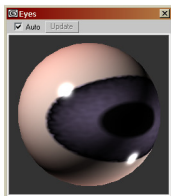
The Parameter Collector solves this problem by letting you group specific parameters from one or more objects into a single dialog, rearranging, renaming, and adding notes and other features to the individual parameters.



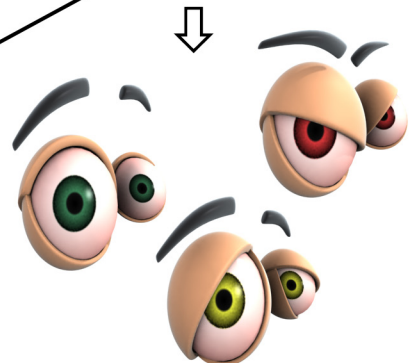
In this example, take a look at the eye rigs to the left. Each eye has custom attributes that control the upper and lower eyelids. In the example below, we decided that only the upper eyelid attributes are important, and did not collect the lower eyelid controls.

The resulting collection presents the chosen parameters (custom and standard) in a single dialog, making the animation task easier. Note that we have renamed the parameters.

A Dummy object is used as a reference for the eyes rigs, and can have custom attributes that affects more than one object. In this case, the rotation of the eyelid works together to create an angry or sad expression.



The eye material is procedural, and the iris color is determined by the red channel of an RGB Tint map. Even though this is not a custom attribute, it's a track that can be added to the collection.



## Parameter Collector User Interface

The Parameter Collector dialog is where you create, manage, and use the collections. All the collections in the scene are listed and can be selected for use or editing.

This list allows you to name collections and switch among them. Sets of collections can be managed from the Collection menu by associating them with scene objects.

These three buttons create a new unnamed collection, duplicate, or delete the current one. Deleting a collection that has been associated with a scene object does not remove it from the object, only from Parameter Collector.

The menus duplicate the toolbar options, but also have additional options available. See the next page for details.

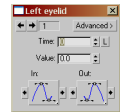
The toolbar has the most common commands. The toolbar details are explained below.

Use this toggle button to select one or more parameters. Many commands act on the selected parameters. They are identified by a yellow mark in the toolbar button. Make sure your selection is always correct. You can rearrange selected parameters by moving them up and down using the arrow buttons in the toolbar.

Each collection can have multiple rollouts. Use them to group parameters appropriately, break up long lists, or to separate frequently and rarely used parameters.

Use this long toggle button to select the current rollout. You can reorder rollouts by dragging them vertically.

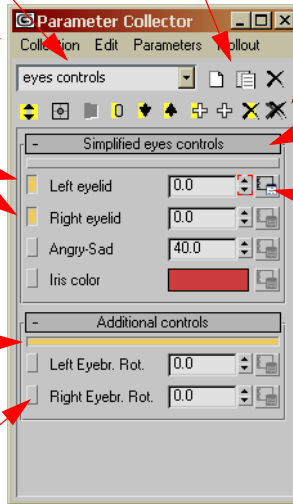
When a parameter is animated, this button is available and gives you access to the controller keys properties.



When you right-click a parameter selection toggle, you access the Notes dialog. See below for more information.

**Notes:**  
You can select only one rollout at a time, but you can select multiple controls, even on different rollouts.

Slider and array parameters are changed into spinners. Arrays are accessed by their integer index only.



## The Parameter Collector Toolbar

**Multiple Edits:** When on, editing a parameter also changes all the other selected parameters of a similar type. Changes are always relative for parameters with numeric values, while they are absolute for colors.

**Absolute/Relative:** When on (Relative), fields are zeroed and entered values are treated as offsets from the original values.

**Key Selected:** When clicked, creates keyframes for all selected parameters. Available only when animating.

**Reset Selected:** Sets all selected numeric parameters to zero.

**Move Parameter Down/Up:** Moves selected parameters down or up in the list. Parameters move only within their rollouts, and only if they have space to move to a new position.

**Add To Selected Rollout:** Opens the Track View Pick dialog to select a parameter or track. Selected parameters are added to the selected rollout.

**Add To New Rollout:** Like Add To Selected Rollout, but the selected parameters are added to a new rollout.

Deletes selected parameters.

Deletes all parameters and rollouts.



## The Parameter Collector Menu Bar

The toolbar options are also available from the menu bar, but menus also have additional tools. Menu options are enabled or disabled depending on whether the current selection (parameters or rollouts) is appropriate.

### Collection Menu

Two important set of commands are found in this menu:

The first set shows or isolates all or just the selected keys in the track bar. These options activate the proper track bar filters so that only desired keys are visible.

The second set associates the collection with a specific scene object and retrieves the collection. Use these options to manage related collections and merge objects into other scenes. Collections can be merged only when associated to a scene object.

You can specify that one particular object gathers all the collections related to a rig. When you use Put To Object to associate the collections with an object, you can then delete them from Parameter Collector, and retrieve them at any time by using Get From Object.

### Edit Menu

Additional options include the ability to select all or none of the parameters, invert the selection, or select all the parameter in a single rollout.

### Parameters Menu

Adds the options to move a parameter up or down to the previous/next rollout, and to reset all the parameters.

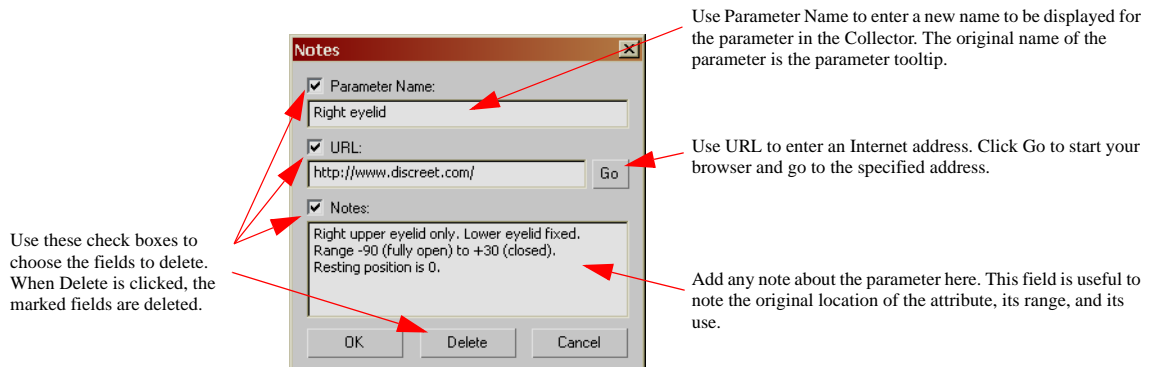
### Rollout Menu

Lets you rename the selected rollout, to create a new empty rollout, or to create a new rollout and populate it with selected parameters.

Also, you can delete a rollout and move its content to the previous or next rollout, so that the parameters are not lost.

## Parameters Notes

The Notes dialog appears when you right-click a parameter check button.



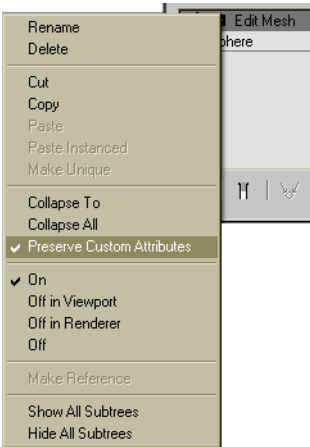
## Other Tracks

As we already mentioned, Parameter Collector is not limited to custom attributes. You can also add tracks (such as Position, Rotation, Scale), colors, and specific objects attributes (such as Radius, Segments, etc.) to the collection.

This ability makes collections more than just a way to organize custom attributes, but a way to present all animatable parameters for one or more objects in a quick, compact and flexible user interface. No need to traverse stacks and rigs. Everything can be organized into collections and assigned to a single node in a rig.

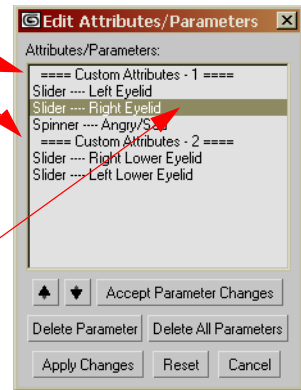
## Collapsing An Object

When you collapse an object's modifier stack, you can maintain its custom attributes. They are grouped into a new container. Objects can have multiple Custom Attributes containers.



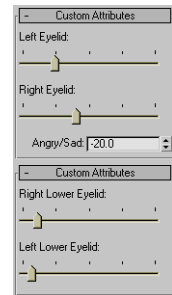
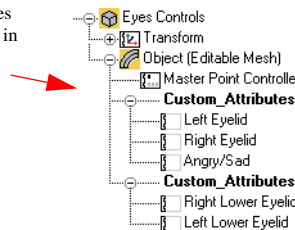
This new option in the modifier stack right-click menu allows you to specify whether custom attributes are to be maintained and moved to the Base Object, or deleted when an object's stack is collapsed.

Here is an example of an object with multiple containers as they are displayed in the Edit Attributes/Parameters dialog. Each container has its own set of parameters.



Selected parameters can be moved up or down only within their container. If a container is selected, you can move it up and down relative to the other containers.

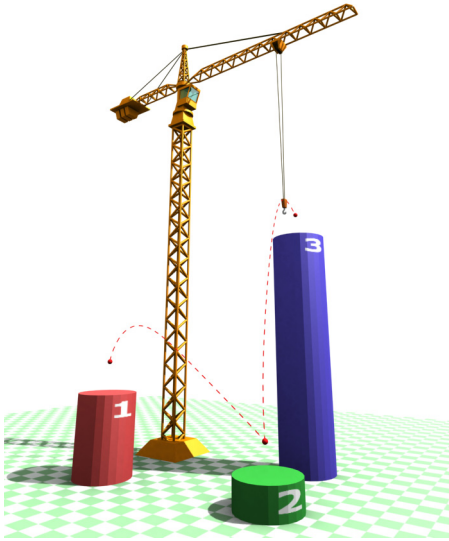
Multiple Custom Attributes containers are also visible in Track View and on the Modify panel.



## Attribute Holder Modifier

The only purpose of this modifier is to act as a container for custom attributes. It's sometime useful to keep custom attributes for an object separate from the base object or other modifiers. For example, you can copy and paste this modifier to other objects to quickly duplicate the custom attributes assigned.

## Reaction Manager



Reaction Manager is a new interface for managing interactions among different objects.

Reactions were previously managed by the Reactor controllers through a very basic user interface. These controllers are still used, but have been renamed to Reaction controllers to avoid confusion with reactor, the integrated dynamics engine.

The new Reaction Manager solves the problem of managing numerous reactions, and makes the process not only easy, but even more flexible and powerful.

You can start Reaction Manager from the Animation menu. The Reaction Manager dialog handles all the reactions in the scene from a single location.

### Managing Reactions

A reaction is a way to affect one parameter by changes made in another. The controlling parameter belongs to the master object, and is managed by the user. The affected parameters belong to slave objects, and their controllers are replaced by Reaction controllers (Position Reaction, Rotation Reaction, Scale reaction, Float Reaction, and Point3 Reaction) and automatically managed.

You can use a single master parameter to control parameters of any number of different slave parameters. Each combination of master/slaves is a reaction. The user then defines additional states for each reaction by setting the master/slave parameters and recording specific sets of values. Every time the master assumes that value, the slaves assume the recorded set of values, and the interpolation is managed automatically.

Reaction Manager provides a unified interface that allows you to view, edit, and manage all these potentially complex interactions. In Reaction Manager you work with objects and parameters only. Controllers are automatically assigned, reactions and states are grouped appropriately, every parameter relationship can be fine-tuned, and interpolation can be customized.

### An Example

The best way to understand Reaction Manager is to analyze a scene. The following example uses the crane scene from the opening illustration. The Reference and the Tutorials have more examples.

## Analyzing the Crane Scene

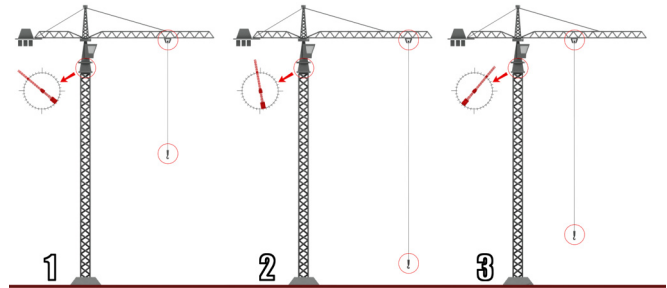
To position the hook over a platform, the crane needs to assume a specific combination of positions: arm rotation, slider position on the arm, and hook elevation.

To automate the animation process, we decided that the slider position and the hook elevation can be calculated based on the arm rotation. If that can be automated, the user needs only to animate one parameter.

This is an excellent opportunity for using reactions. Use the arm rotation as the master, and the slider position and hook elevation can be driven by the rotation of the arm.

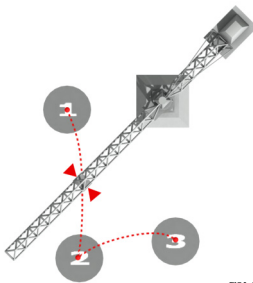
The arm rotation around its Z axis becomes the master parameter. The slider Y position and the hook Z position will be the Slaves.

The three illustrations show the states. Each state is a record of the correct position of slider and hook for a specific arm rotation to position the hook over a platform.



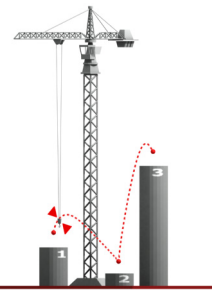
Once the states have been recorded, you can test the reaction by changing the master parameter, either interactively or by animating it.

By default, the interpolation between the recorded values is linear. Reaction Manager provides a curve editor to customize the interpolation.

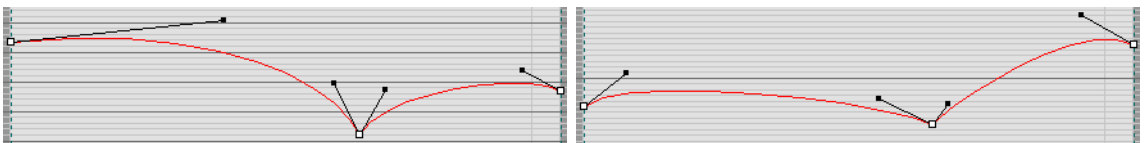


Slider Graph and trajectory

Here you can see how the edited interpolation graphs affect the trajectories of the slider and the hook, giving them a more natural motion, especially when raising the hook above the platform before lowering it into the right position.



Hook Graph and trajectory



Now we can look at the Reaction Manager user interface using this sample scene to see how it works. Read the Reference for a more detailed description of the user interface, since there are many controls and right-click menus available that are not described here.

## Reaction Manager User Interface

The Master objects need to be added first using the black “+” button. Click “+” and then select the object from the viewport or the selection dialog. A cascade menu appears allowing you to select the master object parameter track.

Once the master object/track is in the list, highlight it to enable the gray and white “+” buttons to add one or more slaves. Use the cascade menu again to select the slave object parameter track. The gray button lets you pick the objects and the white button adds all the objects currently selected.

The Reactions list shows the available reactions in the scene (all, or just the ones relative to the selected objects if Show Selected is enabled). Each reaction is a group of one master and one or more slaves. Each item shows the object/track used by the reaction, the time range in which the reaction is enabled, and if the curve graph is enabled for that value.

Use Create Mode to set the objects in the correct positions, and then create a new state (arrow buttons). The state is created for the master/slave tracks currently selected in the Reactions list, so make sure your selection is always correct.

Create Mode is necessary since tracks using the Reaction controllers cannot be edited normally and their values are controlled automatically.

Edit Mode allows you to select a state from the States list and change the objects/tracks values. When in this mode, selecting a state sets the slave objects/tracks as defined in the state. The master object remains unaffected.

The States list shows all the available states for the current reaction.

Note that a new state is created automatically when slaves are added. Make sure your objects are set up correctly in advance, so that the state created is usable, otherwise edit or delete it.

Editing values for a track in the States list can be done by moving/setting the track and editing the object in the viewport, or by changing values directly in this table.

Click a value and drag the mouse up or down to increase/decrease it, or double-click to type it.

The curve editor shows the graphs for the tracks selected in the Reactions list. Each key represents a state. The horizontal and vertical axes represent the master and slaves, respectively.

The screenshot shows the Reaction Manager window with the following components:

- Reactions List:** A table with columns for Reactions, Start, End, and Curve. It contains three entries: Crane Rotation / Z Rotation, Slider / Y Position, and Hook / Z Position.
- States List:** A table with columns for States, Value, Strength, Influence, and Falloff. It contains five entries: State03, State04, and State05, each with sub-entries for Slider / Y Position and Hook / Z Position.
- Curve Editor:** A graph showing curves for the selected tracks. The horizontal axis represents the master and the vertical axis represents the slaves.

Red arrows point to various UI elements: the '+' button, the 'Show Selected' button, the 'Create Mode' button, the 'Edit Mode' button, and the 'States' list.

## Conclusion

Reactions are easy to manage once you understand how Reaction Manager works. They provide system to drive dependent values that is more powerful and flexible than expressions and parameter wiring. In many cases, reactions can also replace scripting.

## Expose TM Helper

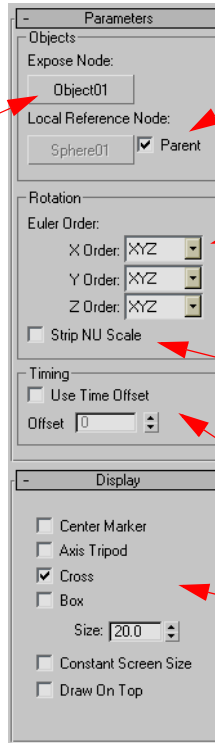
This new helper object gives you access to non-keyed node transform information (like IK or Constraints controlled nodes). You can use the values it exposes in expressions or MAXScript procedures.

Objects whose transforms are handled by constraints are non-keyed, and therefore not directly accessible through the node. This helper gives you access to them in an easy and organized way.

Once you create the helper, go to the Modify panel to enable the node selection. You cannot enable it from the Create panel.

Click to select the object whose transforms you want to expose.

This panel displays all the exposed values. When the Display Exposed Values option is on, values are updated interactively and can be monitored if you pin the stack display on the Modify panel.



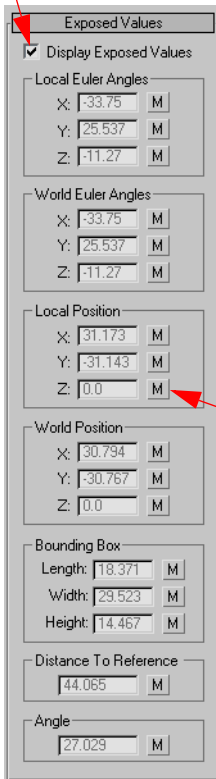
You can use the parent or another object in the scene as the reference object. The reference object is the base from which the local transforms are calculated.

Choose the order in which each axis rotation Euler value is evaluated. Rotation values depend on the order in which the axes are evaluated.

This option affects only the values exposed by the helper. Non-uniform scale values are ignored. The node, however, still uses them.

You can enable and specify a time offset (in frames) for the returned transform values.

The helper object appears as a point helper in the viewport. The display options are the same.



The **M** button to the right of each value copies to the clipboard the MAXScript code that access that value. You can then paste it into your scripts. Below is a sample of the MAXScript code for each value:

```
$ExposeTransform01.localEulerX
$ExposeTransform01.localEulerY
$ExposeTransform01.localEulerZ
```

```
$ExposeTransform01.worldPositionX
$ExposeTransform01.worldPositionY
$ExposeTransform01.worldPositionZ
```

```
$ExposeTransform01.worldEulerX
$ExposeTransform01.worldEulerY
$ExposeTransform01.worldEulerZ
```

```
$ExposeTransform01.worldBoundingBoxLength
$ExposeTransform01.worldBoundingBoxWidth
$ExposeTransform01.worldBoundingBoxHeight
```

```
$ExposeTransform01.localPositionX
$ExposeTransform01.localPositionY
$ExposeTransform01.localPositionZ
```

```
$ExposeTransform01.distance
$ExposeTransform01.angle
```



<i>mental ray</i> .....	82
<i>User Interface Changes</i> .....	87
<i>mental ray Shaders</i> .....	90
<i>Render Shortcuts</i> .....	91
<i>Render To Texture</i> .....	92

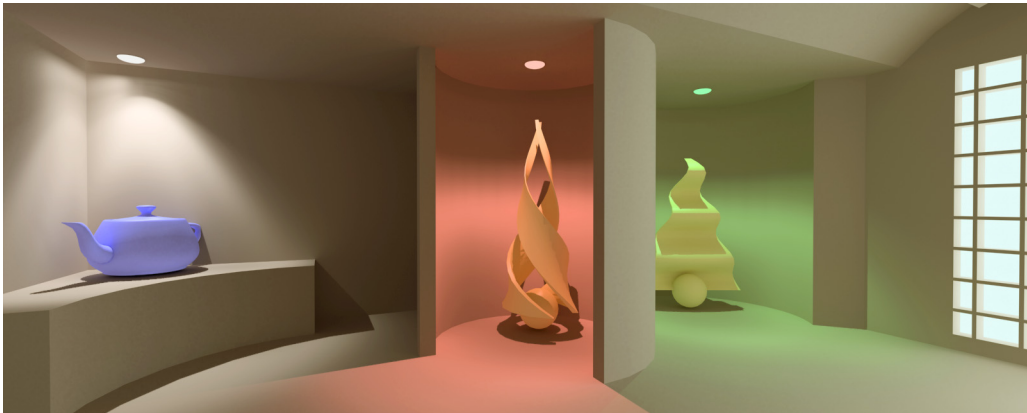


## mental ray

**3ds max 7** includes an update of the mental ray rendering software, to the new version 3.3. Several new features have been added, and a lot of improvements have been made to the user interface to take advantage of these new features and to streamline and simplify the workflow for global illumination.

### Physically Accurate Global Illumination

One of the main goals of this update was to make global illumination physically accurate and easy to set up.



The above scene uses photometric lights, self-illuminated objects, and materials with various properties. The global illumination solution was created using radiosity, which is a physically accurate system. The goal is to have mental ray render the same scene and obtain similar results, with no manual adjustments.



Above is the same scene rendered with mental ray, using photons for the global illumination solution. No changes were made to the scene, and only minor adjustments were made to the rendering settings. Note that the images are similar in brightness, colors and most of the global illumination details, but they are not identical since the two global illumination methods are based on very different approaches.

Photometric lights are necessary to achieve accurate global illumination. Standard light energy might need manual adjustments.

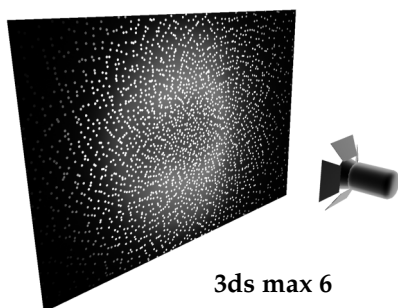
## Improved Workflow

The user interface has been reorganized and changed to make it easier to set up a scene for global illumination. You no longer need to deal with most technicalities and individual settings. The user interface changes are presented on the following pages, but first, let's explain some of the improvements made to various aspects of the mental ray renderer integration.

### Photon Emission

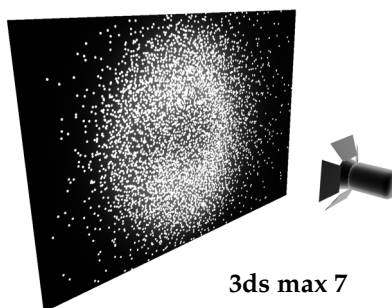
Settings for the photon emission for each scene light are now automatically adjusted based on the light's individual characteristics, such as intensity and distribution. This guarantees good global illumination result using only the default values.

#### Photons Distribution



3ds max 6

Previously, photon distribution was spread uniformly, and photon energy was adjusted based on the light intensity in that particular direction. In the above example, a photometric light with a custom web distribution shows how photon energy is lower near the edges, and how the photons are evenly distributed on the surface.

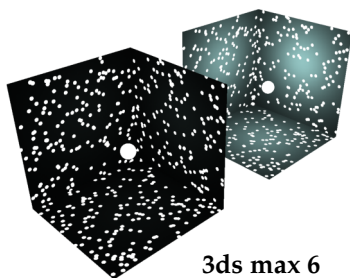


3ds max 7

Now photons have the same energy, but their density changes based on the light intensity. More photons are emitted where the light is more intense. This new approach gives better results by improving the photons' effectiveness where it's needed most.

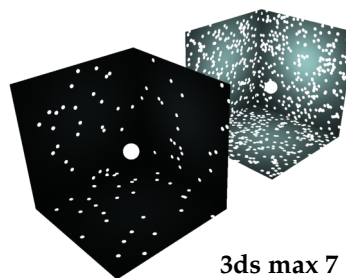
#### Number of Photons

Lights now emit different numbers of photons based on their intensity. Stronger lights emit many more photons than dim lights. The user needs to set only an average number of photons per light.



3ds max 6

Previously the default number of photons for dim and bright lights was the same.



3ds max 7

Bright lights are now set to emit more photons than dim lights, improving the global illumination accuracy for the lights with more influence.

Both GI and Caustic photons are affected by these changes.

### Photon Energy

When using photometric lights, the photon energy is automatically calculated. Standard lights still need to be adjusted manually. As always, it's useful to remember that all these values depend on the correct System Unit setup, and assume that models have real-world sizes.

### Manual Settings Override

It's always possible to manually override the settings for each light using multipliers to increase or decrease the automatic values, or by assigning exact values.

### Materials

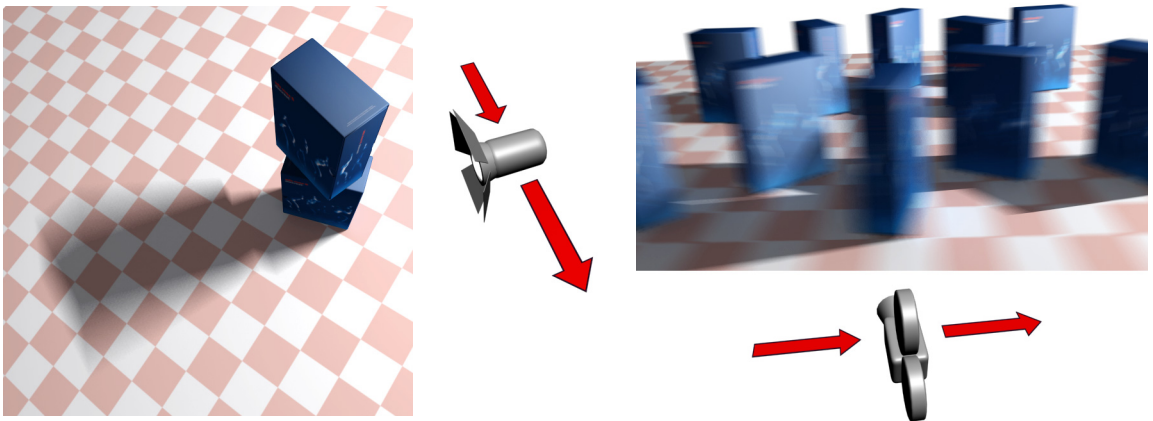
Improvements let standard materials influence indirect light accurately, based on their surface color, reflectivity, transparency, and translucency.

### Light Analysis

Logarithmic Exposure Control and Pseudo Color Exposure Control are fully supported. High Dynamic Range output has physically correct values, and can be used for analysis with Radiance tools.

### Motion Blur

Lights and Cameras can now be set to generate object motion blur from the Object Properties dialog, like regular geometry.



With Object Motion Blur enabled, a moving light generates blurred shadows as shown above, while a moving camera blurs everything in the scene, as shown on the right.

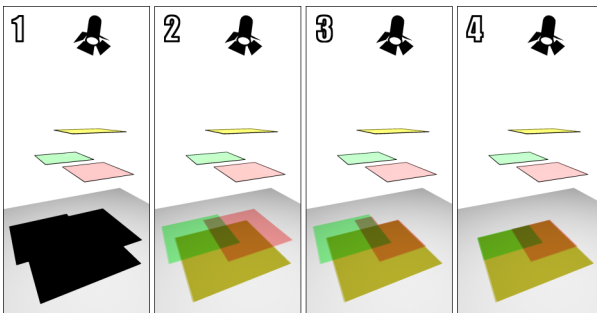
Note that motion blur properties for lights and cameras have no effect in the Scanline renderer.

## Transparent Shadows

The mental ray Shadow Map functionality now supports object transparency and can coexist with caustics in the same scene. Previously, enabling caustics would disable transparent shadows and transparency was managed by caustics alone.

When enabling transparent shadows, the map generated adds a Z-Depth dimension, and layers are used at different depths to manage the transparency.

A specific distance value is used to separate those layers, and objects closer than that value are considered as one. The default value is 0, and that layer distance is automatically calculated.



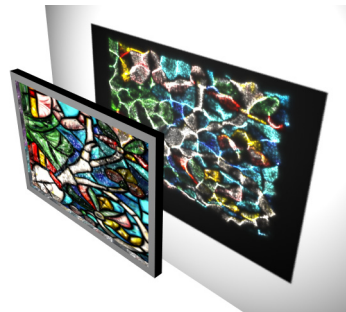
- 1) Transparent Shadows disabled (default)
- 2) Transparent Shadows and Color support enabled.
- 3) A small distance value merges two of the three surfaces.
- 4) A higher distance value merges all three surfaces.

Merging surfaces is a way to optimize the map memory usage by limiting the number of layers that can be created if many small objects are present in the scene.

The ability to have transparent shadows together with caustics in the same scene lets you select which objects should use caustics and which ones are better using transparent shadows. Shape, size, importance or visibility of the object in the scene, rendering time, memory usage, are all things that should be considered.



Example of transparent shadows with colors enabled. This option is the best and fastest for flat, transparent objects. The shadow color is taken from the standard material Filter Color map.

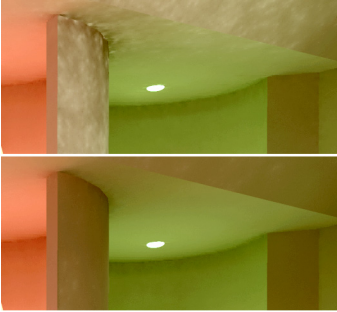


Caustics for transparency should be used for objects that are not flat. Unlike transparent shadows, caustics are refracted. The glass above is actually bumpy, and affects caustics, but rendering time is longer with caustics. Transparent Shadow might provide a good alternative if the glass is a background object.

An option to keep the legacy behavior of disabling transparent shadows when turning on caustics has been added to maintain compatibility.

## Final Gather Filter

A Filter option in Final Gather now averages the number of samples to smooth the grainy effects that some surfaces might exhibit.



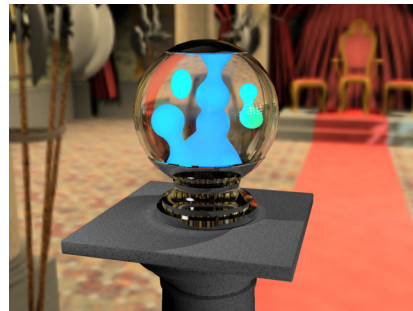
Certain conditions can generate uneven lighting of surfaces when using Final Gather. Increasing the number of samples helps, but it also slows down rendering considerably. Using Filter to average neighbor samples allows for a smoother result as seen in the lower image, but with less impact to the processing time.

## Automatic Environment Physical Scale

Using the Physical Scale value of the Logarithmic Exposure Control no longer affects reflections and refractions of the Environment Map when it's excluded from processing.



Even if the Environment Map was excluded from processing in the Logarithmic Exposure Control, as we can see in the background, reflections and refractions were processed anyway causing unrealistic results.



Now, reflections and refractions are processed correctly. Self-illuminated objects continued to be affected by the Physical Scale value, as expected.

## Incremental Echo

When exporting an animation to *.mi* you can choose to save one single file instead of one file per frame. A single file is easier to manage and is much smaller because it records only the changes between frames.

## IES Sun

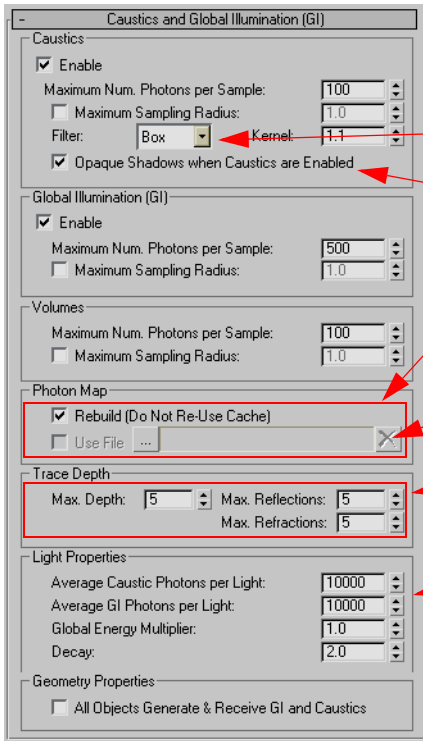
IES Sun is now supported and energy values are assigned appropriately.

## User Interface Changes

The following pages explain the changes to the mental ray rendering dialog tabs and other dialogs made to support the new global illumination workflow and new features.

### Indirect Illumination Panel

The long Indirect Illumination rollout has been split into two: Caustics and Global Illumination controls on one rollout, and Final Gather on another.



Some items have been renamed. Most of the renamed items reflect the new logic for managing photons automatically or to make them more consistent with the rest of the parameters. Renamed items are not listed here unless their functionality has changed.

A new filter is available: Gauss.

This option disables Transparent Shadows when Caustics is enabled. Disable it if you want to use both transparent shadows and caustics in the scene.

Managing maps has been redesigned and made consistent across the mental ray dialogs. Turn on Rebuild to recalculate the maps every time. Specify a file name with the Browse button ("...") to make Use File available. With a file name specified and Use File on, the file is written if Rebuild is on; otherwise, the file is loaded.

The Delete button deletes the specified file.

Trace Depth parameters have been renamed and rearranged for consistency and to highlight the importance of the Max Depth value (previously "Sum").

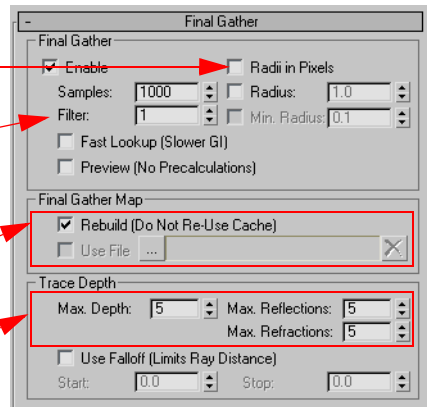
This group replaces the Global Light Properties group, and reflects the changes implemented in the way photons are distributed. Now, you specify an average number of photons per light. The actual value for each light is higher or lower, depending on the light intensity and distribution. Global Energy is now a multiplier that increases or decreases the illumination effect for lights managed automatically throughout the scene.

Use this option to specify sampling radii in pixels instead of scene units.

The new Filter option averages the Final Gather samples. The higher the value, the smoother the result, but small lighting details might be lost. See the illustrations on the previous pages.

Managing maps has been redesigned and made consistent across all mental ray dialogs. See the Photons Map explanation, above, for details.

Trace Depth parameters are renamed and rearranged (as with photons tracing).



## Renderer Panel

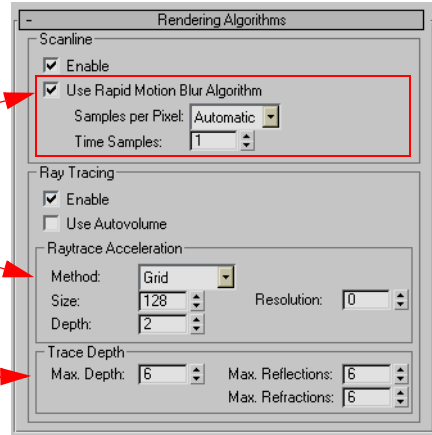
The Rendering Algorithms rollout has been redesigned to make some of the options more clear. Each algorithm (Scanline and Ray Tracing) now has its own group and options.

The previous Scanline Method option is renamed to Use Rapid Motion Blur Algorithm.

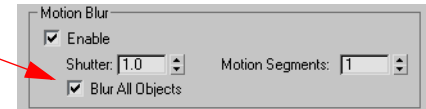
The new Sample per Pixel and Time Samples parameters let you fine-tune rapid motion blurring.

New parameters are available for the Grid raytrace acceleration method. These are the grid Size, Depth, and Resolution parameters.

Trace Depth parameters have been renamed and rearranged (as with the photon and final gather tracing).

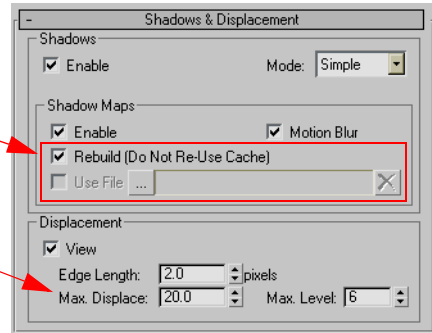


A new option lets you apply motion blur to all objects in the scene.

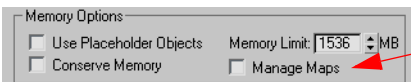


Managing maps has been redesigned and made consistent across all mental ray dialogs. See the Photon Map explanation on the previous page for details.

The Max. Displace default value has been lowered to 20.0. Setting this too high can cause rough displacement and excessive memory usage. Try to keep this value just a bit above the maximum displacement used in the scene.



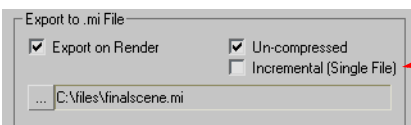
## Processing Tab



When Manage Maps is on, mental ray reads the maps from disk. When off, maps are read from memory.

When maps are read from memory, plug-ins can change them, and mental ray recognizes the changes.

This is an advanced feature. Please refer to the reference for more information on some of its limitations.

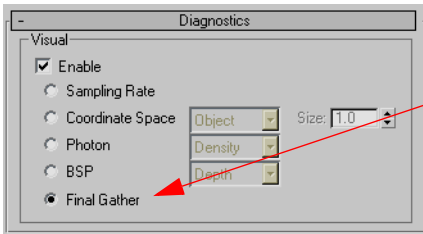


Turn on Incremental (Single File) to use incremental echo when saving an animated file. This means that instead of saving a file per frame, **3ds max** saves a single file that records only the changes from frame to frame.

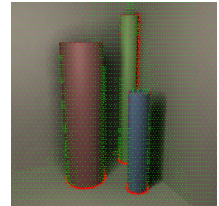
## Processing Panel (continued)



Skip Maps and Textures disables all maps and textures for all materials. This is useful when materials prevent you from seeing clearly the lighting of a scene and the effects of indirect light.



A new diagnostic tool gives you details about Final Gather. Initial final gather points are shown as green dots, and render-time points appear as red dots.

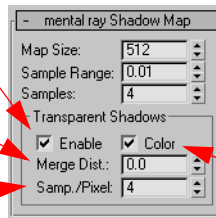


## Lights mental ray Shadow Map Rollout

Enable Transparent Shadows for the mental ray Shadow Map. Check the previous pages for explanations and examples.

The Merge Distance parameter defines the Z-Depth threshold for surfaces to be considered separately.

Set a higher Samples per Pixel value to increase the shadow map quality.

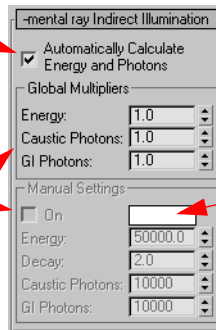


Colors in a transparent material can be used or ignored.

## Lights mental ray Indirect Illumination Rollout

With this option on, a light's photon and energy values are calculated automatically, based on the light's parameters and the global scene settings. See the previous pages for descriptions of the new way that energy and photons are managed.

Fine-tuning is always possible by using the multipliers to change the influence of the light, or by disabling the automatic assignments and assigning exact values.



Manual Settings now let you apply a color filter to the photon energy.

## Messages

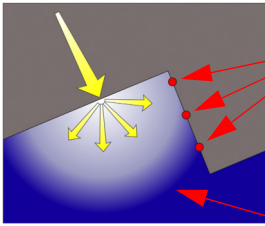
When photons are assigned to lights automatically, the mental ray Messages dialog reports the assigned values for each light. This information can be used to adjust multipliers and fine-tune the scene.

## mental ray Shaders

A few mental ray materials (phenomena) and maps (shaders) have been added.

### Materials

The new materials take advantage of a new shader for subsurface scattering, also known as SSS. In this example we see SSS in action on a translucent object.



Light enters an object and is scattered inside the material. Points on other surfaces are lit up from the inside, depending on their distance and other material properties.

Subsurface scattering results from light being scattered under the surface of a translucent object, as seen in some type of stones or the human skin.



**SSS Fast Material:** A generic, highly customizable material for translucent objects.

**SSS Physical Material:** A more sophisticated material for SSS effects.

**SSS Fast Skin Material:** A shader designed specifically for simulating the look of human skin, with subsurface scattering on multiple layers.

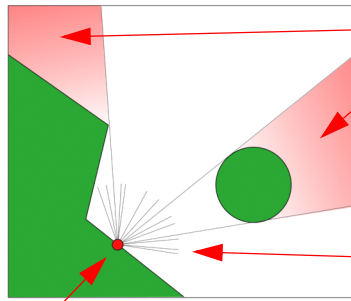
**SSS Fast Skin Material+Displace:** Like the Fast Skin material, but with support for displacement.

### Maps

**Ambient/Reflective Occlusion:** A raytraced map that samples the environment from the object surface, and calculates how much of the environment is visible or occluded by geometry. By default, the map generates a grayscale proportional to the amount of occlusion.



Occlusion map for a complex model.



Occlusion is calculated for each point of the surface rendered.

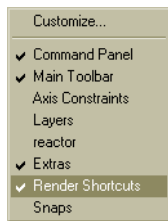
These highlighted areas are the parts of environment not visible from the specific point on the surface. The more environment that is occluded, the darker the surface (using the default black to white scale).

To determine the occlusion value, sample rays are traced from each surface point. The number of samples is one of the most important parameters for this shader.

## Render Shortcuts

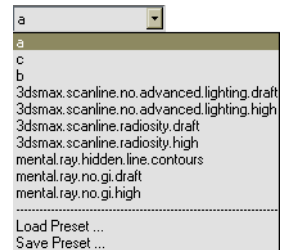
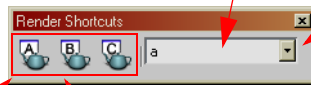
This new toolbar gives you the power to create three custom rendering presets. Just SHIFT+click one of the three buttons (A,B,C) to save the current rendering settings, and then simply click a button to recall its settings.

When you save the current settings, **3ds max** assigns the presets to the file that corresponds to the button (*a.rps*, *b.rps*, *c.rps*) and adds it to the list of presets. Like all other rendering preset files, these rendering preset files are global, not specific to the scene.



The new toolbar is activated from the Customize Display right-click menu.

The toolbar gives you access to all the Rendering Presets. Saved settings for the A,B,C shortcuts will appear in this list too.



SHIFT+click one of the A, B, C presets to save the current rendering settings.

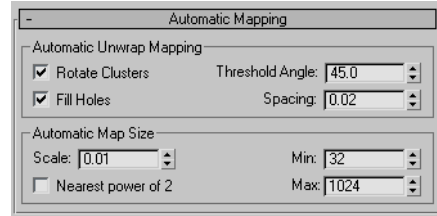
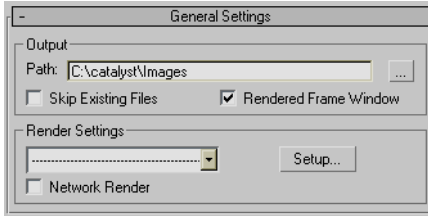
Click one of the A, B, C presets to quickly recall the saved settings.

Recalling an a, b, c shortcut setting using the A, B, C buttons does not bring up the Presets Categories dialog. To load a preset not assigned to a button, use the drop-down list.

The Environment and Effects panel settings are not saved or restored.

## Render To Texture

There are a few changes and additions to Render To Texture. The major change is the integration of the Projection modifier to allow for the creation of Normal maps. Other improvements include a new render element to create height maps, better options to manage existing UV mappings, support for sub-objects, and small user-interface improvements.

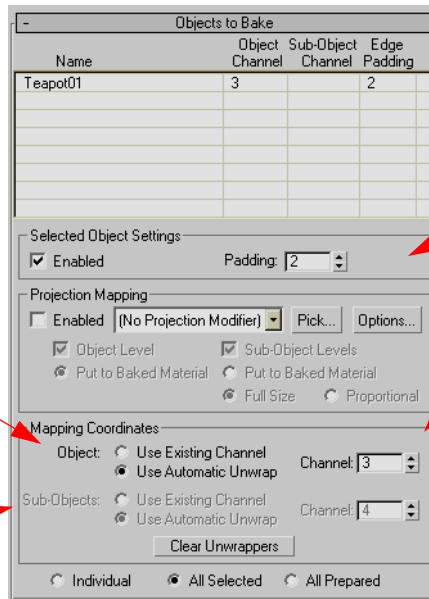


The Automatic Unwrap Mapping settings have been removed from the General Settings rollout, and now have their own rollout.

All the options in this group are related to the use of Render To Texture and the Projection modifier for the creation for Normal maps. See the Normal Maps topic in this guide for more information and a description of these options in their proper context.

Choose the type of mapping for the selection. You can reuse the existing mapping, or force a new automatic unwrap.

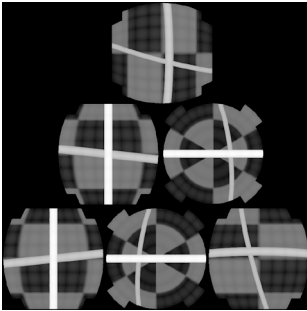
Sub-object selections are now supported, and can be unwrapped individually.



The Channel option has moved to the Mapping Coordinates group.

The new Mapping Coordinates group improves the way unwrapping is handled.

## HeightMap Texture Element



The new HeightMap texture element creates a grayscale image based on the data collected by the Projection modifier.

To fully understand this feature, read the Normal Maps topic in this guide. Basically, the Projection modifier is used to collect data about a high-polygon, detailed object mesh, and then simulate the details on a low-polygon mesh. That data contains the necessary information to create the HeightMap.

The HeightMap element does not have any parameter. The Minimum and Maximum height limits are part of the Projection modifier, and can be set in the Options dialog, available in the Projection Mapping group.

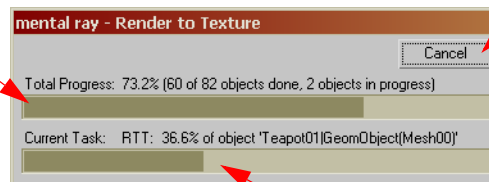
The HeightMap can be used as a bump or displacement map.

## Render To Texture Support for mental ray

In **3ds max 7**, you can use Render To Texture with the mental ray renderer. The steps to render to texture are the same as using the default Scanline renderer. However, you should be aware that Distributed Bucket Rendering (DBR) is not supported and a progress dialog is displayed instead of the Rendered Frame dialog.

The top bar shows the overall progress for all the objects being processed.

Use Cancel to abort the process.



The bottom bar shows the progress of the current task for each object.

This process is multi-threaded and each object is assigned to one processor, making it much faster on computers with multiple processors.

Network Rendering is supported, as is Normal Mapping creation.