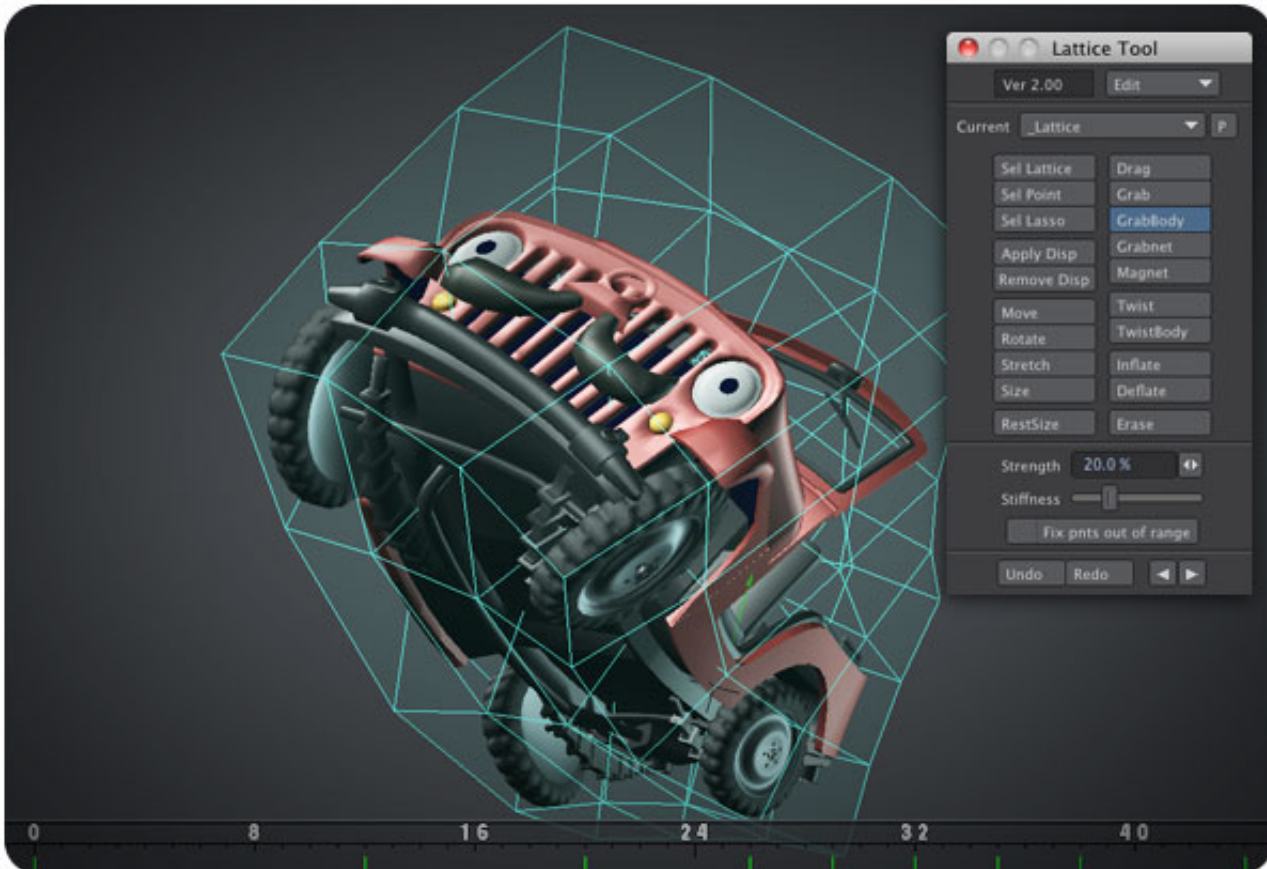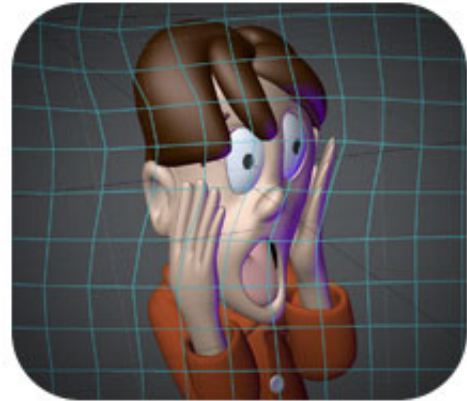## What is Lattice Deformer

Lattice Deformer is a very simple and powerful animation tool that allows you to distort and animate your object under the influence of the lattice. There are two types of lattices, Box(3D) and Screen(2D). The Box lattice deforms the whole or portions of the object within the lattice itself, and the Screen lattice changes the proportions and silhouettes of the object from a camera perspective, directly to the desired results. With lattice editing tool, as if by touching real thing, you can intuitively edit the lattice by grabbing, stretching, rotating, and distorting. This deformer is suitable for animation of inanimate objects, such as cars and buildings, and also for perspective control.

Plug-ins

This tool consists of the following four plugins:

3PS_LatticeDeformer (Custom Object)
creates a lattice in a scene. Because it is automatically added into a scene by "**Lattice Add**" command, you don't have to use the Add Custom Object pop-up menu on the Geometry Tab of the Object Properties Panel to apply this custom object plugin to an item.

3PS_LatticeDeformer (Displacement)

deforms the object under the influence of the lattices in the same group by referring to the lattices.

3PS_LatticeDeformer_Tool (Layout Tool)

opens the Lattice Tool panel, which allows you to edit the existing lattices in the current scene.

### 3PS_LatticeDeformer_Add (Layout Command)

adds a new lattice into the current scene. If any one of the existing cameras is selected, the screen lattice for the selected camera will be added into the scene. If not, the box lattice will be added.

How to Use Lattices and What's the Difference between the Two Types of Them.

To deform an object with lattices, first, add a lattice item into the current scene and translate it to fit the object you want to deform, and then the 3PS_LatticeDeformer Displacement plugin needs to be applied to the object. This is about the same procedure used to usually apply Displacement plugins to objects in LightWave Layout. The lattice items and lattice deformers are grouped by **Group Name**. The lattices affect the objects deformation within each group. In other words, if the lattice deformer applied to the object is given the same **Group Name** as the existing lattice, the object will be deformed with the lattice.

To add a new lattice item, use the **3PS_LatticeDeformer_Add** generic plugin command (after adding it into the list on the Configure Menus Panel, it should appear as the **Lattice Add** button in the Toolbar menu). There are two types of lattices, **Box** and **Screen**, and when the **Lattice Add** command creates a lattice in the scene, the type of the currently selected Layout item determines which type of lattice to use. If the type of the selected item is Camera, a screen lattice will be added into the scene, which is automatically parented to the selected camera. If not, a box lattice will be added and placed just in the center of the scene. The box lattice is a box-shaped cage grids you usually see, and it deforms the whole or portions of the object within the box lattice itself. The screen lattice available since version 2 allows you to drastically change the proportions and silhouettes of your character from your camera's perspective. If you want to push in or pull out some portions of the object without taking plenty of time, it may help you quickly get the results you desire. If a new screen lattice is applied to a Perspective camera, its initial size and position will be determined by the settings of the camera. If to the other types of cameras, you may have to manually adjust them because the camera plane is indefinite or unacquirable.

After completing the setup for lattices, use the **3PS_LatticeDeformer_Tool** plugin command (it appears as the **Lattice Tool** button in the Toolbar menu) to edit lattices. Immediately after activating the tool, it opens the tool panel that has several editing modes and commands for manipulating lattices. If necessary, adjust the rest size of the lattice to fit it to the object and change the number of segments, and finally, you can deform your object with lattices.

Box Lattice


Screen Lattice
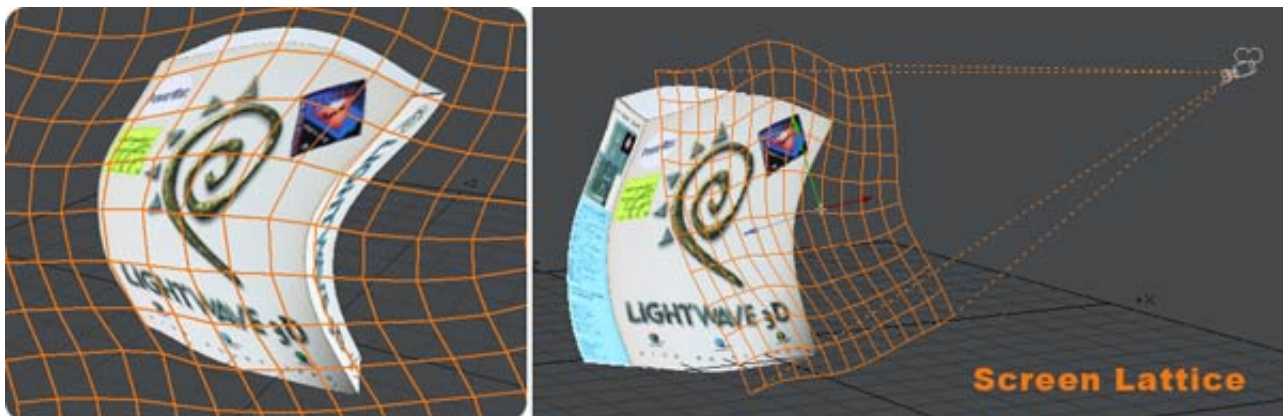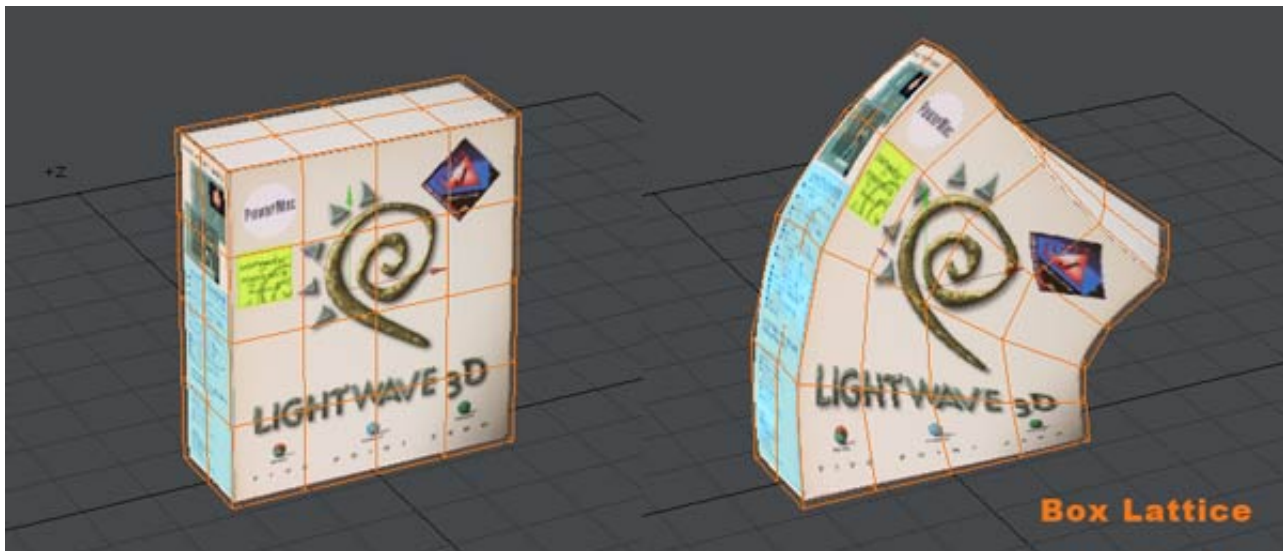
Controls

3PS_LatticeDeformer_Tool (Layout Tool)

Current - shows the name of the currently selected lattice item. Also, you can choose an existing lattice directly from this drop down list instead of clicking on it in a viewport. When no lattice is selected, this drop down button shows the option "**(none)**". If multiple lattices are selected, the text string "(**multiple**)" will appear on the drop down button.

Properties button [P] - opens the Options panel for the currently selected lattice.

Tool Menu - Editing modes are as follows:

> **Sel Lattice** - selects or deselects the lattices that you want to edit. You can select or deselect the lattices by left-clicking and also add more lattices to the existing selection by right-clicking. In this mode, you can also cancel your lattice selection by clicking in the blank space on this tool panel.
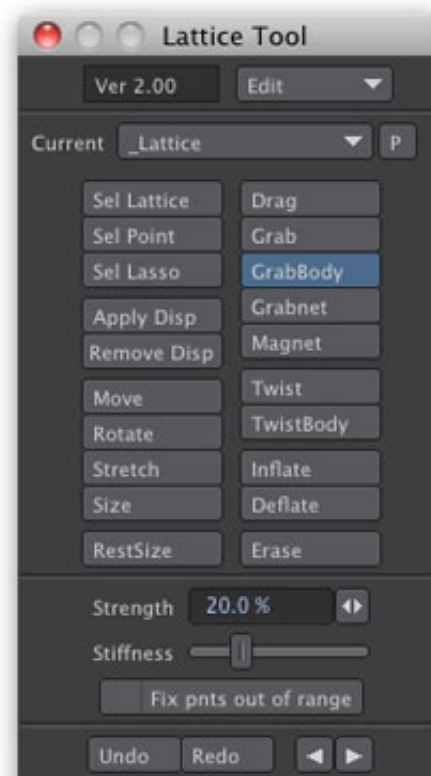
Sel Point - selects or deselects the points of the selected lattices. You can select or deselect the points by left-clicking and also add more points to the existing selection by right-clicking.

Sel Lasso - lasso-selects or lasso-deselects the points of the selected lattices.

When no points are selected, every point of the selected lattices is considered selected and is affected by editing. If points are selected, only the selected points will be affected by editing. You can also cancel your point selection by clicking in the blank space on this tool panel.

Apply Disp - applies a lattice deformer (3PS_LatticeDeformer Displacement plugin) to the object you clicked on, which is automatically given the same **Group Name** as the current lattice. Of course, you can also use the Add Displacement pop-up menu on the Deform Tab of the Object Properties Panel to apply a deformer to an object, but it will be hard work for you if there are many objects you want to apply the deformer plugins to. With the **Apply Disp** selected, clicking on an object directly in a viewport is a reasonable way to apply the lattice deformer to a lot of objects quickly. If the lattice deformer is already applied to the clicked object, its **Group Name** will be just replaced with the **Group Name** of the current lattice.

Remove Disp - If the lattice deformer is applied to the object you clicked on, it will be removed from the list, and the object will become unable to be affected by lattices.

Move - moves the whole or selected control points of the selected lattices.

Rotate - rotates the whole or selected parts of the selected lattices. The center of the effect is the initial point of dragging.

Stretch - stretches the whole or selected parts of the selected lattices. The center of the effect is the initial point of dragging.

Size - scales the whole or selected parts of the selected lattices.

RestSize - resizes the rest size (the initial size of a lattice at the time it is rested) of the currently selected lattice. You can adjust the XY rest size by left-clicking and adjust the Z rest size by right-clicking.

Drag - moves a control point of the selected lattice.

Grab - grabs and moves the surface of the selected lattice you clicked on. The center of the effect is the initial point of dragging on the surface. Control points within the brush's influence area will be affected.

GrabBody - grabs and moves the surface of the selected lattice you clicked on, in a similar way to **Grab**. The only difference is that this mode will try to maintain the volume or surface area of the lattice, and its retention rate is determined by the **Stiffness** value.

Grabnet - grabs and moves the surface of the selected lattices. **Grabnet** is similar to **Grab**, except that all of the selected lattices will be affected.

Magnet - smoothly moves control points within the brush's influence area in screen space. The center of the effect is the initial point of dragging.

Twist - twists (rotates with falloff) the surface of the selected lattice you clicked on. The center of the twisting is the initial point of dragging on the surface.

TwistBody - twists the surface of the selected lattice you clicked on, in a similar way to **Twist**. The only difference is that this mode will try to maintain the volume or surface area of the lattice, the same way as **GrabBody**.

Inflate - inflates the outer portion of the Box lattice, or the grid mesh of the Screen lattice. The center of the effect is always the surface point of the lattice where the mouse pointer is pointing. It will work while you are clicking and dragging the mouse pointer on the lattice. The intensity of the effect is determined by the **Strength** value.

Deflate - deflates the outer portion of the Box lattice, or the grid mesh of the Screen lattice. **Deflate** is the same as **Inflate**, except for the direction of the force.

Erase - reduces the displacement amount of each control point within the brush's influence area. The intensity of the effect is determined by the **Strength** value.

In **Grab**, **GrabBody**, **Grabnet**, **Magnet**, **Twist**, **TwistBody**, **Inflate**, **Deflate**, and **Erase** modes, you can graphically adjust the brush size by right-clicking and dragging out a circle.

Strength - determines the intensity of the effect. Larger values of **Strength** cause the displacement amount of each control point to reach the final result of the effect more quickly.

Stiffness - causes the lattice to roughly maintain its own volume or surface area in **GrabBody** and **TwistBody** modes. The more the slider is moved to the right, the stiffer the lattice is. In other words, it will try to maintain the volume or surface area of the lattice much more strongly. However, too stiff lattices may be broken when you bend them. In contrast, the more the slider is moved to the left, it allows much more stretch of the lattice.

Fix pnts out of range - If checked, the control points out of the brush's influence area will be considered not selected, and they are not affected at all, that is, they are fixed at the current positions while you are clicking and dragging the mouse.

Undo/Redo - can undo and redo almost all of the changes you made to your lattices. This tool has its own undo/redo mechanism in Layout. The undo/redo stack will be retained during having the tool panel open as long as there is enough free space in RAM, and it will be cleared when the tool closes.

Left/Right Arrow Buttons ◄ ► - Clicking on the left arrow button will jump to the previous keyframe in the timeline for the currently selected lattices, and clicking on the right arrow button will jump to the next keyframe.

Edit Drop Down Menu `Edit ▼` - The commands in this menu are as follows:

Set Zero-Key - creates a keyframe that has no displacement value at the current time.

Create Key - creates an interpolated keyframe at the current time.

Delete Key - removes existing keyframes. This will remove a keyframe if one exists at the current time. If the selected (highlighted) time range exists in the timeline, all of the keyframes within the time range will be removed. In other cases, all the keyframes of the selected lattices will be removed.
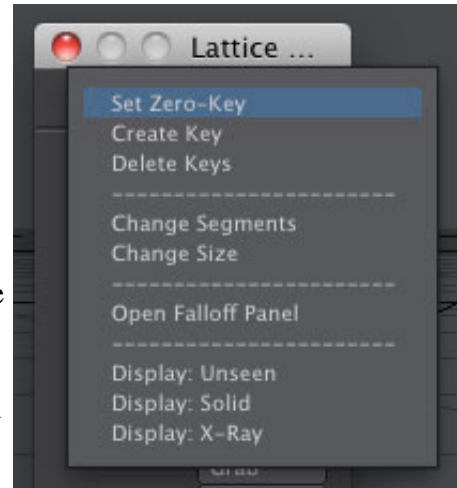
Change Segments - changes the number of segments in the currently selected lattice. Immediately after changing, the displacement values of all the keyframes are interpolated.

Change Size - changes the rest size of the currently selected lattice. Immediately after changing, the displacement values of all the keyframes are interpolated.

Open Falloff Panel - opens LightWave-style falloff setting panel. Here you can change the falloff setting for the influence area of the brush.

Display: Unseen - The Display mode of every lattice in the current scene is changed to **Unseen**.

Display: Solid - The Display mode of every lattice in the current scene is changed to **Solid**.

Display: X-Ray - The Display mode of every lattice in the current scene is changed to **X-Ray**.

Independent Timeline

This tool has its own independent timeline. When you open this tool by clicking on the **Lattice Tool** button, the timeline appears at the bottom of the viewport window, which allows you to edit keyframes for the current lattices in various ways, such as shifting keyframes by left-clicking, copying keyframes by right-clicking, removing keyframes, switching between linear and smooth interpolation settings, and quickly jumping to the previous or next key.

You can scroll the timeline by left-clicking and dragging at the top of the timeline.

A key can be moved by clicking and dragging the key itself directly in the timeline.

You can select (highlight) a desired time range by right-clicking and dragging at the top of the timeline. If keys are highlighted, all of the keys within the highlighted time range can be shifted, removed, and copied together by clicking and dragging any one of them.


Dragging and dropping the keys out of the timeline will remove the keys themselves. There is no problem even if you remove necessary keyframes by mistake. You don't need to worry about making mistakes because you can also undo the changes made in the timeline by clicking on the **Undo** button.
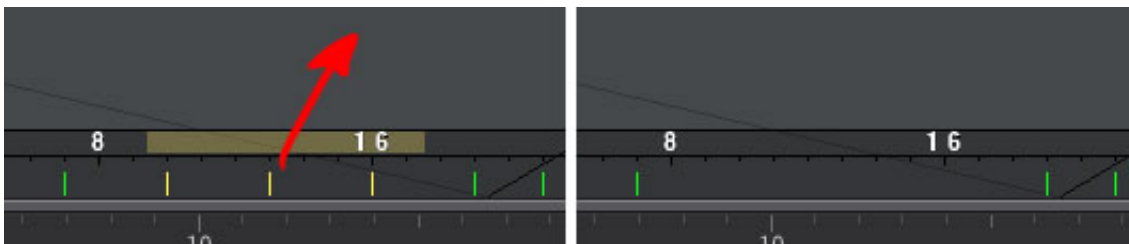
There is the **L** button at the right of the timeline. This button allows you to switch between the types of interpolation of the keyframe at the current time. If On, the shape motion of the lattice will be interpolated linearly between the keyframes. If Off, smoothly. Off by default. The left and right arrow buttons have the same functions as the tool panel's.

Left-clicking and dragging left/right on the scale button located at each side of the timeline let you interactively rescale the timeline range.
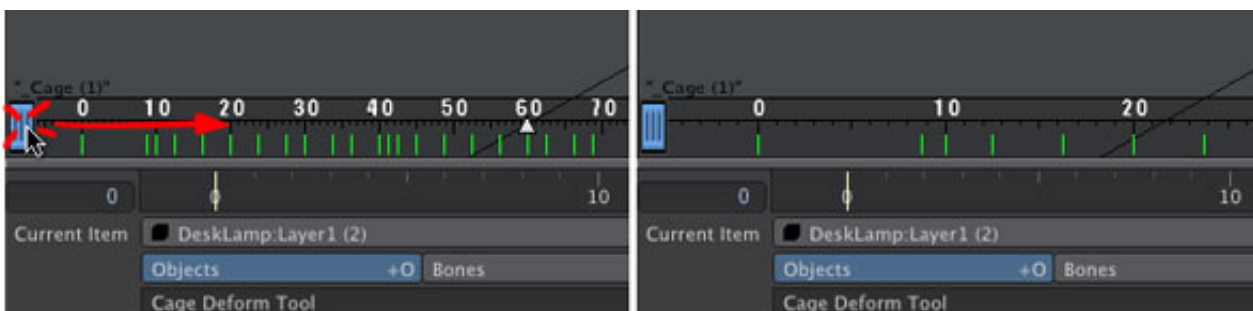
You can also fit the timeline to Layout's built-in timeline by right-clicking on the scale button, but the pixel width per frame is limited to numbers between a minimum of 4 and a maximum of 128.
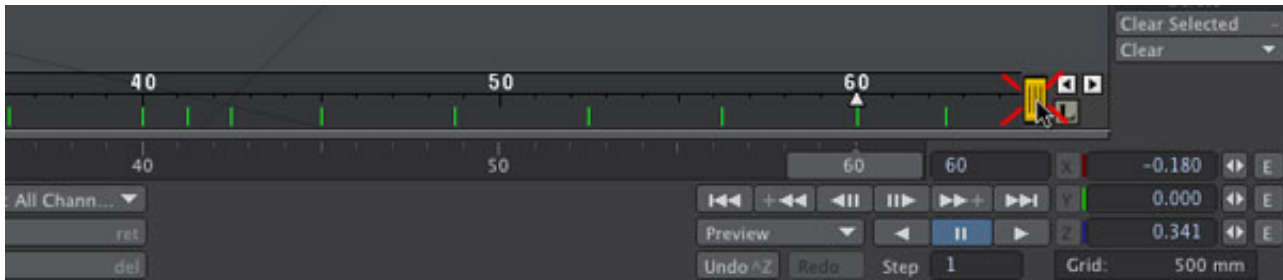
Editing the keyframes in the Scene Editor's dope sheet

Also in the Scene Editor's dope sheet, the shape keyframes for scene lattices can be edited. That allows copying, deleting, quantizing, time shifting, and time scaling of selection of keyframes.
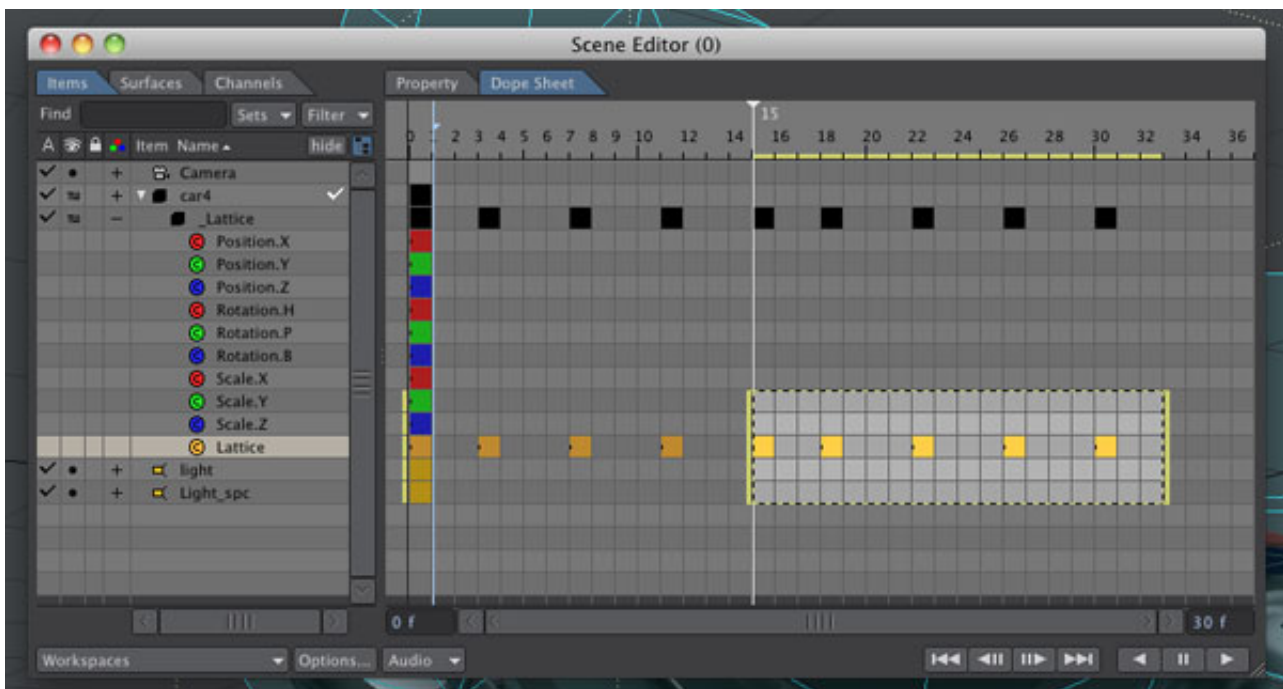
If any of the existing shape keyframes are edited in the Scene Editor with the **Lattice Tool** panel open, the undo/redo stack will be cleared. Because these keyframe values are used as IDs for tying themselves to the actual shape keyframes, they should never be changed. Even if they are changed and become broken links due to some kind of mistake, you can repair broken key links by selecting the lattices or by saving and reloading the scene.

3PS_LatticeDeformer (Custom Object)

Either of the following options panels appears when you open it, depending on which type of lattice is applied to the lattice item, **Box** or **Screen**.

Display - has the following three visibility options:

> **Unseen** - makes the lattice invisible.
>
> **Solid** - The lattice is drawn the same way as the solid object. If the lattice is placed behind or inside an object, it will be hidden behind the polygons of the object. If it becomes a problem for you, try switching this to **X-Ray**.
>
> **X-Ray** - The lattice is drawn in front of all the objects existing in the scene. The whole lattice can always be seen through objects.

Selected Color - The lattice is colored with this color when selected in lattice editing mode or when the **Lattice Tool** is not open.

Unselected Color - The lattice is colored with this color when unselected in lattice editing mode.

Opacity - specifies the lattice's surface opacity.

Affect All Groups - If this option is checked, the lattice will affect all the objects to which the lattice deformer (the 3PS_LatticeDeformer Displacement plugin) has been applied, regardless of the **Group Name**.

Group Name - The lattice is grouped by this name. To deform your object with the lattice, the lattice deformer applied to the object must be given the same group name as the lattice.

Weight Map - You can also specify a weight map, which determines how much each point of objects will be affected by the lattice. If points are assigned a weight of zero, those points will not be affected at all by the lattice. If a weight of 100 percent, they will be affected, completely 100 percent.

Camera - shows and specifies the camera used to determine the viewing position and angle for the **Screen** lattice. When the screen lattice item is created in the scene, the currently selected camera is automatically chosen as the **Camera**.

Projection Type - There are two projection types, **Perspective** and **Orthographic**, currently available to choose from. If necessary, you can change the default projection type to another type suitable for your camera.

3PS_LatticeDeformer (Displacement)
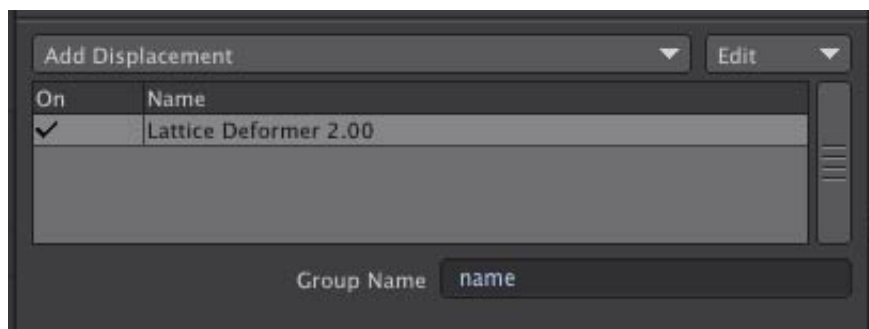
Group Name - The lattice deformer (3PS_LatticeDeformer Displacement plugin) refers to the lattice items (3PS_LatticeDeformer Custom Object plugins) given the same **Group Name** as this to deform the object.

Example 1: Using the Box Lattice

In Layout, we've loaded the "Spacecraft.lwo" file found in the content. The spacecraft object has appeared in front of us, which is very cool and looks strong. Let's distort this with a box lattice.

We've used **Lattice Add** command to add a new box lattice into our scene. Immediately after that, the options panel for the box lattice has been automatically opened. We've made sure the **Group Name** field shows the default group name of "**name**", and then we'll accept the defaults and close the panel.
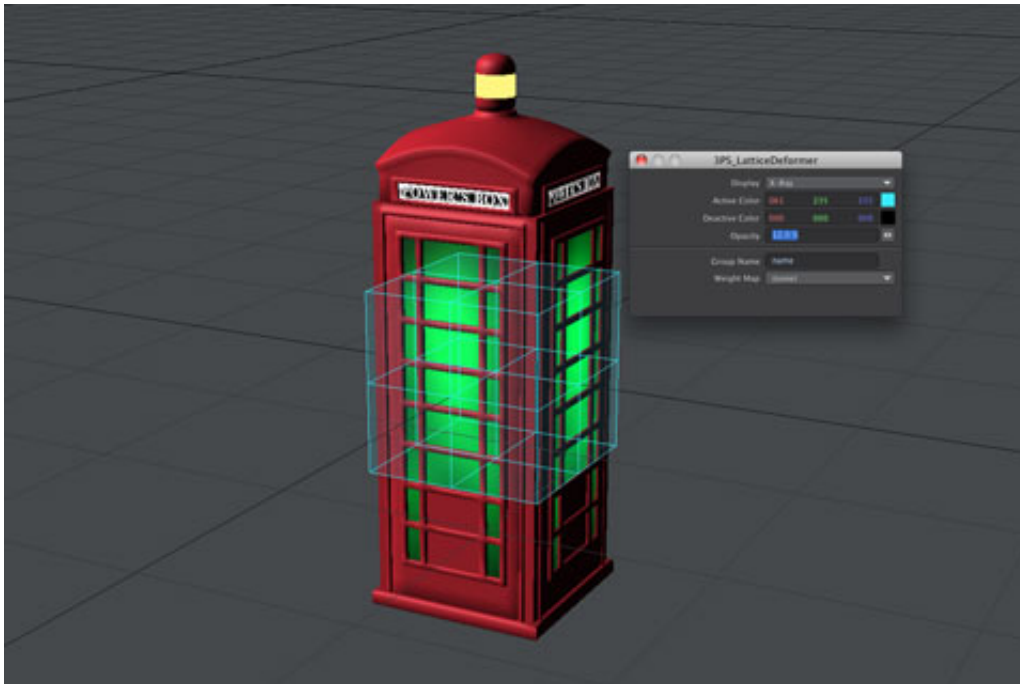

To parent the box lattice to the spacecraft object just in this example, we've switched to the **Schematic View**, and then we've selected the lattice item and clicked on the spacecraft object while holding the Ctrl key down. If we want to animate the object within the box lattice, we should parent the object to the lattice.
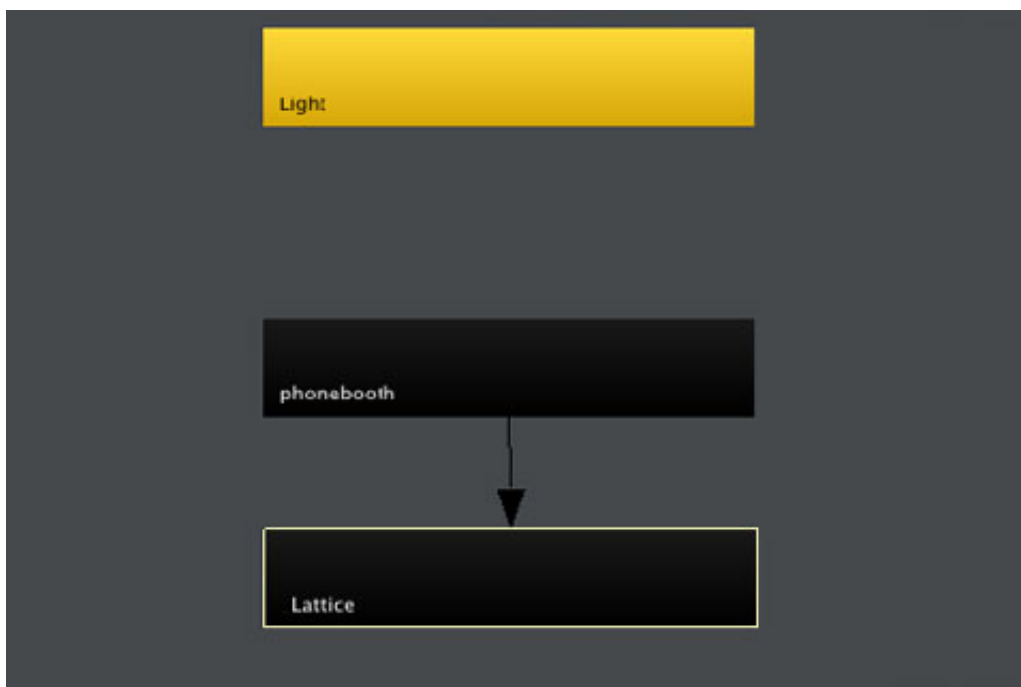
We've made sure we are currently in Object Edit mode because this tool can only open in Object Edit mode. Then we've entered lattice editing mode by clicking on the **Lattice Tool** button in the Toolbar menu. We'll choose **Sel Lattice** on the lattice tool panel and click the lattice to make it editable in the viewport.
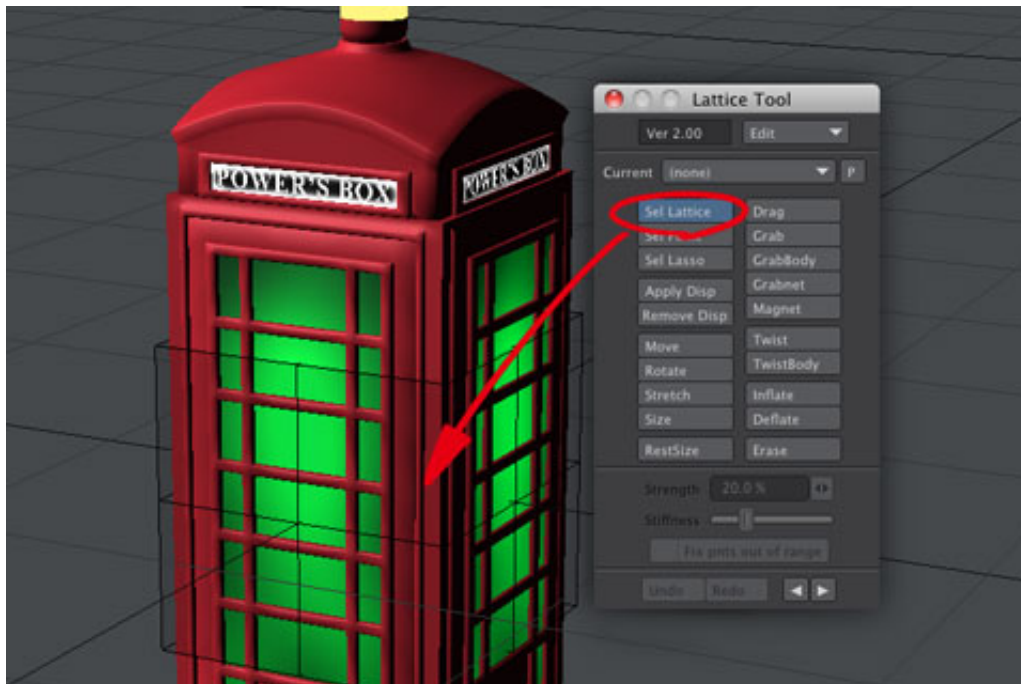

We've switched to the **RestSize** mode to fit the lattice to the spacecraft object. Now we can adjust the XY rest size by left-clicking and adjust the Z rest size by right-clicking.
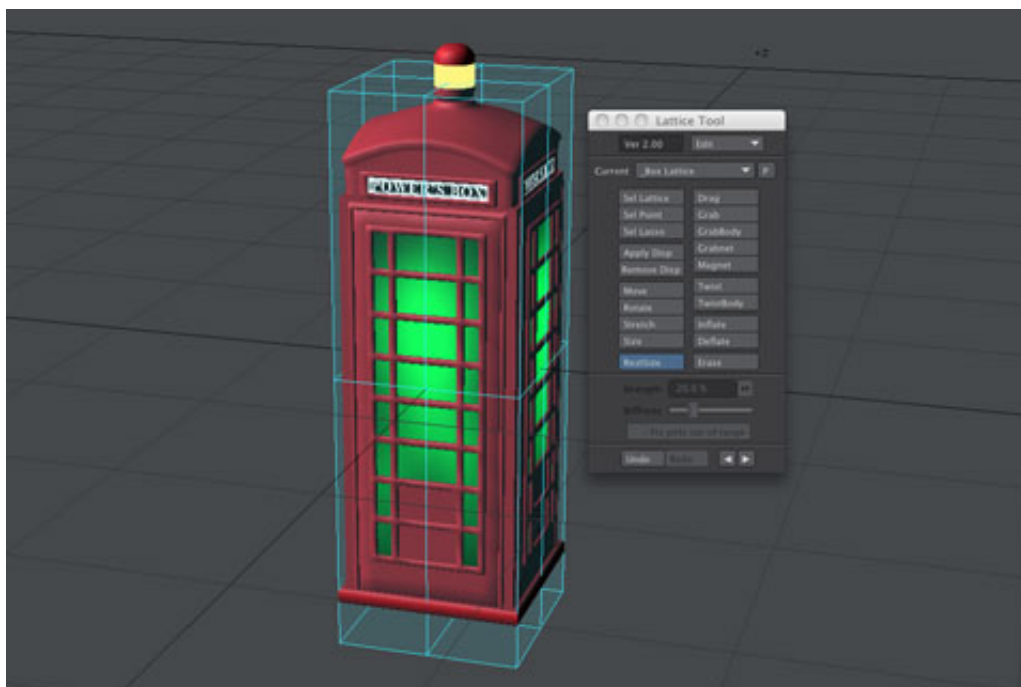
We'll tap the spacebar or close the tool panel to get out of lattice editing mode for a short time, and we'll adjust the Y position of the lattice item to fit the lattice to the object. It is not recommended to use other tools or commands with the Lattice Tool panel open.
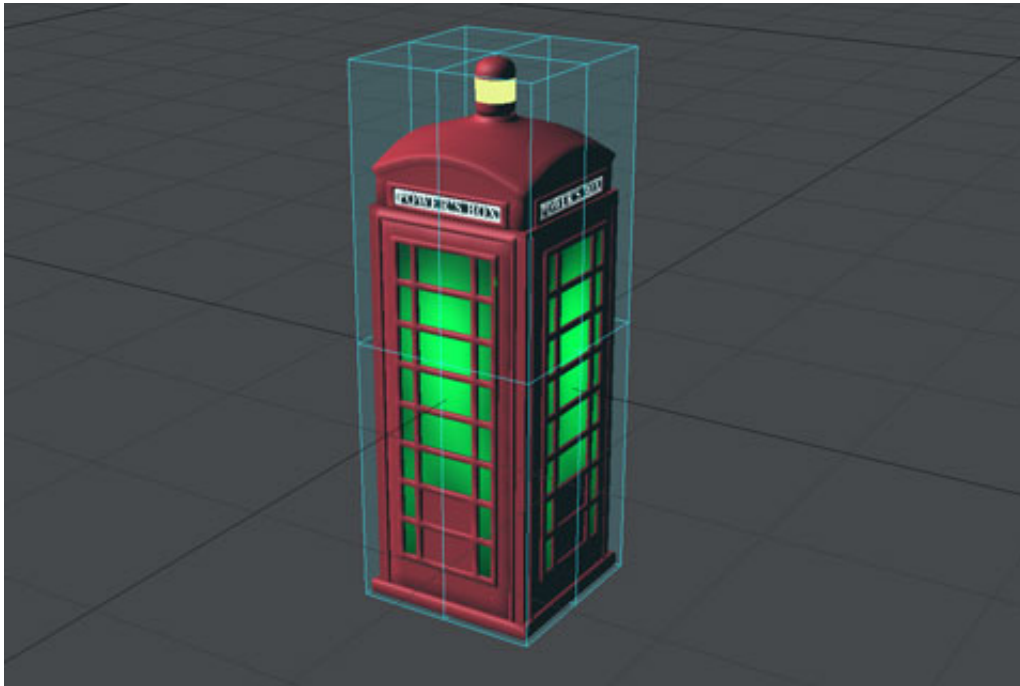

After adjusting the Y position of the lattice item, we've entered lattice editing mode again and selected the lattice. We can also change the XYZ rest size of the lattice by choosing the **Change Size** command from the **Edit** drop down menu. The dimensions shown in the following image, a width value of **1.05 m** in X, a height value of **3 m** in Y, and a depth value of **1.05 m** in Z, are best in this example.
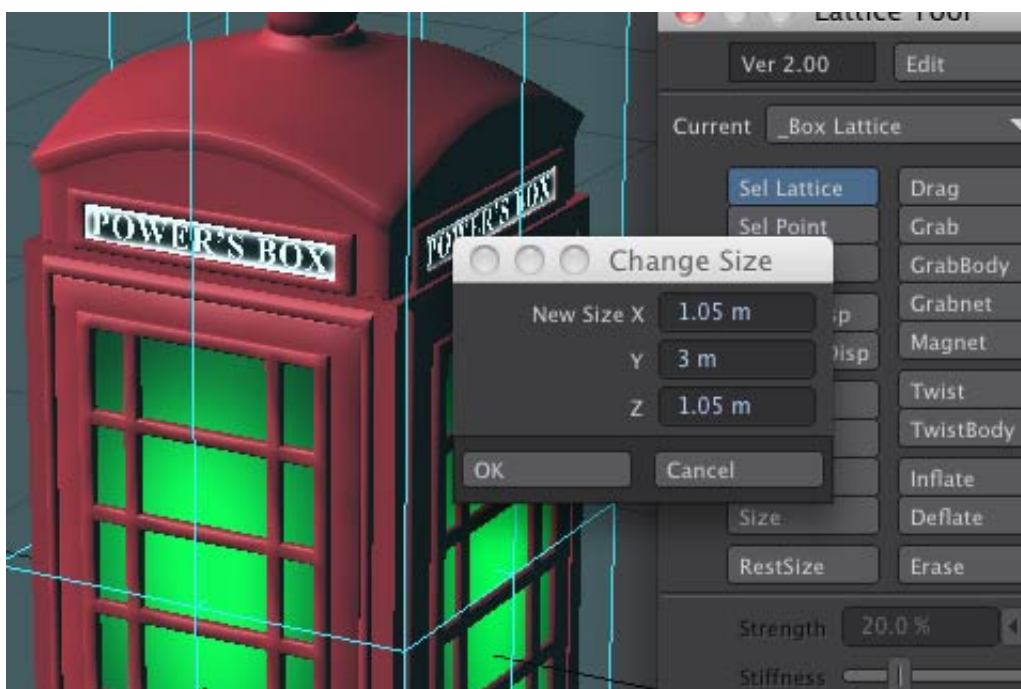
To give the lattice a minimum desired resolution by changing the number of segments, we've chosen the **Change Segments** command from the Edit drop down menu, and we've set X to 2, Y to 6, and Z to 2.
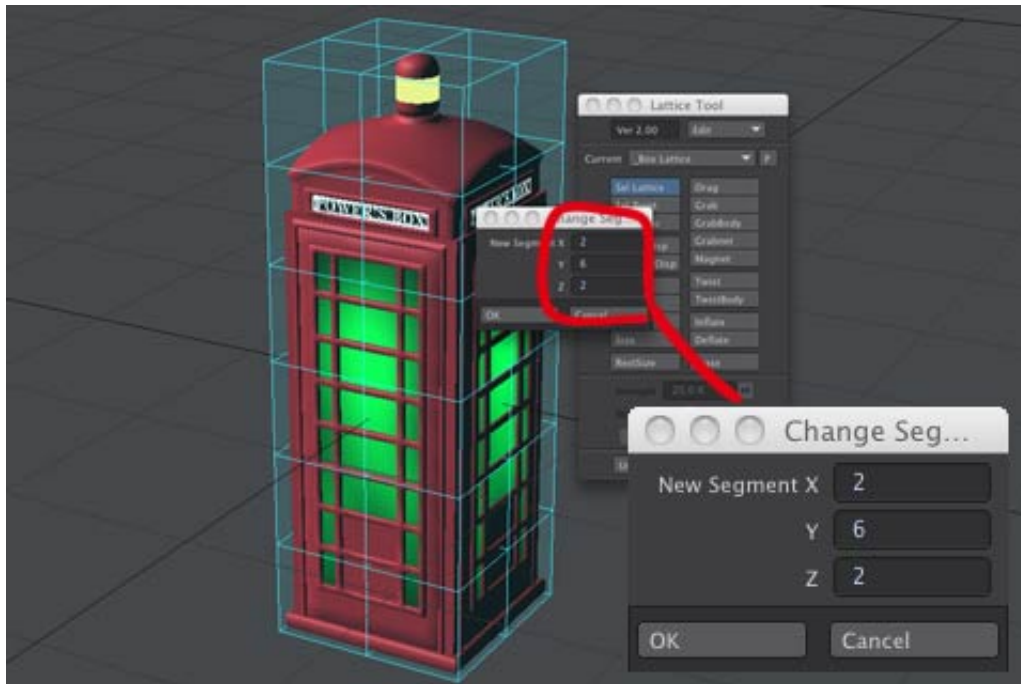

To apply a lattice deformer plugin to the spacecraft object, we've opened the Object Properties panel and chosen "**3PS_LatticeDeformer**" from the Add Displacement pop-up menu on the Deform Tab. Basically, its **Group Name** text field needs to be typed the same group name as the lattice to tie the deformer to the lattice, but we've accepted the default group name of "**name**" without changing it because they both have already become the same.
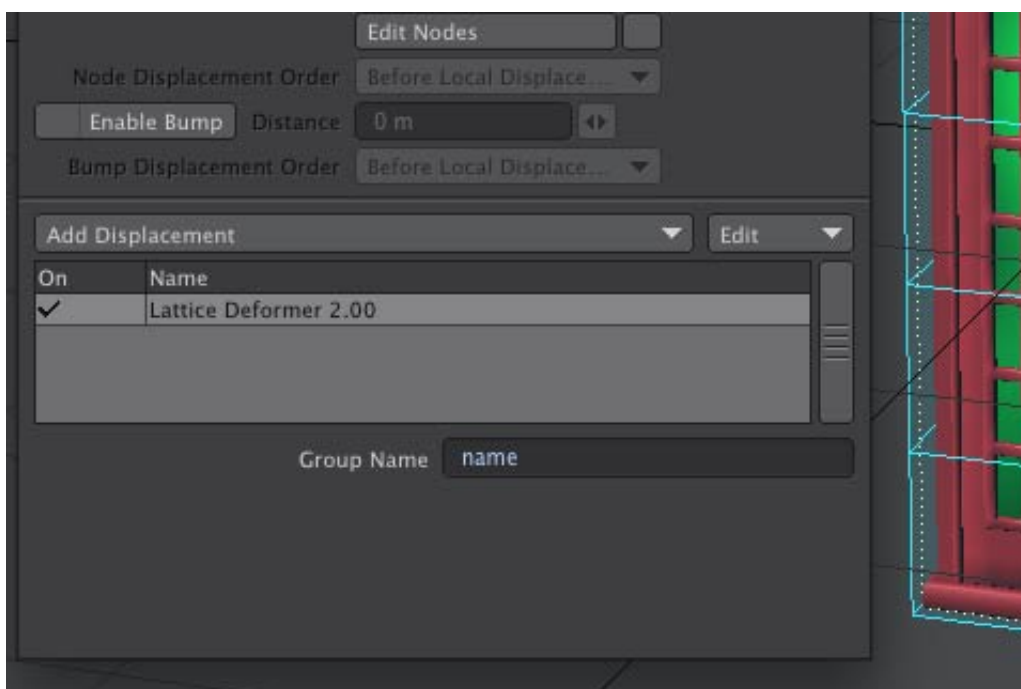
We've moved the **Stiffness** slider to the middle and chosen **GrabBody** to deform the spacecraft object with the lattice. Then, after making the diameter of the brush slightly smaller than the height of the lattice by right-clicking and dragging, we've left-clicked on the upper part of the lattice and dragged the mouse left. As you see in our viewport, the spacecraft was distorted just like a clay model as if it had been drawn into a hyper space!
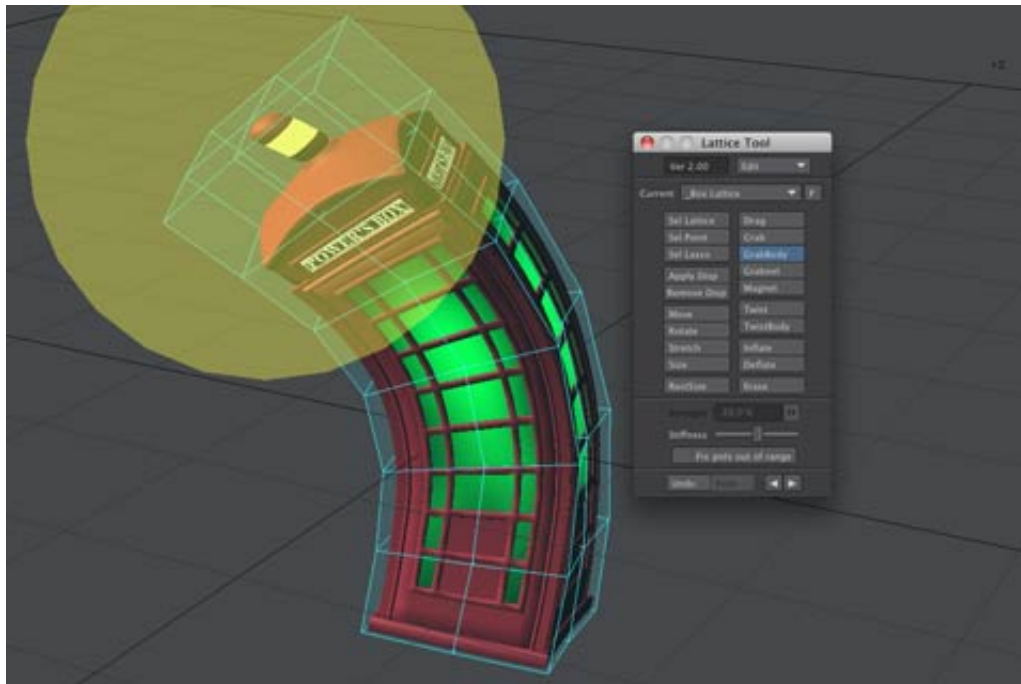

Now, let's enjoy animating this spacecraft freely, just follow your heart and senses.
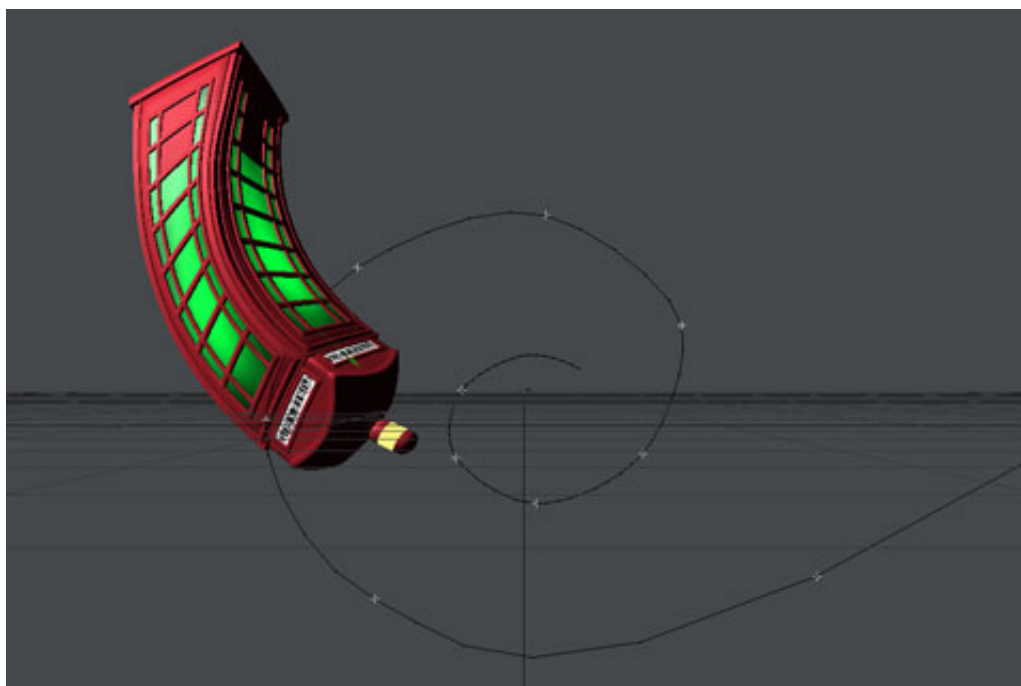

Example 2: Using the Screen Lattice

We'll try using the **Screen Lattice** this time. First, we've chosen **File > Clear Scene** to remove all data from the current scene, and we've loaded the "Spacecraft.lwo" file again. Then we've switched to the **Camera View**, set the Edit Mode to Cameras, and made sure the first camera is currently selected. With the selected camera, clicking on the **Lattice Add** command button will

add a screen lattice automatically parented to the selected camera into the scene. Because the default camera is usually a **Perspective** camera, the initial size and position of the newly added screen lattice will be automatically determined by the settings of the camera. If any of the other types of cameras, we might have to manually adjust them in **RestSize** mode or by choosing the **Change Size** command from the **Edit** drop down menu, because the camera plane is indefinite or unacquirable.
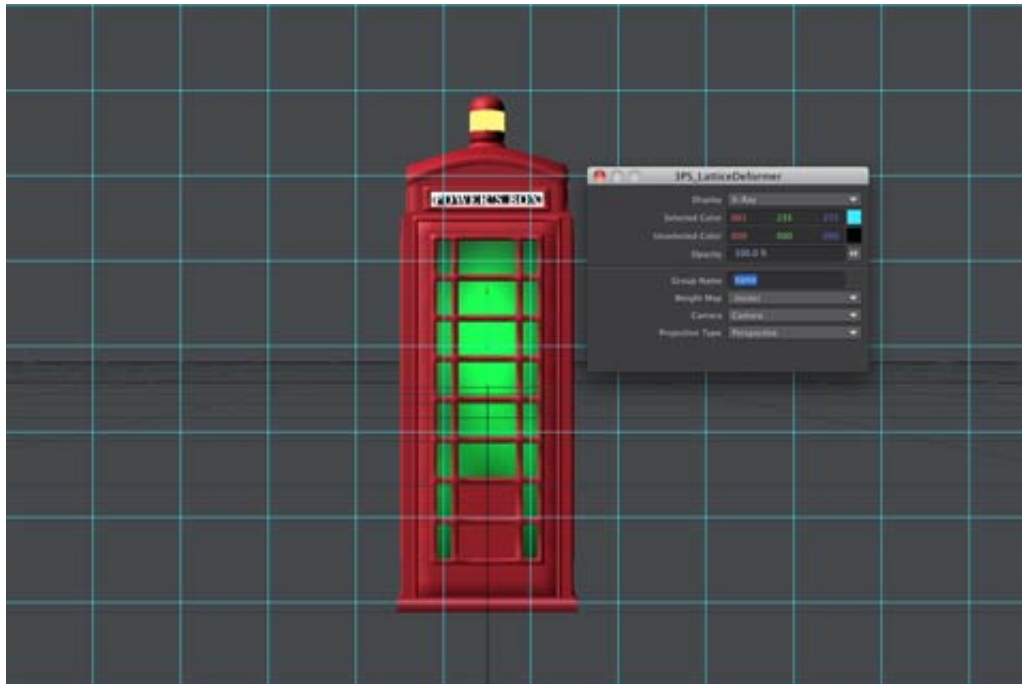

We've opened the **Lattice Tool** and chosen "_Screen Lattice" from the **Current** drop down list to make the screen lattice selected and editable. In this way, we can choose an existing lattice directly from the drop down list instead of clicking on it in any viewport. Then we've switched to the **Inflate** mode and set the **Strength** to **20** percent. After making the diameter of the brush slightly smaller than the height of the viewport window by right-clicking and dragging, we've left-clicked and dragged the mouse in the center of the viewport window. In our viewport, it can be seen that the grid mesh of the screen lattice has been inflated.
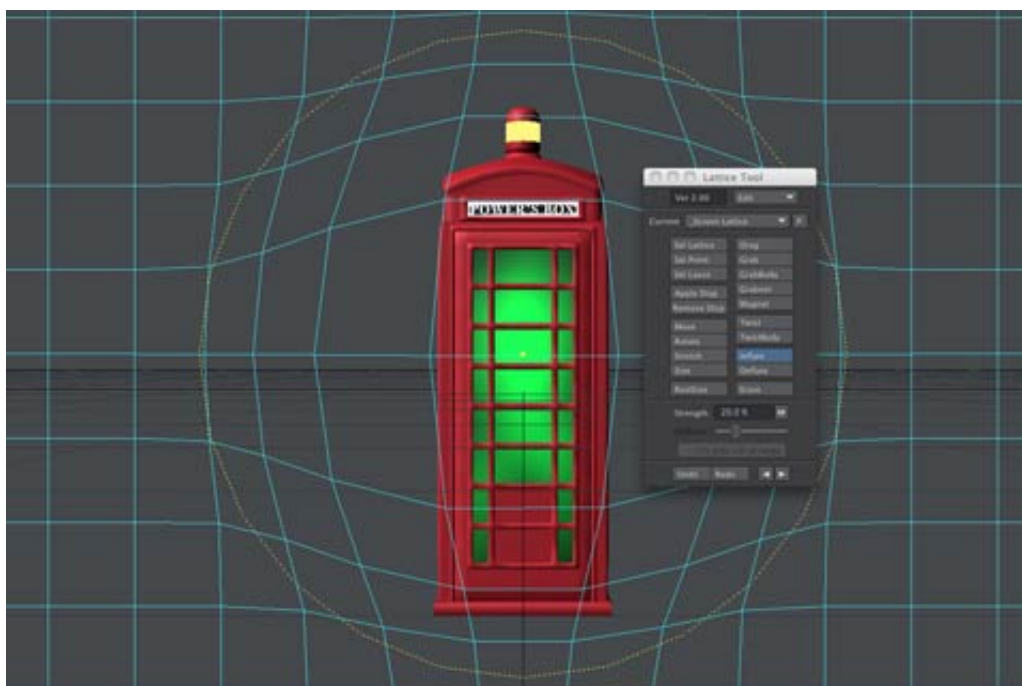
We've not applied a lattice deformer plugin to the spacecraft object yet, so it can't be deformed with the screen lattice. Then we've switched to the **Apply Disp** mode and clicked on the surface of the spacecraft object in the viewport. Immediately after that, it has been deformed.
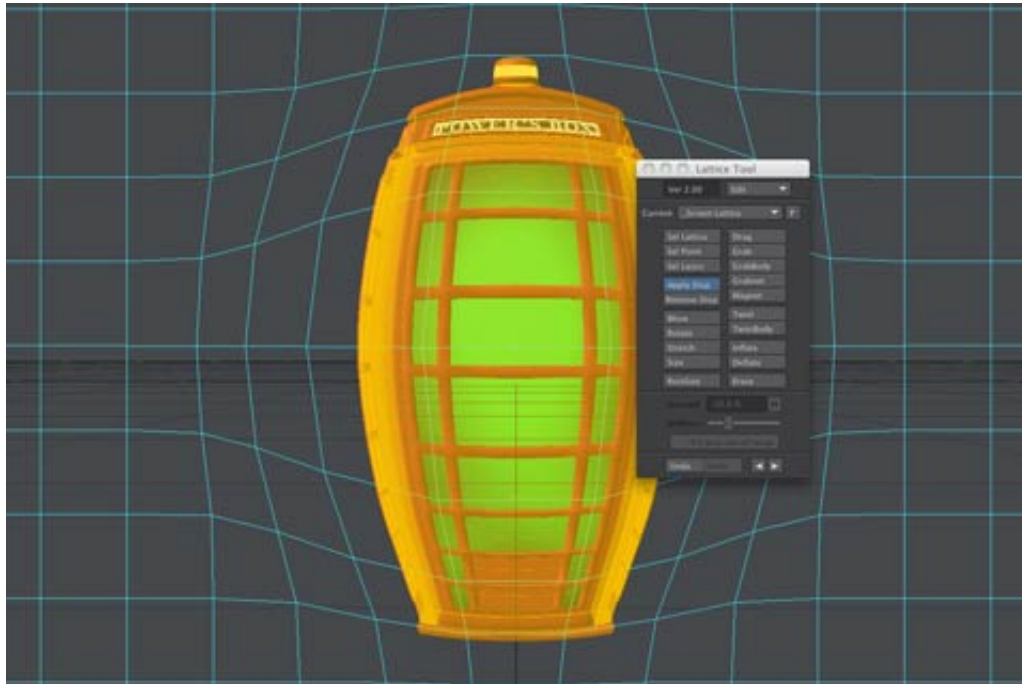
To know what happened, we've selected the spacecraft object and found the change of the settings on the Deform Tab of the Object Properties Panel. It seems that the lattice deformer plugin has been applied to the object as we clicked on the object. We can understand that the 3PS_LatticeDeformer Displacement plugin can be applied to an object by clicking on the surface of the object itself in **Apply Disp** mode, instead of using the Add Displacement pop-up menu on the Deform Tab of the Object Properties Panel. We can also use the **Remove Disp** mode to remove it from the object in the same way.
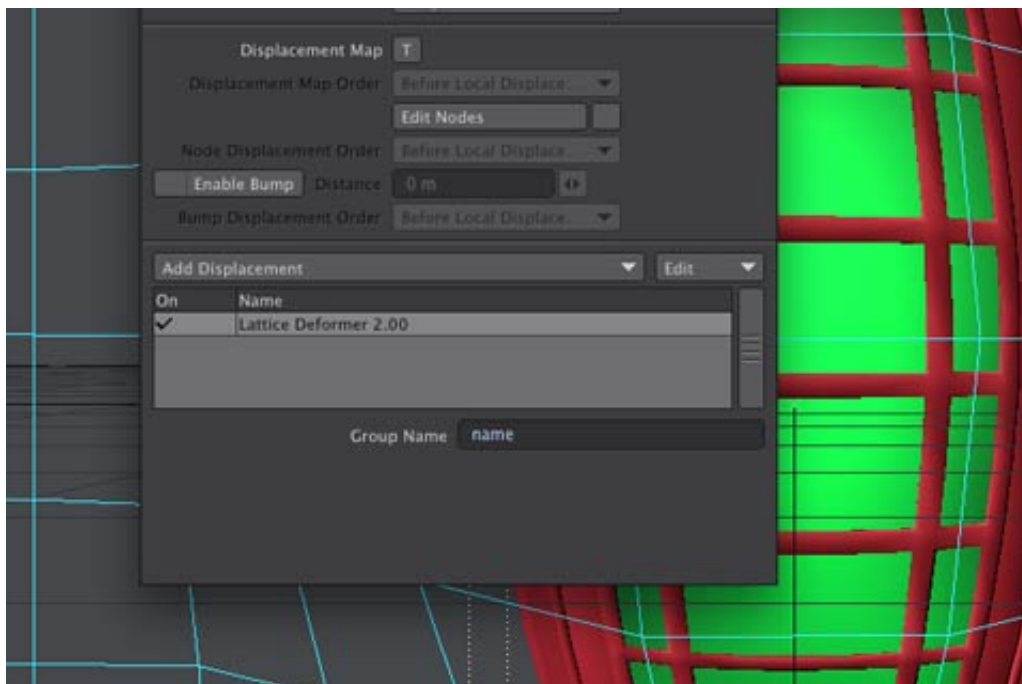
To increase the resolution of the current lattice, we've chosen the **Change Segments** command from the **Edit** drop down menu, and then we've set **X** to about **26** and **Y** to about **20**.
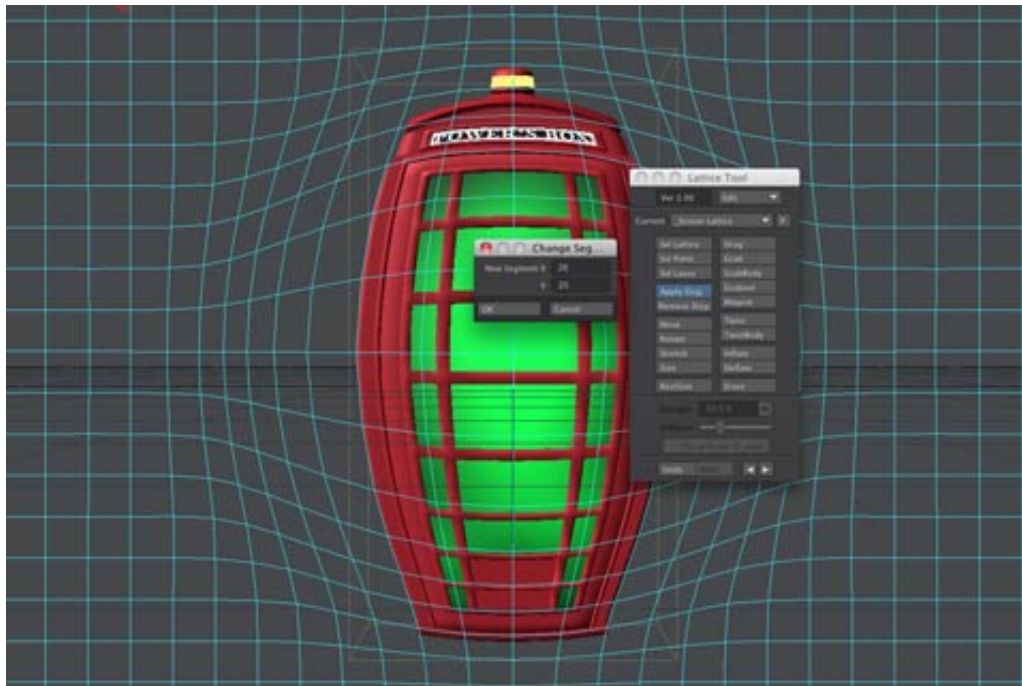
Now, let's try using the various editing modes to deform the object with the screen lattice. With effect brushes in those modes, we'll be able to continuously and drastically change the proportions and silhouettes of the spacecraft object just by clicking and dragging from our camera perspective.

Website: http://www.3rdpowers.com
Email: post@3rdpowers.com