

BASIC INTERFACE : NURBS & CURVES : MODELLING A DOLPHIN : MATERIALS & TEXTURES
BUILDING A HOUSE : MR BASIC : PAWN IN A HURRY : SELECTION SETS : WELDING VERTICES : MICRO TUTORIALS



BLENDER TUTORIAL GUIDE

About the Tutorial Guide PDF series

The Tutorial Guide PDF series is the latest addition to our Blender documentation. The first four sections of the Tutorial Guide PDF series consist of the content from our printed Tutorial Guides 1 and 2.

So how do these PDF documents relate to the printed Tutorial Guides? When making the decision to convert the printed guides into a digital format we were faced with various restrictions, which come with distribution via the Internet. The documents had to be small enough to download, which forced us to split them up. Instead of making a division based on the original guides we thought it best to rearrange the content based on four subjects:

Beginners
Modeling
Animation
Materials, Lighting, Rendering

Each PDF contains tutorials from both Tutorial Guide 1 and 2. Although this is less attractive for users already familiar with the printed guides, this new division will make it easier for new users of Blender; it will allow them to tackle their learning path in more manageable chunks.

We hope you will enjoy these PDFs, we think they are a valuable addition to the Blender library.

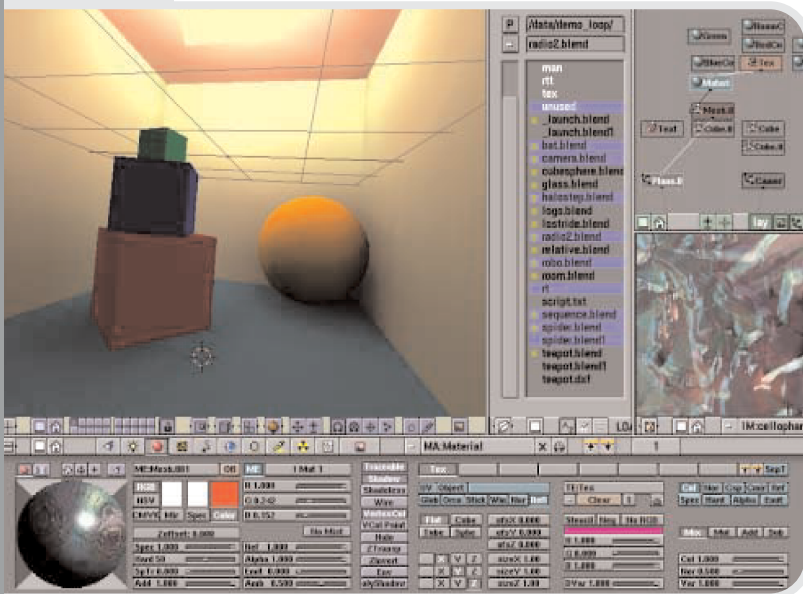
Have fun,

The Blender Team

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basic interface



*Author: Bart Veldhuizen
Subjects: user interface
Level: beginner*

Introduction

If you are reading this chapter, you are probably feeling like I did exactly one year ago. I had found this extremely interesting looking 3D application (which other users were raving about), but the user interface completely baffled me. I couldn't find the quit function (I had to kill the application instead of exiting it), I saw buttons that seemed to react differently each time I clicked on them and every time something interesting happened, I could not reproduce it.

In the weeks after that, I slowly found out the basic principles behind the Blender user interface. And though it is non-standard, it became clear that it was a very consistent system - it would let me use the same functions in a number of completely different situations.

This chapter will save you weeks of frustration by explaining the basics

of Blender's user interface. It will not explain every button or even every window in detail (that is where the Blender manual comes in), but instead let you see the basic idea behind it.

After finishing this chapter you are ready to work with the rest of the book. Like me, you will find out that Blender's user interface really grows on you; it is one of the most efficient and well-thought out interfaces I have worked with.

Here is what I found to be the Golden Rule of Blender:

"Keep one hand on your keyboard and one on your mouse."

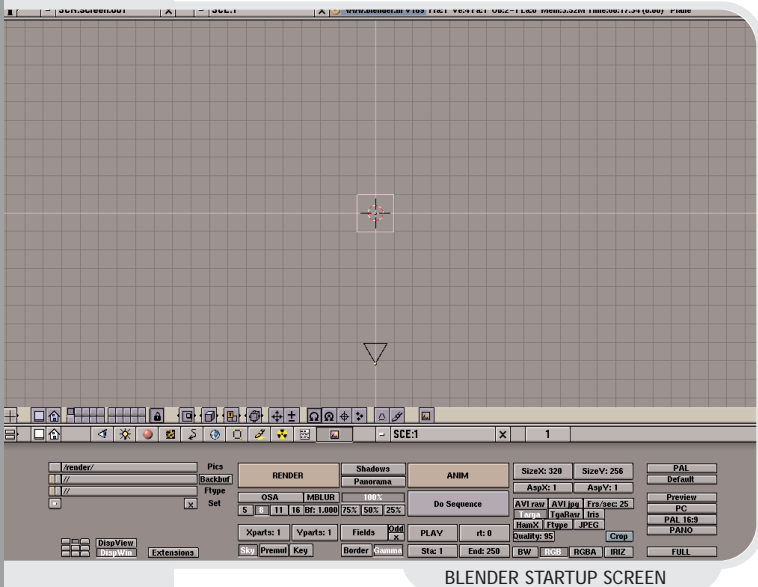
!

Even while Blender's user interface may be a bit daunting at first, I hope that working with this book will teach you that it is actually a very intuitive one. It was written entirely for working efficiently and quickly and this means that a lot of functions are accessible both by using the keyboard and by using the mouse. Working with hotkeys instead of menus is harder to learn, but the rewards are great.

After a while working with Blender becomes a second nature. Often, my girlfriend watches in amazement at the speed with which I can handle objects, change views, navigate my way around my scene in Blender. Blender has really turned my keyboard and mouse into a glove which reaches into 3D space.

But it all starts with the Golden Rule - remember it while you are working your way through this book!

basic interface



BLENDER STARTUP SCREEN

What am I looking at?

When you first start Blender, your screen will look like this. The screen is divided into three parts; at the top you see the Info Window. Among other things, you will see Blender's version number and some statistics about your current scene.

Next is the 3D Window. This window type is used for all the editing in your 3D world. The pink square in the middle is the standard plane. It is pink because it is currently selected. The black triangle on the bottom is the camera. The gray lines are the grid lines of the 3D world - you can use them to align your objects. The cross hairs with the white and red colored circle is the 3D cursor. You can place it anywhere in 3D space. It is used to determine where new objects are placed, but it can also act as a center for rotation or scaling.

The window on the bottom is called the Buttons Window. In this window, you can edit a variety of information about your scene: materials, lights, animation settings, rendering settings - it is all in here.

Each window has a Header. For the 3D window the header is located at the bottom. You can switch the position of the header by **RightClicking** on it and confirming the requester that pops up ('Switch header').

Pay special attention to the button on the far left - each window has this icon. This is also the one that completely eluded me in the beginning.

In Blender terms, it is called an Icon Slider button. If you **LeftClick** on it and drag left or right it will change, revealing a number of different icons. Each icon corresponds to a different window type. I will explain the different types later.

You can also click on the left and right half of the Icon Slider to change the window type. **!**



The contents of the Buttons Window can be changed by clicking on one of these buttons. In fact, it is a lot like the Icon Slider button that I discussed, but now all the options are visible. The meaning of the different buttons is explained later in the paragraph 'the Buttons Window'

Configuring the screen your way



CHANGING THE SIZE OF THE WINDOW

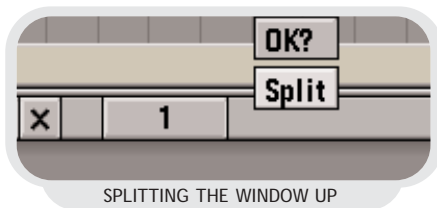
Blender's screen can be reconfigured in any way that you like. To start with, you can change the size of the



THE WINDOW HEADER

basic interface

different windows by placing the mouse pointer over one of the lines separating the different windows. The cursor changes shape to indicate you can now change the window size. **LeftClick** and drag to change the window size. **LeftClick** and drag to change the window size.



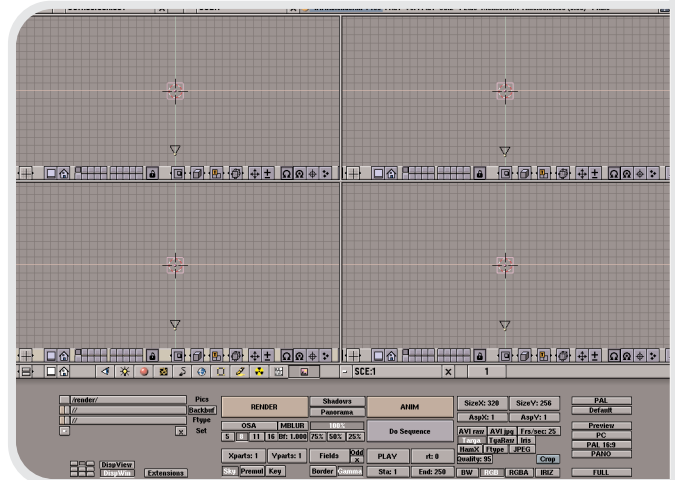
SPLITTING THE WINDOW UP

Adding a new window is similar: move the mouse pointer over a window border and **MiddleClick**. A small requester will pop up now. You can confirm splitting the screen by **LeftClicking** on the text 'Split', or by pressing **[ENTER]**. The window which has the focus and has a yellow header (in this case, the top window) is the one that will be split - approaching the window border from below will split the bottom window.

A line indicating the position of the split is now shown. You can move it to the desired position and **LeftClick** to confirm the location.

Cancel the action by moving your mouse pointer away from the requester, or by pressing **[ESC]**.

Of course, splitting windows works on vertical window borders, too. In this example, I have created three additional 3D Windows by splitting the default 3D Window three times. Each window is now independent from the others. This way, you can create the traditional 4-view window (top, front, right and camera) in Blender. More about this in the paragraph 'the 3D Window'.



THE BLENDER SCREEN AFTER 3 SPLITS

If you own a mouse with 2 buttons instead of 3, hold down the **[ALT]** Key and **LeftClick** to mimic the **MiddleButton**.

Removing windows is very much like splitting them; with the mousepointer over a window border, **RightClick**. Confirm the requester. Like splitting, the direction from which you approached the border (or rather, which window has the focus before joining) determines which window 'survives' the joining.



The toolbox - adding a sphere

Almost every Blender function can be accessed by using the keyboard or the mouse. The Toolbox contains most of Blender's functions. You can call up the toolbox either by clicking its icon in the top-right of the Blender screen, or by pressing **[SPACE]**.

This is how the toolbox works: The dark gray buttons on the left are function categories; moving your mouse pointer over them will change the button list on the right. Move

OK?
Join

JOINING TWO
SCREENS INTO
ONE

basic interface

| | | |
|--------|-----------------|----------|
| ADD | Load File As | F1 |
| VIEW | Load Last | cl |
| EDIT | Append File | shift+F1 |
| OBJECT | | |
| OBJECT | Save File as | F2 |
| MESH | Save | cn |
| CURVE | Save Image | F3 |
| KEY | Save VRML | clF2 |
| RENDER | Save DXF | shift+F2 |
| FILE | Save VideoScene | aln |

Quit Blender
THE TOOLBOX

| | | |
|--------|----------|----|
| ADD | Mesh | >> |
| VIEW | Curve | >> |
| EDIT | Surface | >> |
| OBJECT | Text | |
| OBJECT | MetaBall | |
| MESH | Empty | A |
| CURVE | | |
| KEY | Camera | A |
| RENDER | Lamp | A |
| FILE | Ika | A |

ADDING A MESH...

| | | |
|--------|------------|---|
| MESH | >Plane | A |
| VIEW | >Cube | A |
| EDIT | >Circle | A |
| OBJECT | >UVsphere | A |
| OBJECT | >Icosphere | A |
| MESH | >Cylinder | A |
| CURVE | >Tube | A |
| KEY | >Cone | A |
| RENDER | > | |
| FILE | >Grid | A |
| | > | |
| | >Duplicate | D |

... SELECTING ITS
TYPE

Segments: 32 OK

RESOLUTION QUERY

Segments: 32 OK

EDITING THE VALUES

your mouse pointer to the right and click on a function button to activate that function. Each button also shows the corresponding keyboard shortcut. In the shortcut notation, cl<button> means holding down [CTRL] and pressing the listed button. Similarly, al<button> uses the [ALT] key as a modifier.

Clicking some buttons will reveal a third layer of functions. For example, if you wish to add a sphere to your scene, first select 'Add' from the categories list in the Toolbox. Next, LeftClick on the button labeled 'Mesh'.

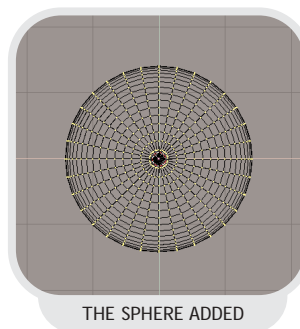
The button list on the right now changes to offer you a choice between the different primitives that Blender knows. LeftClick on 'UVsphere' to add a sphere to your scene.

When adding objects like a sphere, Blender wants to know which resolution you require. A sphere with a high resolution looks smoother than a low-resolution sphere, but it also requires more memory and is slower to manipulate and render.

These buttons work like the Icon slider you saw earlier: LeftClick on the 'Segments' button and drag left or right to increase or decrease the value. Also, you can click on either side of the button to change the value step by step.

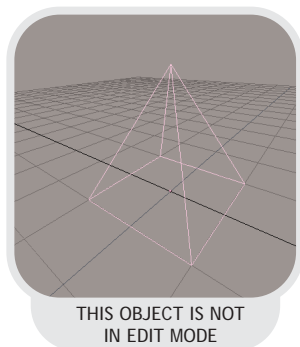
Yet another way to change the value is to hold down [SHIFT] and LeftClick the 'Segments' button. This will change the button into a text input. You can now type a value into the field directly. Press [ENTER] when you have entered the correct value. Finally, click on the OK button

to set the value of the 'Segments' variable.



In the case of the sphere, you will need to set a second parameter, 'Rings'. After doing this, a sphere will show up at the location of your 3D Cursor. Instead of showing up in pink or black, the sphere is drawn with small yellow dots. This mode is described in the paragraph 'Edit Mode'.

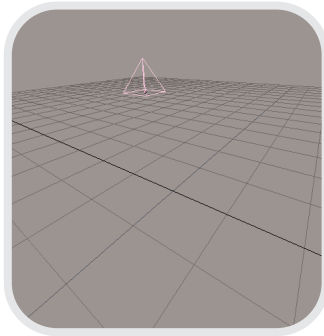
About Editmode



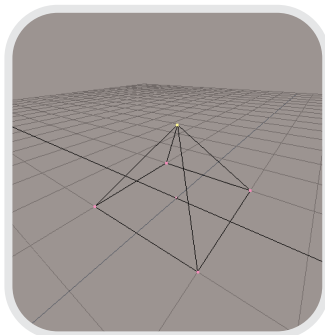
When you are working in 3D space, you can basically perform two types of operations: operations that affect an object as a whole and operations that affect the geometry of an object, but do not affect the object's global properties. An example of the former is moving an object to another location. An example of the latter is shaping a nose on a face.

b a s i c i n t e r f a c e

In Blender, you have to indicate which of the two you want to use. This is where editmode comes in.



This is an example of an object that is not in editmode. Operations like translating [G], rotating [R] or scaling [S] affect the object as a whole. For example, translating moves the entire object somewhere else.



In contrast, when you select [TAB] you enter editmode. The object is redrawn and the separate points of which it consists are drawn. (These points are known as vertices, by the way). If you select a vertex by **RightClicking** on it, you can then translate only this point, while leaving the others unaffected. In this way, you change an object's shape.

If you select more than one vertex, you can also rotate or scale them. In this case, the vertices are rotated or scaled around their median point.

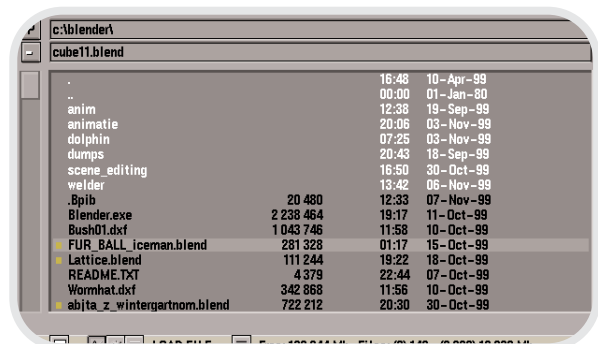
Loading and saving your work

By now you have probably created a Blender scene which you might want to save to disk, or you would like to take a look at the .blend files that we have included on the CD-Rom that comes with this book. Blender has a lot of file loading and saving options - even to the point that you can use Blender as a filemanager.

In this part I will briefly describe the basic file loading and saving mechanisms. As always, these functions can be accessed either from the Toolbox or by using a hotkey.

Loading a blender file

Call up the File Window by pressing [F1]. In this window, files are shown



in black and directories in white text. The .blend files are also indicated with a small yellow square in front of them.

The first method to load a file is by **LeftClicking** on a filename. This will copy the name to the filename box at the top of the window (the second textbox from the top). Pressing [ENTER] will then actually load the file. Alternatively, you can also **MiddleClick** on a file which will cause it to be loaded immediately.

Navigating to the parent directory is

basic interface

done by clicking on the '..' directory in the list or by clicking on the 'P' button at the top of the window. Sometimes you may want to refresh the filelist; for example when another program has been writing or changing files in the current directory. In that case, click on the '.' directory.

Saving a blender file

Open the File Window by pressing [F2]. This window works in the same way as above. Additionally, you can

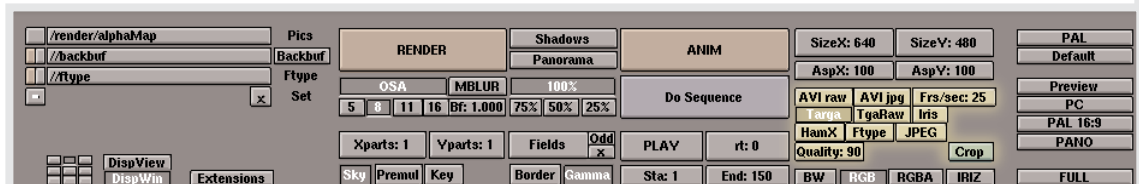
press [ENTER] or LeftClick on the filename. To cancel it, you can press [ESC] or move the mouse away from the requester.

SAVE OVER

c:\blender\welder\las17.blend

SAVING CURRENT
FILE WARNING

Returning to a directory where you have already been (and saved or loaded a file), or changing the current drive that you are working on is easy; just click/hold on the '-' button at the top of the File window. Select an entry to directly jump to this directory.

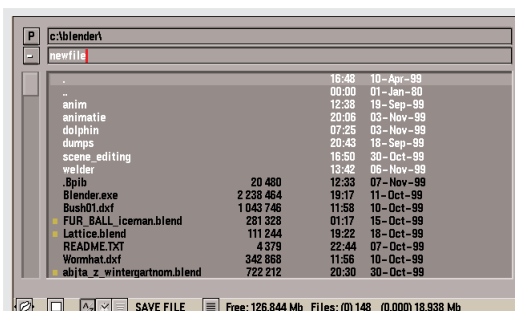


THE DISPLAY BUTTONS

now enter a new filename in the filename box. To do this, LeftClick in the filename box and enter a new name.

Saving an image

To save an image that you have rendered, just press [F3]. From now on saving the file is the same as saving a regular .blend file. The only difference is that you can select the file format in the Display Buttons window. This window is discussed in detail below.



THE SAVE FILE - WINDOW

Saving an animation

Saving an entire animation is done differently; you first need to enter a filename for your animation in the Display Buttons window and then press the 'Anim' button. From then on, all the animation frames are saved using the filename that you just entered as a base. Read more about this in the Display Buttons section below.

Use the keys NumPad [+] and NumPad [-] to automatically increase or decrease the versionnumber of a file before loading or saving

If you try to save over an existing file, Blender will show you this warning. To confirm this request, either

a:\
c:\
d:\
e:\
f:\
g:\
h:\
i:\
j:\
k:\
/usr/people/
/usr/tmp/
c:\blender\welder\
c:\blender\dumps\

CHANGING
DIRECTORIES

basic interface

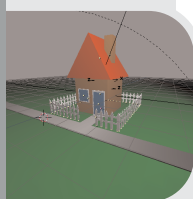
The 3D Window

The 3D window is where you will spend most of your time in Blender. In this window, you can rearrange the objects in your scene, edit their individual vertices (vertices are the points that make up an object), define animation, add lights and cameras, ...



if you own a mouse with two buttons instead of three, skip ahead and read about the Info Window in 'The Blender Windows: a summary'

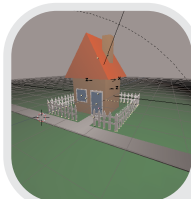
The first thing to know about the 3D view is how you can navigate through it. I am not talking about moving objects, but about moving your view-point - how can you examine objects? How does an object look from another side? Do the different parts have the correct color? Did I



ROTATING THE VIEW



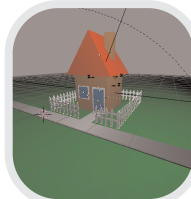
TRANSLATING THE VIEW



ZOOMING THE VIEW



PERSPECTIVE VIEW



ORTHOGONAL VIEW

add a little detail correctly?

Blender uses a very simple yet intuitive method for changing the view in 3D. To get started, **MiddleClick**, **hold** and **drag** your mouse around. Do you see what happens? Without any modifiers, **MiddleClick**, **hold** and **drag** rotates your 3D view.

Now try the same but hold down the **[SHIFT]** key before you click the mouse button. The view is now translated instead of rotated.

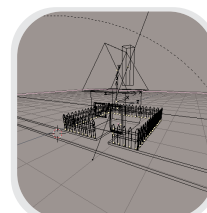
Finally, the **[CTRL]** key allows you to zoom in and out.

To toggle between perspective and orthogonal view, press **NumPad [5]**.

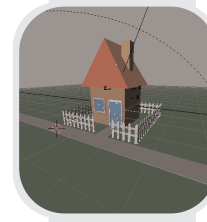
In the 3D window, you can display your scene in a number of modes. Especially if you don't have 3D hardware this can make a huge performance difference. To toggle between wireframe and solid view, press **[Z]**. Solid view can display a scene with some shading even though you have not yet defined a lamp.

Switch to (real) shaded view with **[SHIFT] [Z]**. If you have not defined a lamp yet, the scene will be completely black.

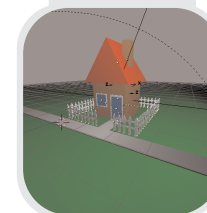
Aside from navigating around 3D space to look at your



WIREFRAME VIEW



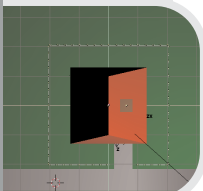
SOLID VIEW



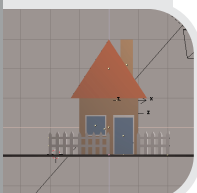
SHADED VIEW

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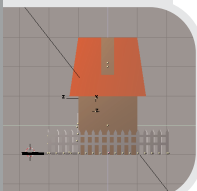
objects, you can also use a few hot-keys to quickly switch to standard views. Use NumPad [7], [1], [3] and [0] to switch to top view, front view, side view or camera view.



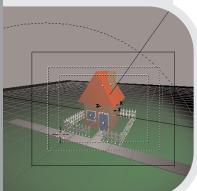
TOP VIEW



FRONT VIEW



SIDE VIEW



CAMERA VIEW

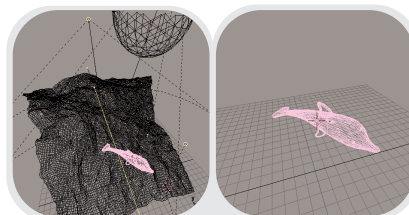


THE HOME BUTTON

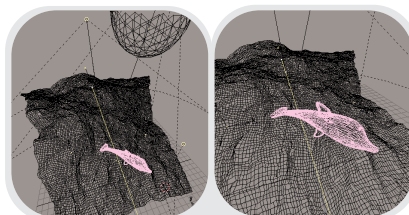
Sometimes you may get lost inside 3D space a bit. To restore the view, either click on the Home icon at the bottom of the 3D window, or press HOME. Blender will resize the view to include every object in your scene.

On some systems you may need to press the numlock key to get the numpad to work. !

If you want to get a specific object into view and not the entire scene, first select the object by RightClick on it (the object will turn pink to indicate it is selected). Next, press NumPad [.] .



CENTERING THE SELECTED OBJECT AND HIDING OTHERS; NumPad [.]



CENTERING THE SELECTED OBJECT; NumPad [.]

The display buttons

Once you are ready to render your image or save it to disk, you need the Display Buttons window. In this window you can control all the parameters that have to do with

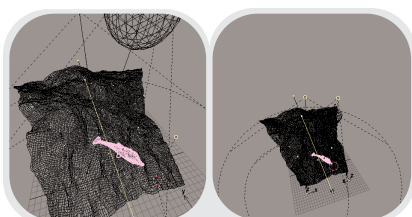


THE DISPLAY BUTTONS

A similar function like the previous one, you can also zoom in to the selected object and hide all other objects at the same time by pressing NumPad [/.]. To unhide your objects, press NumPad [/.] again.

items as rendering quality, rendering size, animation length and animation filenames.

To define the image size you can either select a preset value from the row of buttons on the far right or set an image size yourself by changing the SizeX and SizeY values. For pre-view rendering, you can also render



RESTORING THE VIEW OF THE WHOLE SCENE; HOME



SELECTING THE OUTPUT IMAGE SIZE

basic interface

the image at 25%, 50% or 75% of the final output size.

Turn anti-aliasing on or off with the OSA button. Control the image quality with the oversampling buttons 5, 8, 11 or 16. A higher value will result in a better image quality at the penalty of a longer rendering time.



SETTING THE START/END FRAME OF THE ANIMATION

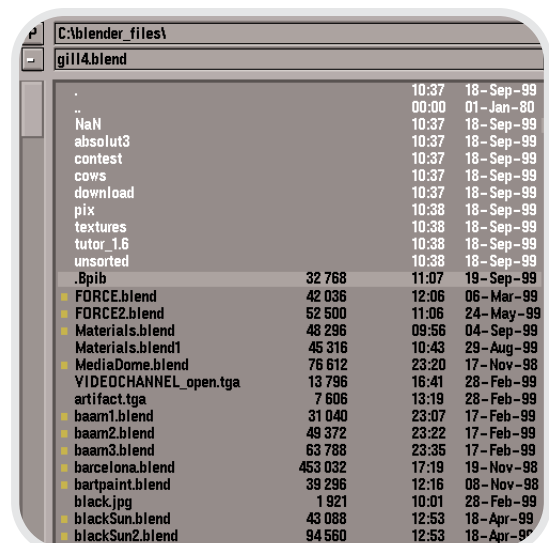
To set the animation start and end frame, change the 'Sta' and 'End' values. Pressing [SHIFT] [-] and [SHIFT] [+] will automatically jump to the start and end frame.

The Blender windows: a summary

This section gives a summary of the most important windows in Blender. It does not try to be complete nor to explain each window in detail. Most of the windows contain pointers to other chapters where it is discussed in more detail.

The file window

[F1] for loading,
[F2] for saving.



LeftClick to select a file and press [ENTER] to load it, or MiddleClick



RENDERING ANIMATIONS AND STILLS

Start rendering by selecting the 'Render' button or by pressing the [F12] key. A separate window will pop up. [ESC] aborts rendering. [F11] will toggle the rendering result window.

Press 'Anim' to render an entire animation. When rendering an animation, enter the basename of the animation frames in the 'Pics' field. Each file will be automatically named <basename>+framenummer. For example: frame0001, frame0002 etc. After rendering, press the 'Play' button to play back your animation.



SELECTING THE OUTPUT FORMAT

Select a file format with the buttons labeled 'Targa', 'TgaRaw', 'Iris', ... For animations, you can also choose 'AVI raw' and 'AVI jpg' and define the number of frames per second for these files.

! the Windows Mediaplayer has problems playing back Blender's AVI-raw and jpg files, but the Quicktime4 player plays them back correctly.

basic interface

to both select and load it.

To save a file, enter a name in the filename field (the second one from the top) and press [ENTER] to confirm the filename. Press [ENTER] again to save the file. If you have already entered a filename earlier, pressing [F2], [ENTER] will save, too.

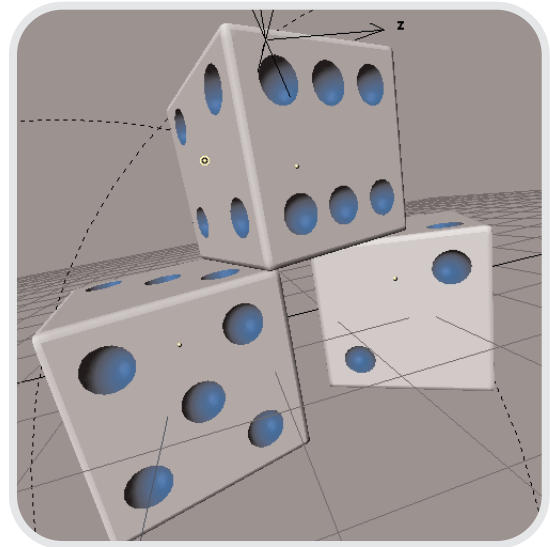
Entering a new directory name in the directory box (the one on the top) will create the new directory for you after asking confirmation.

The image select window



This window type works exactly like the file load window, but all recognized image files are shown as thumbnails. An example of where this window is used is in the Texture Buttons window, for loading image texture maps.

The 3D window [SHIFT] [F5]



This window allows you to manipulate the objects in your scene directly by dragging [G], rotating [R] or scaling them [S].

| | |
|--------------------|------------|
| top view: | NumPad [7] |
| front view | NumPad [1] |
| right view: | NumPad [3] |
| perspective off/on | NumPad [5] |
| camera view: | NumPad [0] |
| solid mode off/on | [Z] |
| shaded mode: | [CTRL] [Z] |

You can navigate through 3D space by dragging with the **MiddleButton**; this will rotate your view. Dragging with **MiddleButton** button and holding the [SHIFT] key will translate the view, and holding down [CTRL] will allow you to zoom.

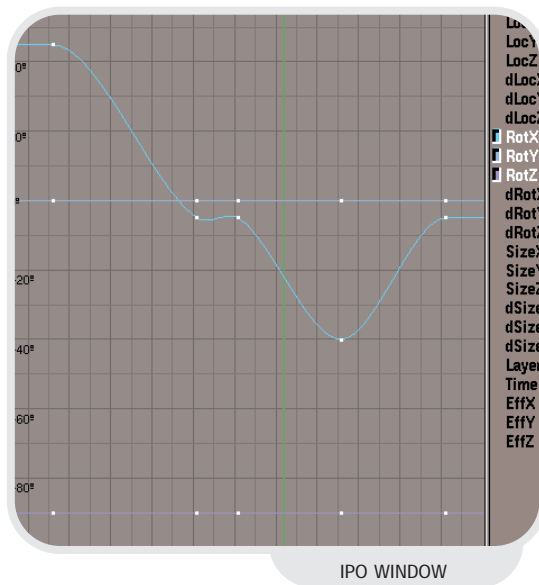
The IPO window [SHIFT] [F6]

In this window you can edit the time-lines that are associated to different object properties, like their position

b a s i c i n t e r f a c e

and rotation, but also their color or layer. The different object properties or 'channels' that are available are shown on the right. You can select channels by LeftClicking on them - [SHIFT] will extend the selection.

Enter editmode by pressing [TAB]. You can now edit the individual vertices of the curves or change their curvature.



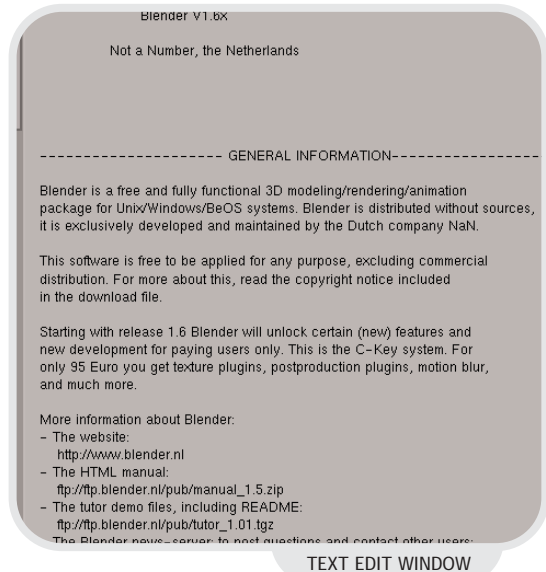
You can read more about the IPO window in the chapter 14



Text edit window [SHIFT] [F11]

The Text Edit Window is mainly used for writing Python scripts, but also if you do not have a C key this window can be extremely valuable. It is often a good idea to keep notes of your animation projects. Information that I always forget (especially after a couple of weeks!) are the maps that I have used, the scenes that I have defined, important frame numbers, well, you get the picture.

A big advantage of using the Text



Edit Window is that the notes are stored inside the .blend files - this way you can never loose your notes again!

When creating a new Text Edit Window, you have the choice of creating a new text object, or to import an existing text file. In that case, a File Window will be opened and you can select a file as usual. Of course, you can have more than one text object in your Blender file.



The info window

The Info Window does not have a hotkey. Instead, it is 'hidden' at the top of your screen. To reveal it, drag down the top window border on your screen as indicated in the picture.



The Info Window shows you the settings of Blender. Among other things, you can tell Blender where to store autosave files, when to save them

basic interface

(use the 'Time' value) and how many versions to keep on disk.

Here, you can also activate Blender's tooltips function. Tooltips will appear in the right corner of the header of the Info Window, right next to the Blender URL and version number.



THE INFO WINDOW

You can make your settings permanent by pressing [CTRL] [U] and confirming the requester that pops up. (Please note, that this entire book assumes that you have not changed the default Blender settings file!)

If you have purchased a C-key, your user name will show up here.

Important note for owners of a two-button mouse: activating the 2-mouse option will cause Blender to simulate a MiddleClick when you hold down [ALT] and LeftClick.



Lamp buttons [F4]

The Lamp Buttons will only show when a lamp has been selected. With these buttons, you can change all the parameters of lamps, like their color, energy, type (regular lamp, spotlight or sun). You can also control the quality of shadows by manipulating the clipping values and shadow buffer sizes.



Material buttons [F5]

Material Buttons are only shown when an object has been selected. This window allows control over properties as object color, shininess, transparency, textures, texture types, texture projection methods.



Animation buttons [F7]

In the left part of the Animation Buttons window you can set properties for things like curve following, automatic object duplication and object tracking.

The middle part of the window contains the interface to object effects like particle systems and the wave effect. Pressing the 'New Effect' button and selecting an effect from the effects list on the right will attach a new effect to the currently selected object and display the list of options for this effect.

The standard effects are: particle system, wave and build.



World buttons

With the World Buttons window you can set up horizon colors, ambient lighting, fog effects and starfields.



Edit buttons [F9]

The buttons that are shown in the Edit Buttons window depend on the kind of object that you have currently selected.



LAMP BUTTONS

basic interface



Display buttons [F10]

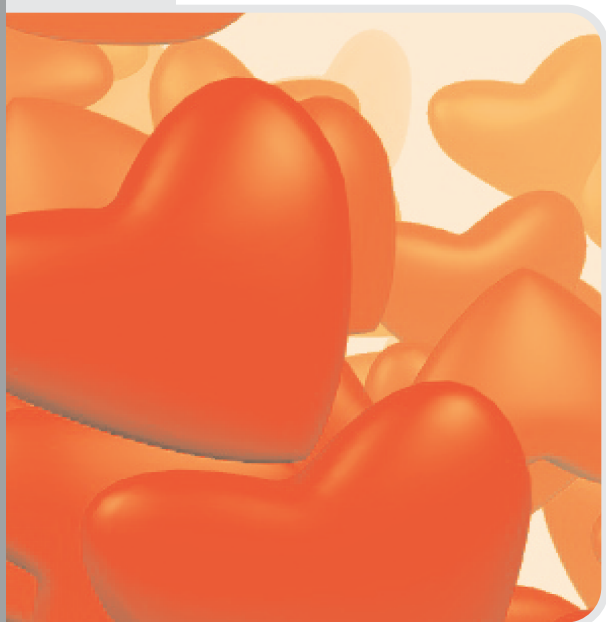
Using the Display Buttons, you can control the way Blender will render your images. Set the image size with the SizeX and SizeY buttons and control the image quality by setting an OSA (Over SAMpling) value. Higher values result in better image quality, but a longer rendering time.

Select the 'Render' button to render a still image, or the 'Anim' button to render a range of images. (For animations, the 'Sta' and 'End' values determine the length of the animation).

The collage displays several key interface panels:

- MATERIAL BUTTONS:** A row of buttons for material types: None, Image, EnvMap, PbrSkin, Clouds, Wood, Marble, Music, Blend, Stucci, Noise, and Default Vars.
- TEXTURE BUTTONS:** A panel with 'NEW Effect', 'Delete', and 'RecalcAll' buttons, along with various texture parameters like 'Tall: 5000', 'Size: 1.00', and 'Life: 50.00'.
- ANIMATION BUTTONS:** A panel with 'Blend', 'Read', and 'Paper' buttons, and a 'Mist' section with 'On', 'Lin', and 'Str' options.
- WORLD BUTTONS:** A panel with 'Blend', 'Read', and 'Paper' buttons, and a 'Mist' section with 'On', 'Lin', and 'Str' options.
- EDIT BUTTONS:** A large panel with various modeling tools like 'Extrude', 'Screw', 'Spin', 'Spin Dup', 'Subdivide', 'Fract Subd', 'Intersect', 'Split', 'To Sphere', 'Beauty', 'Noise', 'Smooth', 'Xsort', 'Hash', 'Rem Doubles', 'Double Sided', 'Limit: 0.001', 'Hide', 'Reveal', 'Select Strap', 'HSize: 0.100', 'Draw Normals', 'Draw Faces', and 'All edges'.

HAPPY HAPPY, JOY JOY



Author: Bart Veldhuizen
Topics: NURBS editing
Level: Beginner

Introduction

You have already seen quite a bit of polygon editing in this book. However, Blender also supports two other important object types to model with: Curves and Surfaces. With Curve Objects you can draw two-dimensional spline graphics that can be filled and extruded automatically. With Surface Objects you can model smooth three-dimensional surfaces.

I will first teach you how to create a smiley using 2D curves, and then how to create a heart by using 3D surfaces.

Creating a smiley in 10 steps

Step 1:

Start with new scene. (You can clear everything in Blender by pressing [CTRL][X] and selecting 'Erase All' from the menu that pops up). Press [SPACE] to bring up toolbox. First, select add, then 'curve', and finally 'nurbs circle'.

Step 2:

I will use the first circle to form the outline of the smiley. While all vertices are still selected (they are yellow, if not; press [A] twice), start scale mode with [S] and move your mouse to make the outline bigger. LeftClick to finish scaling.

Step 3:

Now, I will add the eyes. While still in editmode, add another NURBS circle. After adding, start grabmode with [G] and translate the eye to the correct position. Add a duplicate of the eye with [SHIFT][D], enter grabmode [G] and translate the eye to the right position.

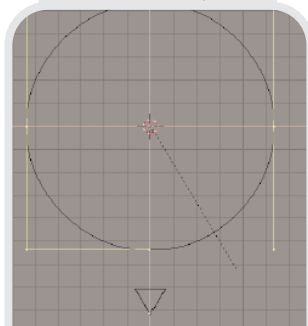
Step 4:

I will now add a mouth. Add another NURBS circle (or just duplicate an eye), and select the two vertices indicated in the figure by right-clicking on the first, holding down the [SHIFT] key and right clicking on the second vertex.

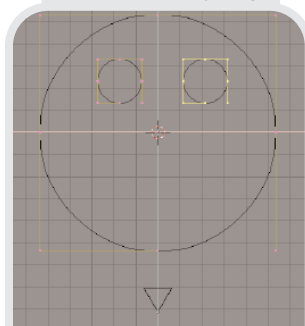
STEP 1

| | | |
|--------|----------------|---|
| CURVE | >Bezier Curve | A |
| VIEW | >Bezier Circle | A |
| EDIT | | |
| OBJECT | | |
| OBJECT | >Nurbs Curve | A |
| MESH | >Nurbs Circle | A |
| CURVE | | |
| KEY | >Path | A |
| RENDER | | |
| FILE | | |
| | >Duplicate | D |

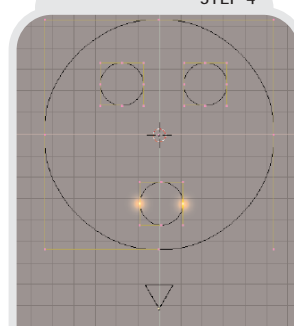
STEP 2



STEP 3



STEP 4



HAPPY HAPPY, JOY JOY

Step 5:
Move the two selected vertices further apart by using the scale mode [S], and translate them upward by using the grabber [G].

Step 6:
The circle that I used for the mouth has too many vertices to create a nice mouth shape. Remove some by selecting the four indicated vertices and pressing [X]. Select 'Selected' from the menu that pops up.

Step 7:
Select the two vertices in the figure and using the grabber to translate them downwards.

Step 8:
Give the smiley a finishing touch by selecting the indicated vertices and using a combination of the grabber and scale mode to move them outwards and up a bit.

Step 9:
Maybe you will need to tweak the shape of the mouth a bit more until you are satisfied. Don't hesitate to experiment!

Step 10:
Now it is time to look at the result of our work. Leave editmode by pressing [TAB], and switch to shaded view by pressing [Z]. Turn on perspective mode for the 3D window with NumPad [5] and change your view by pressing the MiddleButton, and dragging. Do you see how Blender automatically determines which curves are holes and which curves should be filled? This even works with overlapping curves! You can use this to create very interesting effects.

Selecting curves:

The smiley is now composed of several curves and it can be awkward to select a single one of them. Use the select linked tool to select an individual curve.

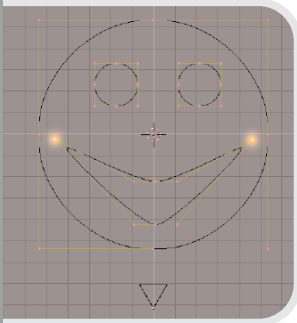
For example, enter editmode with [TAB] and select a vertex of the curve of the mouth by right-clicking on it. Next, press [L] to select all vertices that are linked to this one.

Adding more detail

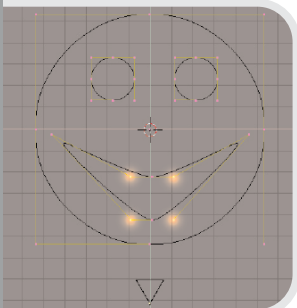
I have shown how to delete vertices from a curve, but of course you can also add them.

| |
|------------------|
| Specials |
| Subdivide |
| Switch Direction |

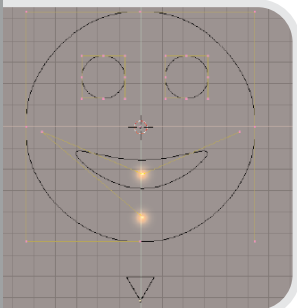
To do this, select two neighbouring vertices (hold down [SHIFT] to extend your selection), and press [W]. Select 'subdivide' from the menu that pops up.



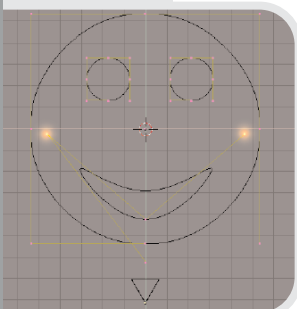
STEP 5



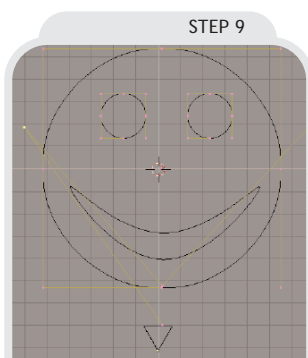
STEP 6



STEP 7



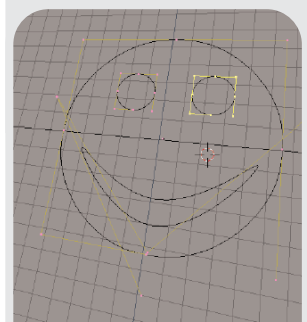
STEP 8



STEP 9



STEP 10



HAPPY HAPPY, JOY JOY

Creating a heart in 10 steps

Step 1:

In this tutorial I will create a love-heart by using a standard NURBS sphere, and tweaking its control points. Start off with a clean blender [CTRL][X]. Delete the default plane and add a NURBS sphere to a new scene. NURBS spheres are located in the toolbox ([SPACE] or [SHIFT][A]), under ADD and then SURFACES.

If you have a fast computer, you can do this tutorial in shaded view by pressing [Z]. If not, you can edit the sphere in wireframe mode.

Step 2:

Go to frontview NumPad [1], and enter editmode by pressing [TAB].

Use border select [B] to select the middle vertices in the top-row of the controlpoints. The figure shows which area to select.

Step 3:

If you switch to topview by pressing NumPad [7], you can see that you have actually selected a couple of vertices that were hidden from your view in the frontview.

Using box-select in front-view selects all vertices within the box, even when they are hidden behind each other. Before going on, return to frontview by pressing NumPad [1].

Step 4:

The next step is to enter grabmode [G], and move the three selected vertices slightly downwards. This will create a nice, smooth bump in the sphere.

Step 5:

Deselect all selected vertices with [A]. (This is a step that you have to make each time in the remaining steps of this tutorial).

Select the three vertices in the top-left and the three in the top-right, and scale them a bit by using the scaling mode [S] so that the top becomes a bit wider.

When you are satisfied with it, use the grabber [G] to move the vertices up a bit.

Step 6:

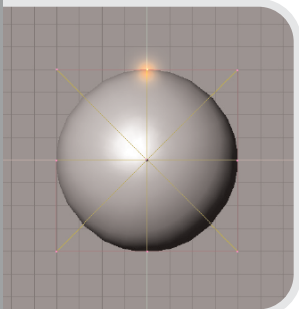
Now I will to taper the bottom of the heart. Box-select all the vertices at the bottom [B] and scale them down:

Step 7:

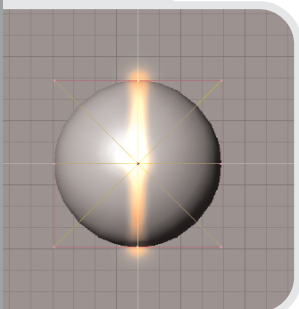
The heart is starting to look good, but the bottom is still a bit blunt. Make it more pointy by box-selecting [B] the middle vertices at the bottom and using the grabber [G] to move them downward.

| | | |
|--------|------------|---|
| SURF | >Curve | A |
| VIEW | >Circle | A |
| EDIT | >Surface | A |
| OBJECT | >Tube | A |
| OBJECT | >Sphere | A |
| MESH | >Donut | A |
| CURVE | | |
| KEY | | |
| RENDER | | |
| FILE | | |
| | >Duplicate | D |

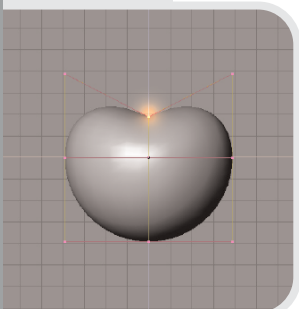
STEP 1



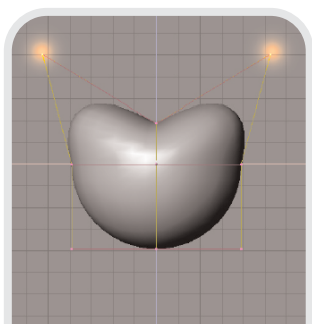
STEP 2



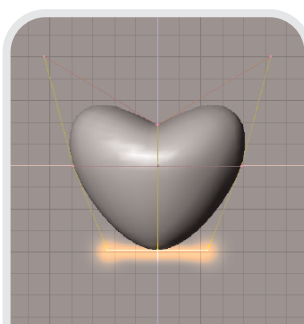
STEP 3



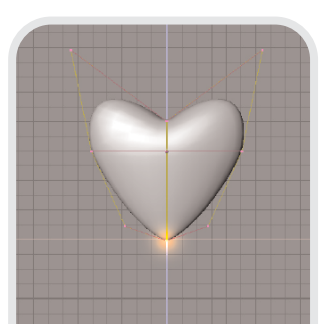
STEP 4



STEP 5



STEP 6

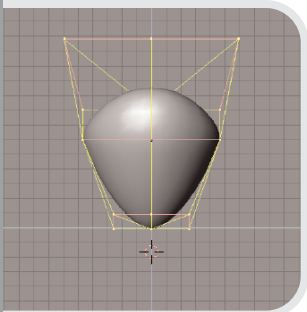


STEP 7

HAPPY HAPPY, JOY JOY

Step 8:

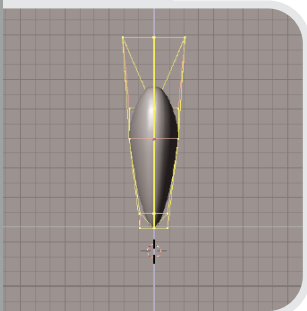
Now, in the frontview our heart looks just fine, but when you switch to sideview NumPad [3], you will see that you have drawn a mighty fat heart!



STEP 8

Step 9:

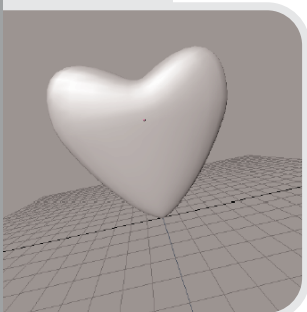
Select all vertices (press [A] twice), and scale everything in the x-dimension. To do this, enter scaling mode, move your mouse horizontally and then press the MiddleButton. This will lock the scaling to only one dimension.



STEP 9

Step 10:

Result after scaling



STEP 10

Step 10+:

I have added some colour and light and rendered a bunch of hearts here.

Also, in the Flock of Birds tutorial, you can learn how to automatically create hundreds of duplicates! (That is the trick that I used here)



STEP 10+

MODELLING A DOLPHIN



| | | |
|--------|------------|---|
| SURF | >Curve | A |
| VIEW | >Circle | A |
| EDIT | >Surface | A |
| OBJECT | >Tube | A |
| OBJECT | >Sphere | A |
| MESH | >Donut | A |
| CURVE | | |
| KEY | | |
| RENDER | | |
| FILE | | |
| | >Duplicate | D |

FIG. 1

Author: Bart Veldhuizen
Level: Beginner
Subjects: lattice modeling, curve extrusion, beveling


Introduction

In this chapter, I will explain how you can easily model a dolphin using a tool called lattice deformation. Lattices are grids that are linked to objects. Deforming a lattice causes the linked object to follow the lattice's changed shape.

Not only can this be used as a tool to create interesting shapes (it is a bit like working with clay, really), but also as a very powerful animation tool.

The dolphin

The main part of the dolphin's body will consist of a sphere. To keep the surface smooth, I choose to use a surface sphere and not a mesh sphere.

Start blender, and press [X], [ENTER] to delete the default plane in the middle of the screen. Next press [SPACE] or click on  to bring up

the Toolbox and select 'add', then 'surface' and finally 'sphere' (as in Fig. 1). A small sphere appears in the middle of the screen.


Scale the sphere in the X-direction to elongate it. Do this by starting scale mode [S], moving the mouse horizontally a bit and then clicking **MiddleButton**. This will constrain the scaling process to the X-axis only.

After you are done, your sphere should look like Figure 2 (because it is not really a sphere anymore I will refer to it from now on as a spheroid).

Switch to Front View NumPad [1] and leave edit mode [TAB]. The model will now turn pink (Fig. 3) to show it is still selected, but you are not in edit mode anymore.

It is now time to add the lattice to the scene. Like other objects, it will appear at the position of the 3D cursor when you add it. Therefore, first **LeftClick** in the middle of the sphere to bring the 3D cursor to the center.

Call up the toolbox with [SPACE] and select 'add' and then 'lattice'. The sphere is deselected and a pink square appears in the middle of the spheroid.

Go to the Edit Buttons window ([F9] or ) and enter the following data for the lattice (see Fig. 5):

Turn on the option called 'Outside'. This will remove the interior vertices from the lattice, making it easier to edit.

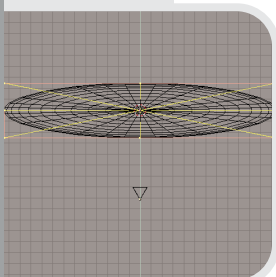


FIG. 2

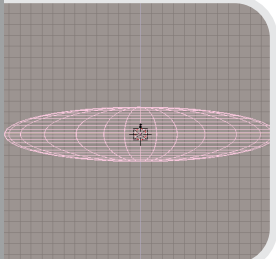


FIG. 3

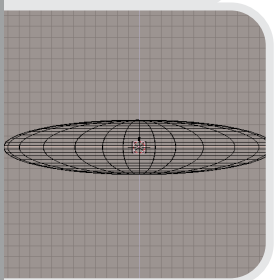


FIG. 4



FIG. 5

MODELLING A DOLPHIN

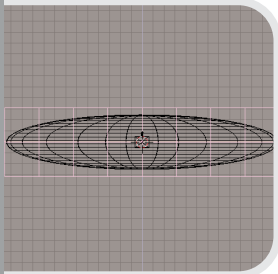


FIG. 6

With the lattice still selected, press [S] to scale the lattice. Increase its size so that it neatly fits around the spheroid (Fig. 6).

Before the lattice can actually affect the spheroid, we need to attach the two together. More specifically, the lattice should become the parent of the spheroid. Blender can then use the 'parent-child' relation to pass on the deformation information from the lattice to the spheroid.

To do this, first select the spheroid, hold [SHIFT] and next select the lattice. Both should be pink now, but the lattice is brighter to indicate it is the active selection.

Now we'll make the lattice the parent of the spheroid. Select [CTRL][P], and a message comes up: OK? Make Parent (Fig. 7). Hit [ENTER], or LeftClick on the 'Make Parent' option. The active object has now become the parent of the inactive but selected object.

Now it is playtime! Let's first get a feeling for the way the lattice looks and works.

To make sure you are not wasting your work so far, save your (Fig. 8) work by pressing [F2], entering a filename and pressing [ENTER] twice to save. (Once to confirm the filename and twice to actually save the file).

Select the lattice (RightClick on it), press [TAB] and play around with the trackball mode (press and hold MiddleButton and move your mouse around). Turn on perspective mode with NumPad [5]

As you can see (Fig. 9), the lattice consists of several layers of control vertices.

Remember this when you make selections in the next step of the tutorial. It is important to use the box tool to select several vertices at once and then move them. Turn on solid drawing with [Z] for the next step.

Now select a single vertex and press [G] to start the grabber and move the vertex around. Do you see the effect that it has on the dolphin's body? Editing the lattice vertices smoothly deforms the attached sphere (Fig 10). Turn off solid drawing with [Z].

To restore the lattice's geometry from before you entered editmode, press [U] now. Confirm the requester 'Reload Original Data?' (Fig. 11) either by LeftClick clicking on the text or by pressing [ENTER].

This is in fact the only form of undo that Blender currently offers. It may seem a bit limited, but with a bit of careful planning and saving regularly you will be fine.

Saving a new version of a Blender file can be done extremely quickly. If you have already saved your file before, try this: press [F2] to call up the file window. Next, press NumPad [+] to increase the version number of the file and press [ENTER] to save. Do this before you make an important editing step, and you can reload the previous scene with [F1], [ENTER]. After a while, you will be doing this so quickly that you really will never think about an undo function again!

OK?

Make Parent

FIG. 7

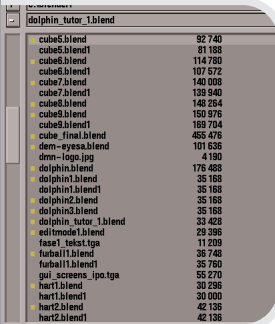


FIG. 8

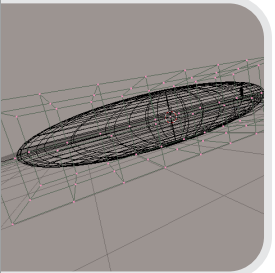


FIG. 9

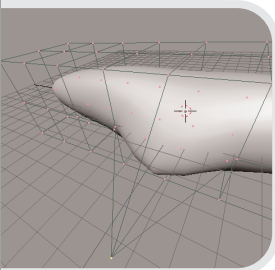


FIG. 10

OK?

Reload Original data

FIG. 11

MODELLING A DOLPHIN

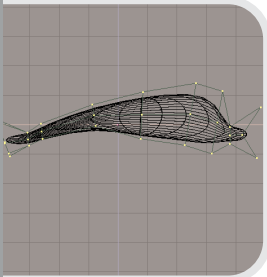


FIG. 12

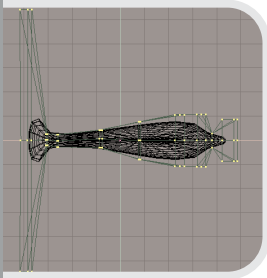


FIG. 13

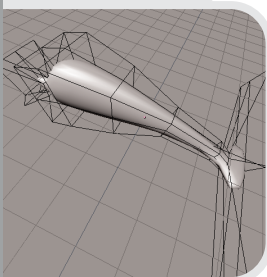


FIG. 14

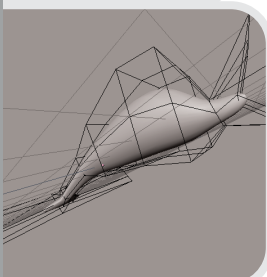


FIG. 15

Restore the front view with **NumPad [1]** and turn perspective mode off with **NumPad [5]**.

The body of the dolphin will be formed by changing the shape of the lattice. I will first create a good looking profile of a dolphin in the front view. When I am satisfied with this, I will turn to top view and create a good profile there.

Each time you need to move a vertex, first make sure all vertices are deselected. Press **[A]** to deselect them all if necessary. Next, use the box select tool to select a row of lattice vertices. To do this, press **[B]** and drag a box around the vertices of interest. Box select will not only select the visible vertices (the ones at the front), but also the vertices that are 'behind it' in other layers. After having selected vertices, press **[G]** to start the grabber, move your vertices and **LeftClick** to confirm their new position.

You can also change a whole line of vertices at once by box-selecting them and moving, scaling or rotating the entire group. **!**

In the front view, keep working until your lattice and sphere look like Figure 12.

Now, switch to top view (**NumPad [7]**) and use the same technique to move the vertices until they look like Figure 13.

By now, we already have got the basic shape of the dolphin! Let's take a sneak peek at how it looks in 3D. Press **NumPad [5]** to turn on perspective view, **[Z]** to turn on shading and play around with the trackball option (remember? **MiddleButton** and move your mouse). Is it already starting to look good (Fig. 14 and 15)? Hello, Willy!

Adding Fins

We are getting there, but Willy is not quite finished yet. First I have to add some fins. Return to wireframe, orthogonal (non-perspective), front view (that is **[Z]**, **NumPad [5]** and **NumPad [1]**).

I am making the fins by drawing an outline and beveling it. Press **[TAB]** to leave the edit mode of the lattice. Place the 3d cursor above the dolphin's back (**LeftClick**). Bring up the toolbox and select add-curve-bezier curve (Fig. 16).

In curve edit mode, you can add vertices by first selecting an endpoint of the curve, then holding down **[CTRL]** and **LeftButton** clicking. Each click will add a new node to the end of your curve (Fig. 17-20).

When you are satisfied, close the curve with **[C]**.

Now try playing around with the bezier controls (the lines that 'touch' the curve) until your curve looks like the one in Figure 21.

| | | |
|--------|----------------|---|
| CURVE | >Bezier Curve | A |
| VIEW | >Bezier Circle | A |
| EDIT | | |
| OBJECT | >Hubes Curve | A |
| MESH | >Hubes Circle | A |
| CURVE | | |
| KEY | >Path | A |
| RENDER | | |
| FILE | | |
| | >Duplicate | D |

FIG. 16

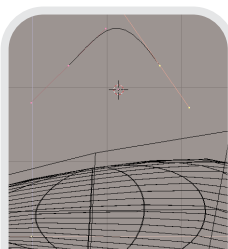


FIG. 17

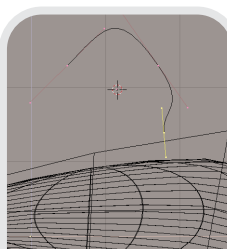


FIG. 18

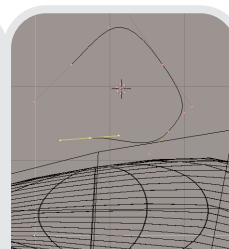


FIG. 19

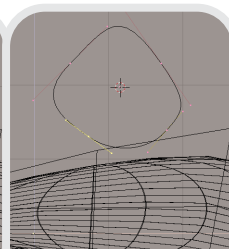


FIG. 20

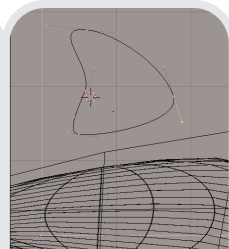


FIG. 21

MODELLING A DOLPHIN

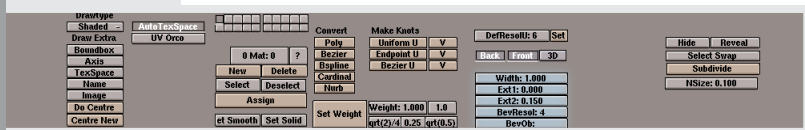


FIG. 22

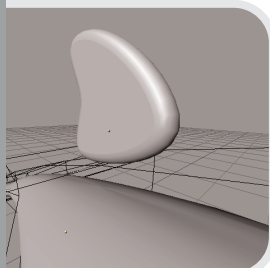


FIG. 23

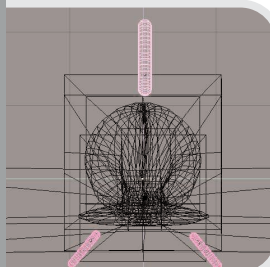


FIG. 24

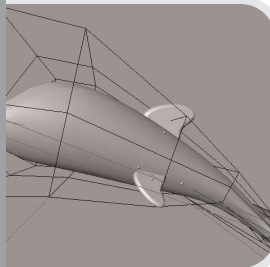


FIG. 25

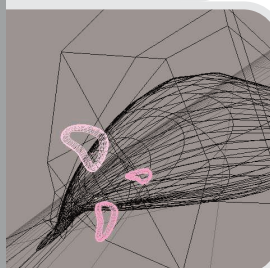


FIG. 26

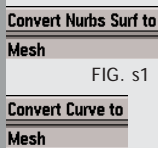


FIG. s1

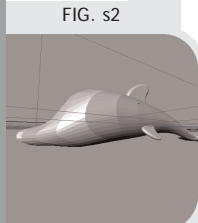


FIG. s3

Press [TAB] to leave editmode and (or [F9]) to go to the Edit Buttons window. There, change the Ext. 2 value to 0.15, and the BevResol value to 4 (Fig. 22). This should give you a nice, rounded fin.

A small sneak in perspective and solid drawing mode (Fig. 23) shows the effect of the bevel settings.

I now duplicate this fin to create two other, smaller, fins. First go to side view with NumPad [3]. Duplicate the selected fin with [SHIFT][D].

Move it away from the top and LeftClick to place it. The position does not really matter yet - I will attach it to the body later. Rotate it about 220 degrees ([R] and move with the mouse - [CTRL] constrains the angles), then scale it to a factor of about 6 ([S] and move the mouse, [CTRL] constrains here, too).

Duplicate this smaller fin and rotate it -80 degrees. too (Fig. 24).

Next, in the front and right view, move the three smaller fins around until they are attached to the body in a proper way. This is how it should look (I rotated the fin on Willy's back a little bit to make it match the angle of his back - Fig. 25 and 26).

Converting the surface to a mesh

You may want to convert the entire dolphin into a mesh once you are

ready. To do this, first select each object and press [ALT][C] (Fig. s1 and s2). This will 'downgrade' each surface into a mesh. This action cannot be undone!

After converting the dolphin's body you will see that it is now strangely deformed. Don't panic! This is only because the lattice now works 'double' - its effect is calculated in the mesh, and afterwards it still works on the (already deformed) mesh. Just select and delete the lattice to fix this ([X]).

Looking at your dolphin in shaded mode (Fig. s3) you will now see that it the surface is no longer smooth.

To fix this, go to the Edit Buttons screen (do you notice it is now showing other options than when the dolphin was still a surface instead of a mesh?) and select the 'Set Smooth' Button (Fig. s4) to set smooth shading for the mesh (Fig. s5).

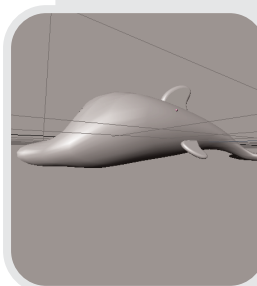


FIG. s5

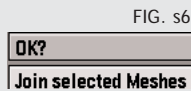


FIG. s6

Finally, to join all the body and the fins into one single object, select them all and press [CTRL][J] (Fig. s6). Now, everything has been joined into a single mesh.

Finishing touches


Willy is almost ready!. As a finishing touch, I will add two eyes. Switch to



FIG. s4

MODELLING A DOLPHIN

top view, use the toolbox to add a sphere. Scale it down and place it in the head, so that a little less than half of the sphere sticks out of the head. The height of the eyes should be equal to the top of the dolphin's beak and they are located a little bit towards the back of the head (as in Fig. 27).

Even though the original sphere was not a mesh but a surface, it is possible that you will see the sides of your dolphin become a bit jagged. This is because at rendering time, the sphere's surface is converted into a mesh. The resolution for this mesh can be changed by selecting the sphere, entering editmode with [TAB] and going to the Edit Buttons screen ([F9] or ).

Change the value of 'ResoU' and 'ResoV' to change the resolution of the dolphin (Fig. 28). Leave editmode for the change to take effect.

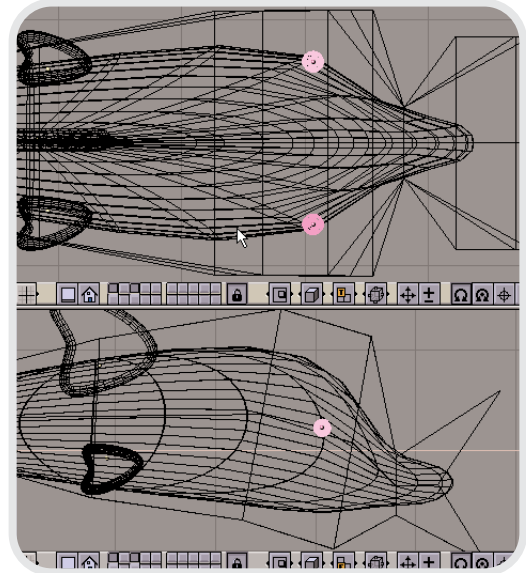


FIG. 27

Result

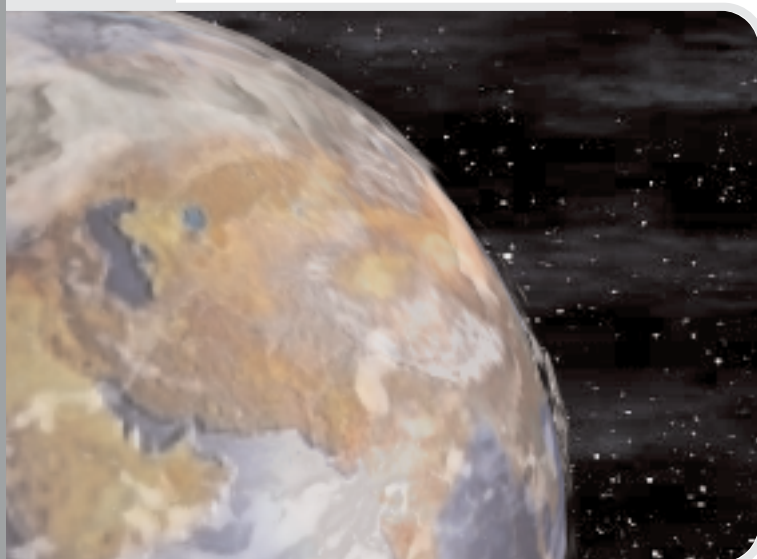
After adding some lighting and an ocean floor, this is what the final result looks like!

In case you are wondering how I did the lighting in this scene, skip ahead and read chapter 6.



FIG. 28

materials + textures





Author: Geno Ruffalo
 Level: Intermediate
 Subjects: Materials, Textures, Image Mapping

Introduction

Second only to modeling, Materials and Textures are probably the most important aspect to creating believable creations in 3D graphics software. This lesson will cover the 2 different types of materials in Blender, Procedural or 3D textures, and 2D image Textures.

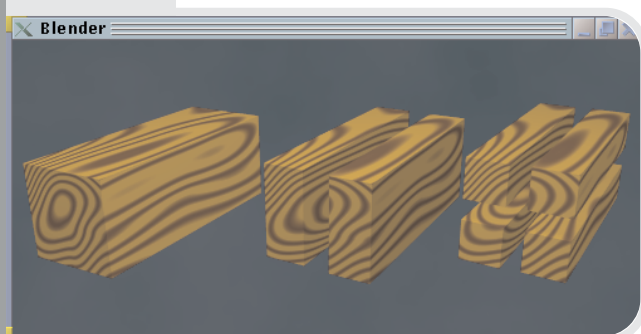
Procedural 3 dimensional textures

Wood

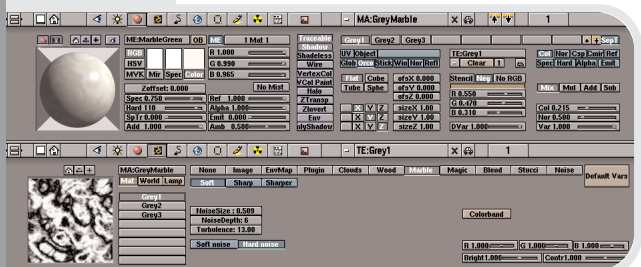
A Procedural Texture is a true 3D texture. This means that each 3D coordinate of the object can be directly translated into a color. This can be easily demonstrated by creating a wood texture and applying it to a rectangular solid, or block of wood. When the block of wood is cut into halves and even quarters the texture flows around the new planks of wood as it would in real life. Create a CUBE primitive and scale it larger on one axis. With the object still selected, go to the Material Buttons window by clicking on the  icon, or pressing [F5]. Click on the '-' button next to the 'MA:Wood' label in the Material Buttons screenshot on the left and select 'ADD NEW' from the menu that pops up. Now click on the  icon or press [F6] to go to the Texture Buttons window and create a new texture by clicking on the '-' button just like you did to create the material. Adjust the parameters as seen in the example. It is a good idea when creating new materials and textures to name them appropriately.



THE MATERIALS BUTTON WINDOW



THE PROCEDURAL TEXTURE APPLIED TO A BLOCK



CREATING THE MARBLE TEXTURE

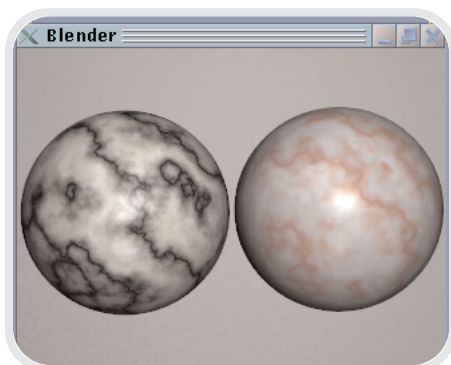
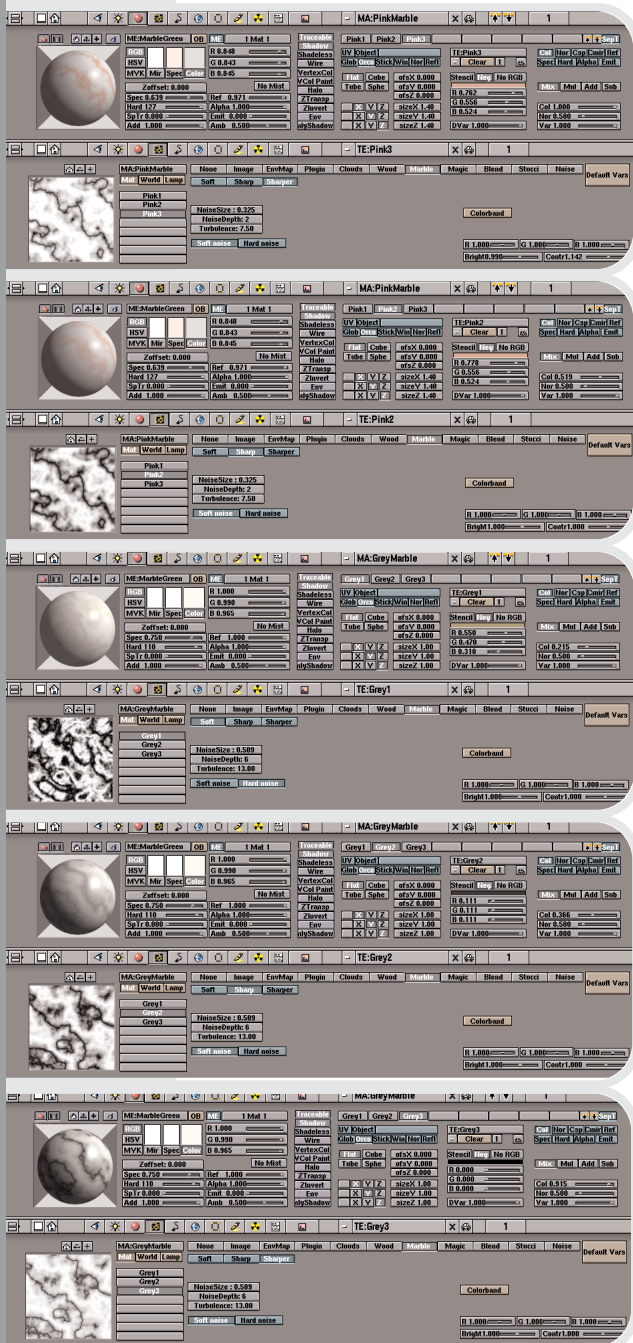
materials + textures

It will be much easier to use them in the future when linking them to other Blender files using the Library feature.

As you can see it is apparent that when you 'cut' the wooden block into planks the wood grain appears just like it would in real life. This is the concept behind 3D procedural textures.

Marble

Marble is another very useful 3D texture. Although the marble texture can be used for a wide variety of different surface effects it can, when used properly, create very realistic marble as you would see in sculpture and architecture. This part of the lesson will explain a 3-Part approach. Start off with a new material and link a marble texture to it. The base color of the material and the color of this first texture will serve as the foundation color of our stone. Notice the SepT button that is pressed in. This allows you to preview the active texture pink1 without any influence from the other textures. This is very useful at the final stages when tweaking out the end result.



THE RESULT

After you have the parameters set to your desires create a second marble texture with the exact same parameters. If you notice the only difference is that the Sharp option is selected and the Noise Depth and type (Soft noise) have been changed.

The third texture is the same as the second with the Sharper option selected. Do you see the pattern from Soft to Sharp to Sharper? The idea is to layer one on top of the other and blend them together.

The final result is quite convincing.

materials + textures

The idea is to look at some real marble and try to duplicate the base and vein colors. Here are the three different layers for the classic Black and White marble. Try to create an ivory colored background.

This layer will serve as the basic shape of the veining.

The final layer reinforces the veining by duplicating the parameters then making it Sharpe.

Blend

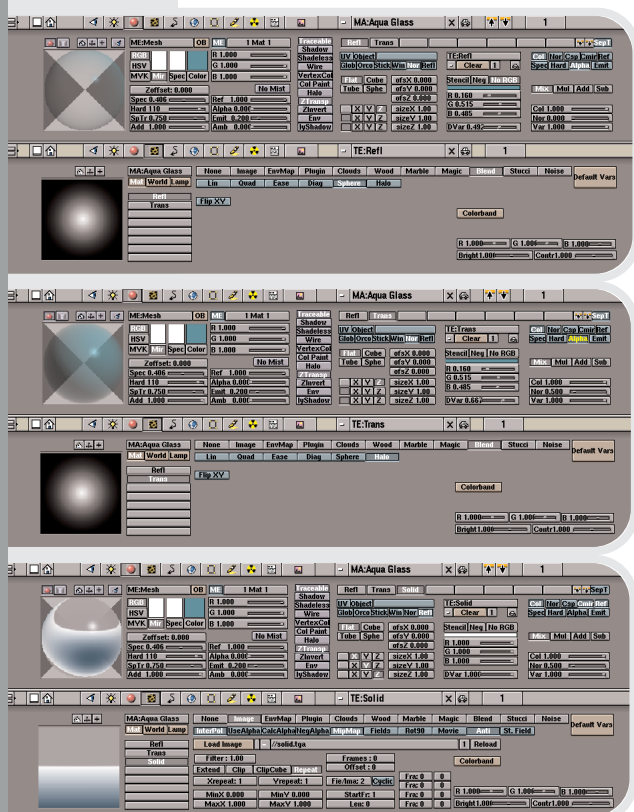
The 'Blend' texture can be used to fade two objects together, put snow on a mountain top, or aid in the creation of glass objects. Start off with a Sphere and add a material and texture. Set the 'Blend' option of the texture to 'Sphere' and map the in coordinates to Nor and out coordinates to Alpha and Col as seen in the example. Now with proper use of the 'ZTransp' setting and the 'Alpha' slider button value we achieve a transparent material. Also notice the value of 'SpTr' or the Spectral Transparency. That will add some spectral reflection on the transparent parts of the object adding to the look of real glass. The last setting to notice is the re-mapping coordinates. The first channel has been set to Z and the last two have been turned off. That will make the color effect the outer edges of rounded objects show color.

The result is a hollow looking glass object.

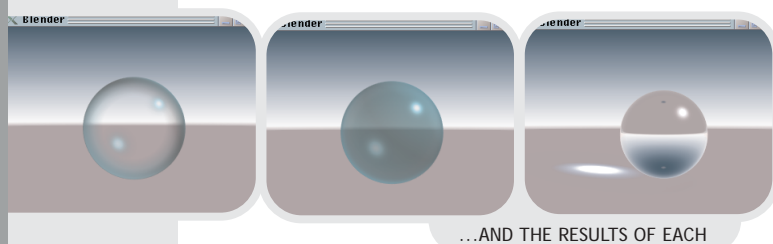
To achieve a solid glass object all that is needed is another Blend texture with some modifications. The Alpha mapping button in the Material Window has been reversed by clicking it again and can be noted by the yellow color of the button's text. The type of Blend Texture has been changed to 'Halo' in the Texture Window.

Now with the proper mixing of the two textures our hollow object now looks solid.

A third layer can be added for stunning realism. In this example the scene was rendered without the glass object (in this example that consists of just a ground plane and sky!) with the camera upside down. Save the result of this rendering and assign it as an color imagemap to the material (you can read more about image



DIFFERENT SETTINGS OF THE BLENDER TEXTURE...



...AND THE RESULTS OF EACH

materials + textures

maps in the paragraph '2 dimensional image textures').

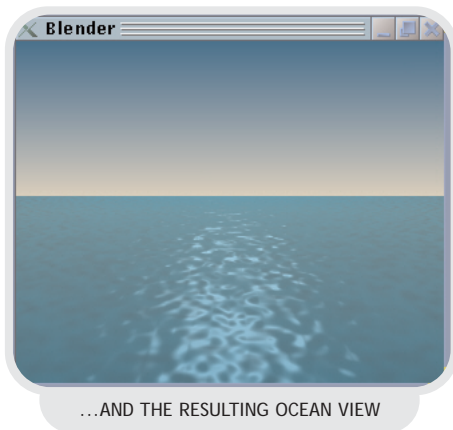
The in and out coordinates have been altered to give the proper look. The final result looks like a solid clear glass ball with a lot of reflection and refraction. See the example on the companion CD for the technique used to create the light refraction in the shadow because it is beyond the scope of this lesson.

be used for pitting metal, wall plaster, or as we will explore in this part of the lesson a very realistic ripple effect for water. The example uses a very large ground plane. Add a new material and texture to the plane. Notice that the 'Nor' button on the texture mapping has replaced the color mapping 'Col' button. Clicking the Nor button a second time would reverse the effect on the normals and be recognized by yellow text on the button itself.

With the proper lighting and the addition of a 'World' object was have create a nice ocean view.



SETTINGS FOR THE STUCCI TEXTURES...



...AND THE RESULTING OCEAN VIEW

2 dimensional image textures

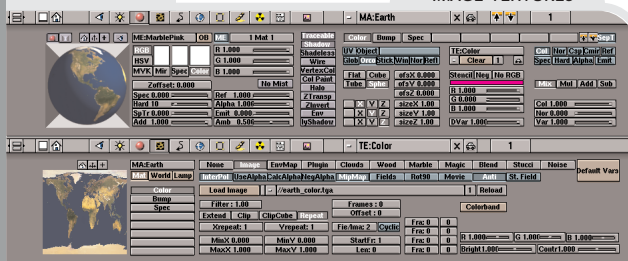
Color

The most common use of image textures is for adding real color surfaces to objects. Two dimensional images can be mapped to three dimensional objects four different ways in Blender. Planar mapping is done with the 'Flat' button and is as if the image were projected on the object. Cylindrical mapping wraps the image around an object with the 'Tube' button. Cubic mapping is where a copy of the image is projected equally on all six sides of a cube with the 'Cube' button. This works extremely well with seamless images. The way we will explore image mapping is with Spherical mapping. Rectangular images are wrapped around a sphere and the most frequently applied use of this is for planetary objects. We will recreate the most well known planetary body of all, the Earth. Start off with a high

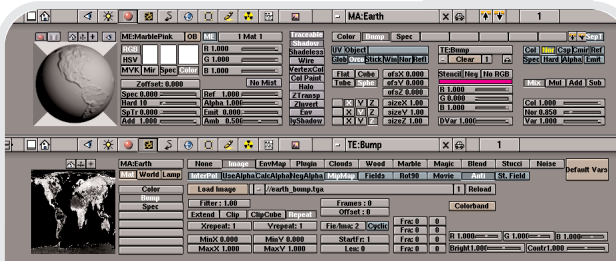
Stucci

Stucci is used for Bump Mapping. Bump mapping effects the way light and color is shaded in respect to the vertex normals adding a sense of depth to the final render. The Stucci texture Blender provides us with can

IMAGE TEXTURES



BUMP MAPS



materials + textures

resolution sphere. Add a new material with three textures of type 'Image' linked to it. Loading an image is very simple. Click the 'Load Image' button which will call up the File Dialog Window. Navigate to the proper location of the file and MiddleClick on the file name. If the image is in the same directory as the .blend file itself then the file name can be entered preceded by '//'

Bump

Bump mapping works the same way the stucci procedural texture does, except in image's light and dark areas are used to calculate the high and low sections. All that is needed is that the 'Col' button be turned off and the 'Nor' button turned on. This will add depth to the mountains and other land formations of our home.

map is just a two toned version of the original color map and is easy to create in any image manipulation program.

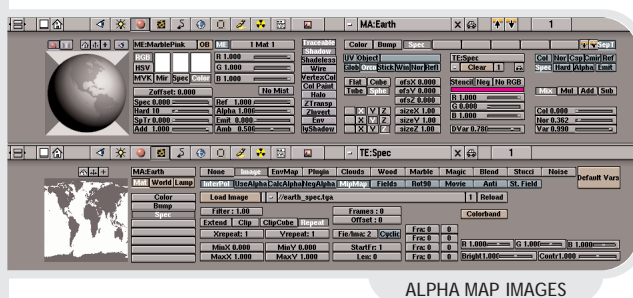
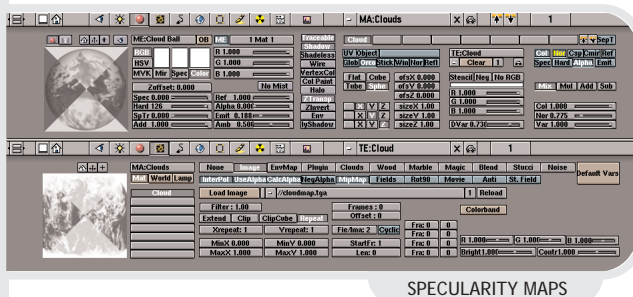
Alpha

Alpha map images can mask off parts of an object from being affected. In our example a second sphere slightly larger that our first is added to the scene and an alpha map is used to create some unbelievable cloud formation circling our planet. Notice the 'CalcAlpha' and 'UseAlpha' buttons activated in the Texture Button Window.

When all put together with a starry background

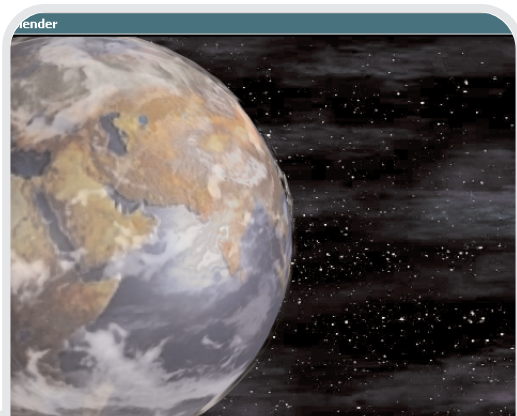
Summary

We have seen the difference between 3D procedural textures and 2D Image textures, and just scratched the surface of what you can do with them. There are no limitations as to what can be achieved with this knowledge. The best way to learn is to experiment with all the features provided to you by Blender. Start out with some simple shapes and try each and every type of texture and mapping options, or tweak someone else's creation to see if you can improve it. You can even use textures to enhance lamp and world objects. The fact is that if you can imagine it Blender can provide it as long as you understand the tools you have to work with.



Specularity

Specularity maps control the reflection of the lights themselves in the objects they are mapped to. The bright glow from the sun can be seen in the earth's oceans but not so much in the land masses. This specularity



materials + textures

Simulating planar reflection

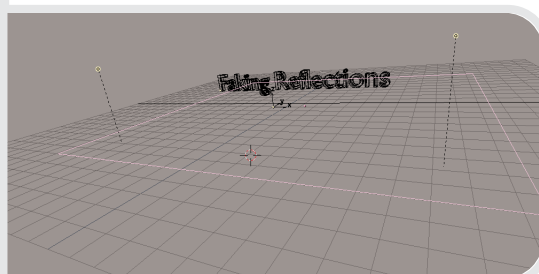
Here is a simple way to simulate planar reflections in your scene. It actually mimics the physics of reflections.

Start with a scene which is placed above a plane (the plane will become the mirror). Select everything but the camera and the plane itself. (include the lamps, too!), duplicate it ([ALT][D]) - this creates an instanced copy; changes to the original are also applied to the copy), and mirror it in the Y axis ([S], [Y]).

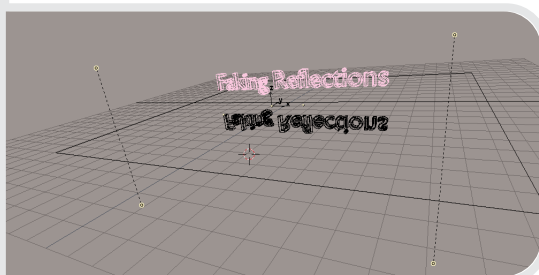
LeftClick to confirm mirroring, enter grab mode ([G]) and move everything downwards until it's under the plane, symmetrical to the original.

Now the plane needs to be semi-transparent, so set the alpha value of the plane's material to 0.7, and turn Ztransp on.

In real life, a planar surface wouldn't have the same amount of reflection everywhere; the amount of reflections falls off with the viewing angle. To simulate this, you can use the 'Blend' texture (a standard Blender texture plugin), and apply it to the alpha channel.



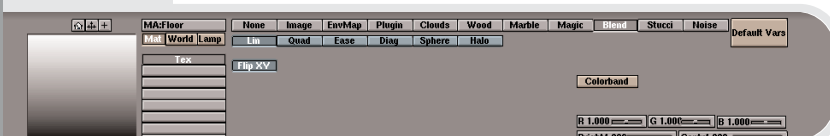
THE SCENE YOU START WITH...



... MIRRORED ON THE Y AXIS



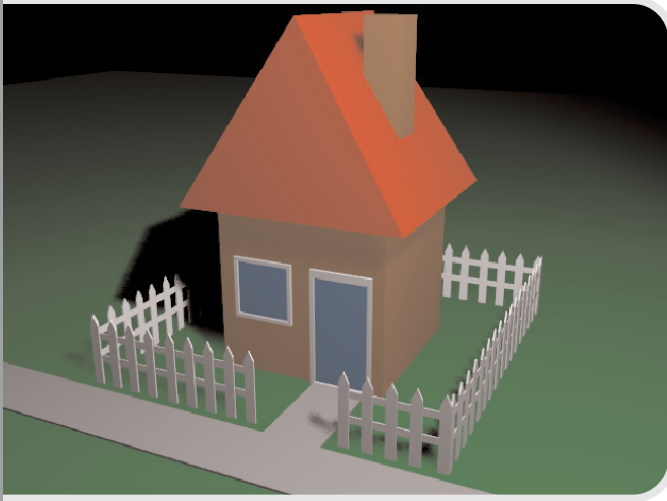
THE SEMI-TRANSPARENT MATERIAL FOR THE PLANE



THE BLEND TEXTURE USED AS THE ALPHA MAP



building a house



Author: Bart Veldhuizen
Subjects: editmode, extrusion, materials, camera, light, rendering, saving images
Level: beginner

Introduction

Tired of only reading about buttons, window types and screens and ready to try it all with your own hands? You have come to the right place! In this chapter, I will show you how to build a simple model of a house. While doing this, you will learn about using the edit mode, navigating in 3D space, duplicating objects and assigning colors.

Creating the roof

Start a new Blender or start with a new scene by selecting **[CTRL][X]** and confirming the requester that pops up. Blender always starts with a camera (the triangle) and a plane (the square). The plane is already selected. I do not need it, so I remove it by pressing **[X]** and confirming the deletion (Fig. 1).

The main part of the house is built out of a cube. Add it to your scene

by calling up the toolbox (press **[SPACE]**) and selecting 'add', 'mesh' and then 'cube' (Fig. 2). This puts a cube at the position of the 3D cursor. Newly added objects are always in editmode (do you see the yellow dots at the corners?).

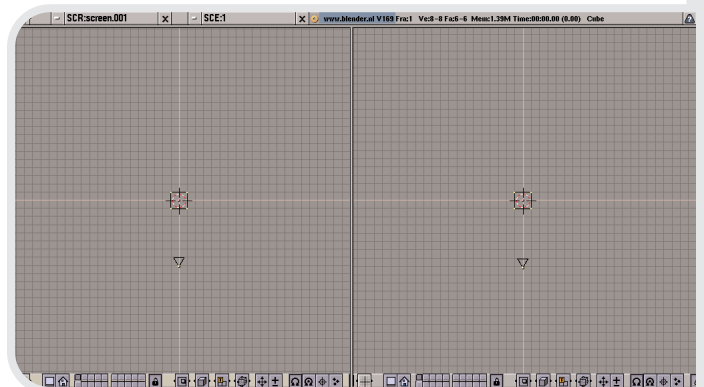


FIG. 3 SPLITTING UP THE SCREEN

This is a good moment to reconfigure my window a little bit. Move your cursor to the bottom of the 3D window and position it over the border (make sure the 3D window's header is yellow). Press **MiddleButton** and then 'Split' to split the window into two parts (Fig. 3).

This is all very exciting, but the windows still show the same picture. To change this, move your mouse into the window on the left and press **[CTRL] NumPad[1]**. This changes the view on the left to front view. Next, move your mouse into the window on the right and press **[CTRL] NumPad[3]** - this changes the view to side view (see Fig. 4 on the next page).

If the views do not change, make sure your keyboard's NUMLOCK is on. **!**

In each window, click on or press **[HOME]** to automatically rescale your scene.

| | | |
|--------|------------|---|
| MESH | >Plane | A |
| VIEW | >Cube | A |
| EDIT | >Circle | A |
| OBJECT | >UVsphere | A |
| OBJECT | >Icosphere | A |
| MESH | >Cylinder | A |
| CURVE | >Tube | A |
| KEY | >Cone | A |
| RENDER | > | |
| FILE | >Grid | A |
| | > | |
| | >Duplicate | D |

FIG. 1 CLEARING THE SCENE

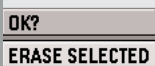


FIG. 2 ADDING A CUBE

building a house

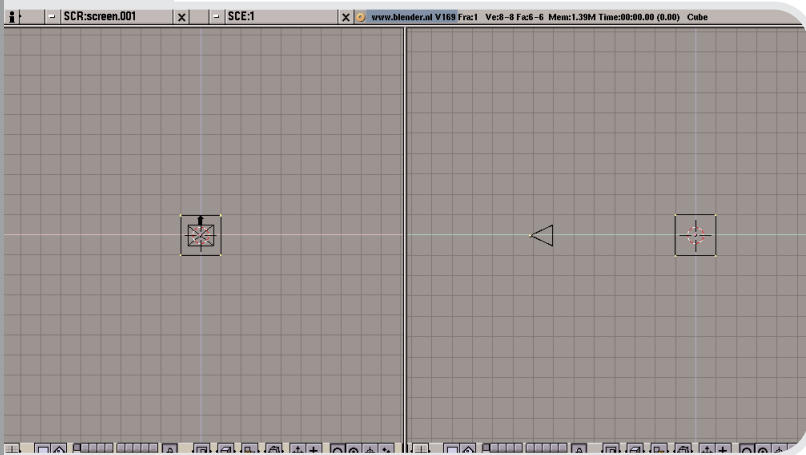


FIG. 4 CHANGING THE VIEWS

If you want to move in a little closer, press and hold the **[CTRL]** key and drag with the **MiddleButton**. Have you zoomed in or out too far? Pressing **[HOME]** will get the entire scene back on the screen again.

The first thing I will do now is copy the cube and turn it into a roof. Go to the front view screen (Fig. 5) and press **[TAB]** to leave editmode. The cube will now turn pink, indicating that it is selected. Make a copy of the cube by pressing **[SHIFT][D]** (from 'duplicate'). The copy is now selected and the grabber is activated; try moving your mouse around - the copy will move around the scene.

I want to place the copy exactly on top of the original cube. To do this, constrain the motion by holding down **[CTRL]** while moving your mouse.

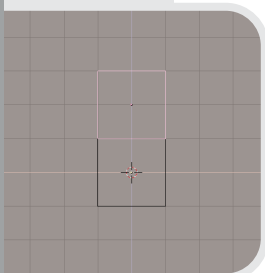


FIG. 5 THE FRONT VIEW

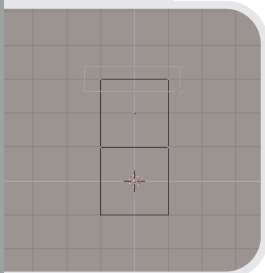


FIG. 6 EDIT MODE

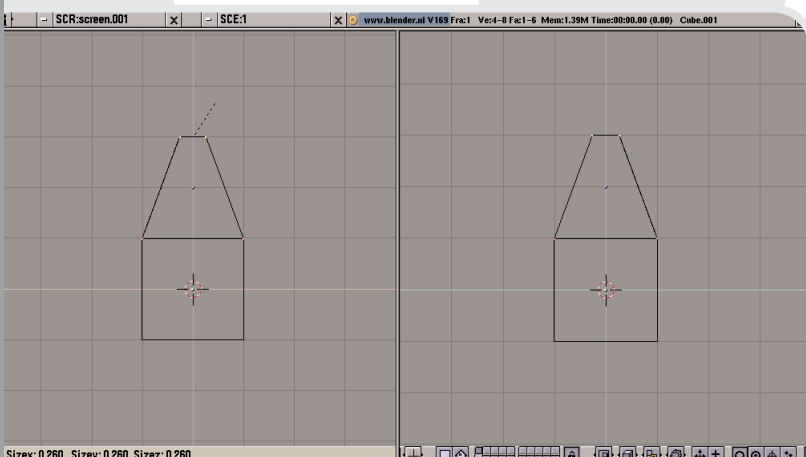


FIG. 7 SCALING THE VERTICES

The cube can now only move along the grid lines that you see in the background. Give the cube its final position with **LeftClick**.

You can always move objects by starting grab mode with **[G]**. Selecting another object is done with the **RightClick**. You can select multiple objects by holding **[SHIFT]** while selecting.

The next step is to taper the top of the roof. With the top cube selected, enter editmode with **[TAB]**. The pink cube now turns black and the points that define the cube ('vertices') are drawn in purple (Fig. 6). Just like with objects, the color of a vertex indicates its status: purple means unselected, yellow means selected.

You can work with vertices just like objects - the grabber works for them, and selecting multiple vertices works with **[SHIFT]** too.

Okay, enough talk - it is time to get started. I want to select all the vertices at the top of the cube. I could of course do this by selecting them one by one in both viewports. Fortunately, there is an easier way: box select.

Start box select in either 3D screen with **[B]**. Next, drag a rectangle around the vertices that you wish to select. All vertices that fall within the rectangle are now selected, including vertices that are on a different 'depth' in the picture. This way, all 4 vertices at the top are selected.

Taper the top of the cube by starting scale mode - **[S]**. Moving your mouse towards the center of the 4 vertices

building a house

you have just selected will scale them down; moving your mouse away from the center will increase the size.

Do you see what happens? In both 3D windows (Fig. 7), the vertices are scaled. This is not the kind of roof that I want my little house to have. Instead, I only want the roof to be pointy in the front view and not in the side view. Press [ESC] to cancel scaling mode.

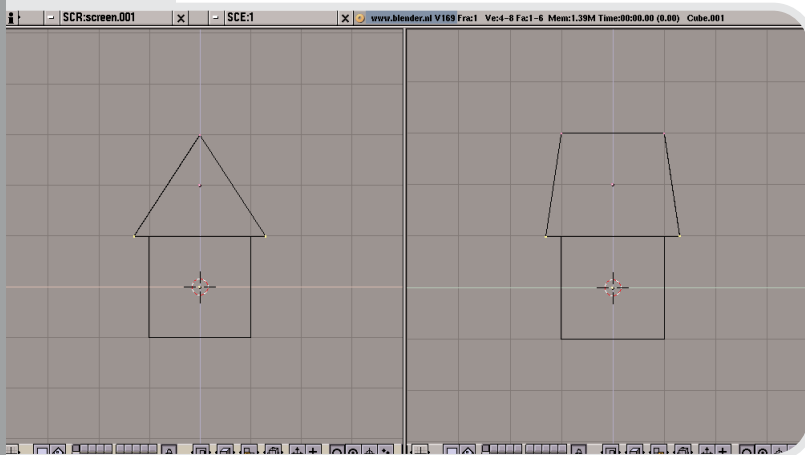


FIG. 8 SCALING ALONG THE X AXIS

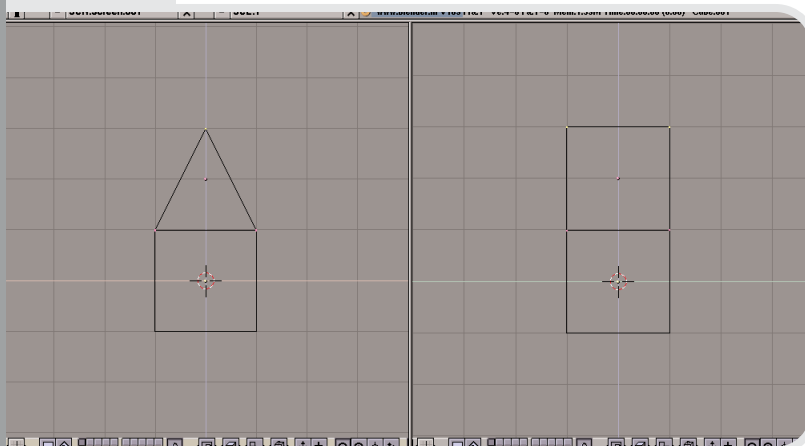


FIG. 9 SCALING IN ALL DIRECTIONS

This is easily achieved by telling the scale operation to only work in a specific direction. Go to the front view (the one on the left) and start the scale mode [S]. Now, move your

mouse horizontally and click the **MiddleButton**. You will see that the scaling now only works in the front view, and no longer in the side view. By moving your mouse in the X-direction and clicking the **MiddleButton**, you have constrained the scaling process in the X-direction. Check the scaling numbers at the bottom of the 3D view to see what I mean.

Scale the top of the roof all the way down to zero.

Finally, I want the base of the roof to be a bit wider than the walls. Deselect all vertices with [A] (pressing it twice will select all the vertices in the currently edited object). Use the box select, to select the bottom vertices and scale them up a bit. Because the roof has to increase in size in each direction, I do not constrain the scaling this time (Fig. 9).

Of course scaling works on objects outside editmode too, and uses the same keyboard command. !

Now, to see the result of your action in 3 dimensions, press **NumPad[5]** in either of the views. This will toggle perspective mode. To change the 3D view, press and hold the **MiddleButton** while moving your mouse. For an even nicer view, toggle solid drawing with [Z] (Fig. 10).

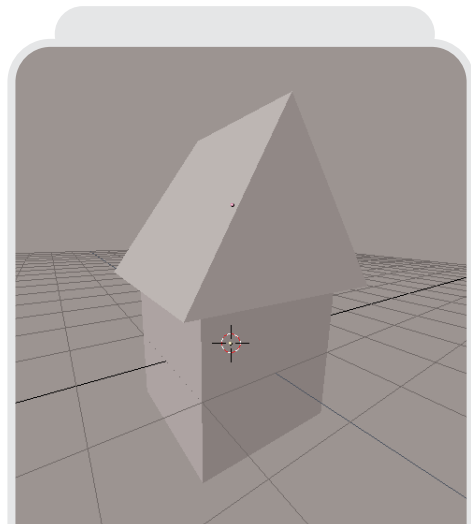


FIG. 10 SOLID MODE VIEW

building a house

Rotation is not the only thing you can do with the 3D window; press and hold [SHIFT] and drag with the **MiddleButton** to translate your view. Use the [CTRL] modifier to zoom in or out. Pressing [HOME] will restore your view here, too.

When you have seen enough, restore the view by pressing [Z] and **NumPad[5]** to switch off solid and perspective view, and press **NumPad[1]** or **NumPad[3]** to restore the correct viewing direction.



If you have a mouse with 2 buttons instead of three, switch on '2-Mouse' in the Info Window.

Giving everything a bit of color

Everything is painted in a dull gray now. To change this, first select the roof by clicking on it with the **RightButton**. Go to the Material Buttons screen by selecting the icon with the little red sphere on it (Fig. 11).



FIG. 11 OPENING THE MATERIALS BUTTONS

To create a new material, **LeftClick** on the button labeled '-' (Fig. 11). This will bring up a list of the available materials in your scene. Because I have not defined any yet, all I see is the default material called 'Material' and the option 'Add New'. Select 'Add New' (Fig. 12) to create a new material. (Later on, you can select existing materials here and assign them to your objects).



FIG. 12 ADDING A NEW MATERIAL



FIG. 13 CHANGING THE MATERIALS NAME



FIG. 14 CHANGING THE COLOR

The default material name is 'Material'. Click in the box that contains the material name with the **LeftButton** and change it into a more sensible name (Fig. 13). Press [ENTER] to confirm the new name, or [ESC] to cancel. Change the color definition by selecting a slider for the red, green or blue component of the color and dragging it to another value (Fig. 14). You will immediately see the effect that this has on your color.

When you are satisfied, select the cube and create another material (you can now also select the roof material if you wish). Press **NumPad[9]** in the 3D view or change the view a bit to update the colors (Fig. 15).

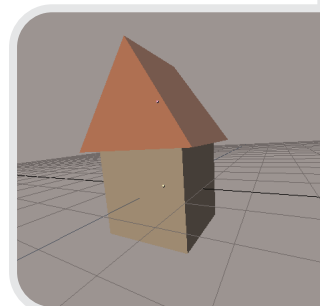


FIG. 15 THE UPDATED VIEW

Adding a chimney

To add a chimney, add another cube to the scene. Start scale mode with [S] and scale it down to the indicated size. When you're satisfied, start the grabber with [G] and move it to the correct position (Fig. 16).

Elongate the chimney by using the scaling mode and constraining the it to the z-axis. Do this by starting scale mode [S], moving your mouse upward and then clicking the **MiddleButton**. When you have reached the correct size, confirm it with **LeftClick** (Fig. 17).

Add a bit of color to the chimney like I described earlier. I chose to use the

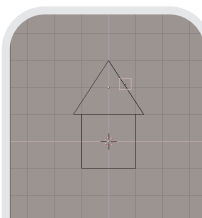


FIG. 16

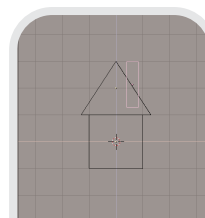


FIG. 17

building a house

same material as the walls.

This is what your house should look like right now (Fig. 18). Not bad, is it? Of course, the door and windows are still missing, but I will be working on that next.

The windows and doors

To model the windows and door, I will use a technique called extrusion. Extrusion is used when you want to give a flat object depth.

Start by adding a plane in the front view. It is probably the same size as the front of the house, so immediately start scaling with [S] and scale the plane to a good size for a window. Use the grabber to position the window correctly (Fig. 19).

In the side view you can see that the plane is placed in the middle of the house. Use the grabber to translate it to a position slightly in front of the front wall (Fig. 20).

I give the window some depth by using the extrude tool. In the side view, enter edit mode with [TAB] and select all the vertices with [A]. Next, press [E] and confirm the requester (Fig. 21).

If you move your mouse now, you will see that you can change the depth of the window (Fig. 22). Like with the scaling operation, you can constrain movement of vertices or objects by moving your mouse horizontally a bit and clicking **MiddleButton**. Move the extruded part into the wall a bit, and confirm the extrusion with the **LeftClick**.

I now want to turn the extruded plane into a `window-frame`. To hide some unwanted clutter from my screen, I first press **NumPad [/]**. This will remove everything but the currently selected object and rescale the view in such a way that you can easily edit the selected object. Next, go to top view with **NumPad [7]**. Enter editmode and use box select [B] to select the front vertices of the window (Fig. 23).

Start extruding with [E], but do not move your mouse just yet. Instead, start the scaling mode and move the selected vertices inward a bit. **LeftClick** to confirm (Fig. 24).

Extrude once more and move the selected vertices up (Fig. 25).

Now return to normal view by pressing **NumPad [/]**. Because I want to color the window blue, I have added a single plane at the position of the extruded window and placed it just in front of the wall.

Use the same technique to create a door and give both the window and the door some color.

Figure. 26 is the result so far. It is already starting to look like a house, don't you think?

Building the fence

To start building the fence, go to the front view and add a plane to your scene. Extrude the top a bit and scale the top vertices down until it looks like Figure 27. In the side view,

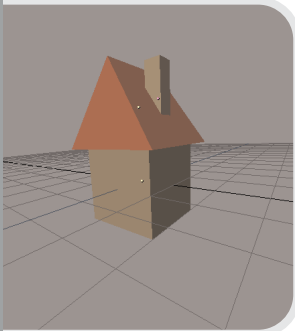


FIG. 18

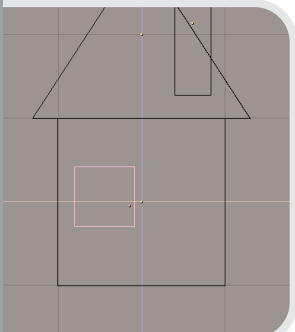


FIG. 19

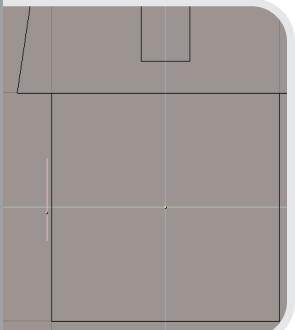


FIG. 20



FIG. 21

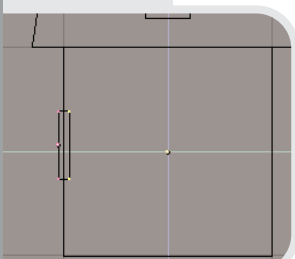


FIG. 22

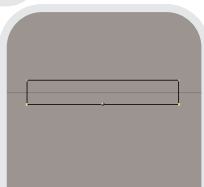


FIG. 23

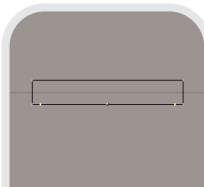


FIG. 24

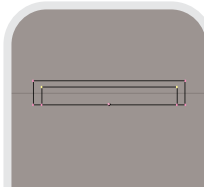


FIG. 25



FIG. 26

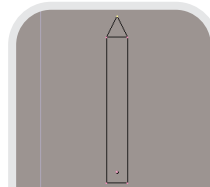


FIG. 27

building a house

extrude the entire shape to give it some depth.

Now all you have to do is create duplicates and place them all around your house. This time, do not use **[SHIFT][D]** to copy your objects, but **[ALT][D]** instead. This created an 'instanced' copy. The difference between normal and instanced copies is that an instance does not copy the object's geometry data, but only references it.

Changing one instanced copy will therefore immediately change all the instances along with it. In our case, if you would like to change something about the fence afterward, you would only have to change one element and everything would be automatically updated.

The easiest way to build the fence around the house is to first build one side of the fence, then use box select **[B]** to select and duplicate it. With the duplicate still selected, use the grabber and rotate tool **[R]** to place the copies around the house. You can constrain rotation with **[CTRL]** too - in this case, rotations are limited to multiples of 5 degrees.

In the picture (Fig. 28), I have also added a path leading to the door.

Setting up the camera and light

It is now time to finish my scene by setting up the camera and adding light.

Each Blender scene should contain a camera (Fig. 29). If you have some-

how accidentally deleted it, you can always add a new one from the toolbox. To look through the camera in any 3D window, press **NumPad [0]**. You can edit the camera (its position and orientation) in another 3D window, and the changes will be shown in the camera view immediately. Editing the camera is exactly the same as editing objects - use **[G]** for moving it and **[R]** for changing the orientation.

You will probably have to switch between front- and side view a few times to get the camera angle just right. A nice trick that can help you with aiming cameras and lights is described in the sidebox 'Follow that Object!'

Blender supports different types of light sources. When you add a lamp to the scene using the toolbox, the standard type 'lamp' is added. This is a source that transmits light into every direction. It can cast no shadows.

You can change lamp types with the buttons indicated in Figure 30. If you wish to use shadows, you have to change the lamp type into 'spot'. A spotlight shines light into a specific direction (Fig. 32). You can manipulate this direction by rotating **[R]** the

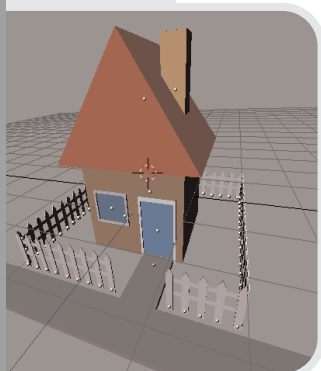


FIG. 28

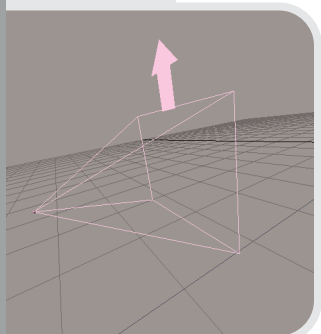


FIG. 29



FIG. 30

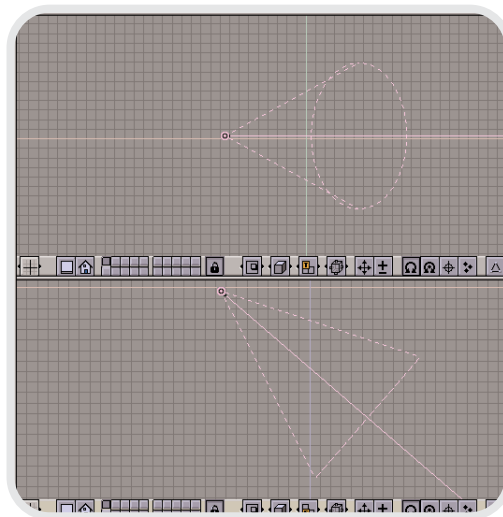


FIG. 32

building a house

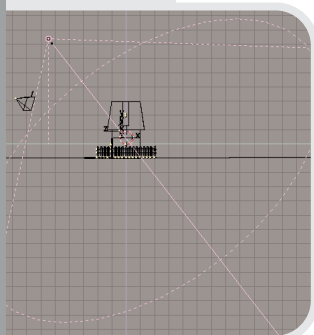


FIG. 33

spot. When you do this, always make sure you check at least two different views - a lamp that is perfectly aligned in one view may be pointing in a completely unwanted direction in the other!

This (Fig. 33) is how I have set up my spotlight for this scene. In the Lamp Buttons window (☀️), I have also increased the value of 'SpotSi' (Spot Size) to make the spotlight cover a larger area, and I have set the value of 'Energy' to 2.0 to make sure the scene doesn't become too dark when I render the image. Try experimenting with the lamp settings later when you have finished the scene.

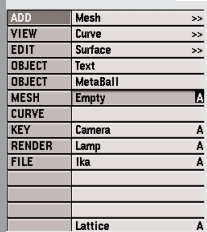


FIG. s1

OK?
Make Track

FIG. s2

OK?
Clear rotation

FIG. s3

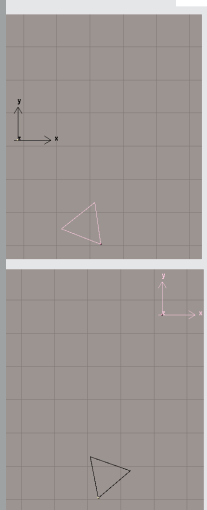


FIG. s4

Follow that object!

Aiming a camera or a spotlight in the right direction can be a hassle, but here is a nice trick that will make it a lot easier. You can add a dummy object and make the camera track it. This way, you will only have to move the dummy and the camera will automatically look in its direction.

Dummy objects only exist in the 3D window and function as 'helper' objects. They do not show up when you render an image.



From the Toolbox select 'Add Empty' (Fig s1).

Select the camera, hold down the [SHIFT] key and select the empty (the order in which you select your objects is important). Press [CTRL][T].

Select 'Make track' (Fig. s2). Usually the camera will now have a strange rotation. To clear this rotation, select it and press [ALT][R].

Select 'Clear rotation' (Fig. s3). The camera is now properly setup. Select the empty and move it around - the camera will automatically follow

(Fig. s4)! Move the camera around - it will keep 'looking' at the empty. Pretty neat eh?

Final result

To finish the house scene, add a plane and scale it large enough so that the edges do not show in the rendering. In the front view, position it so that it coincides with the base of the house.



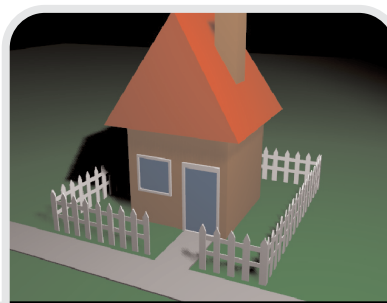
FIG. 34



FIG. 35

Next, switch to the Display Buttons screen and turn on 'Shadows'. Press the button labeled 'Render' to see the result of your hard work (Fig. 34). If you wish to save the image, select a file format from in the Display Buttons screen (Fig. 35) and press [F3]. Enter a name in the second text field and press [ENTER] twice (the first time confirms the filename and the second time actually saves the file).

Not bad for a first try, is it? I hope you have seen that building things in a 3D application is really not that difficult. Take the time to familiarize yourself with Blender's interface and you will see that you can do things like this faster and faster. Why not try drawing your own house in Blender now?



MR BASIC



Author: Jason Nairn
Topic: mesh modeling
Level: beginner

Introduction

In this tutorial we will create a very basic character which will then be used for ika animation. To do this we will use simple extrusions.

Step1:
 Delete the default plane and switch to frontview with NumPad [1] place a plane using [SPACE] then select ADD->Mesh->Plane. Constrain by using [CTRL] while dragging all the points one grid space to the right. This step is important as we need to model in the correct view so ika setup will be easy later on.

STEP 1

Step2:

STEP 3

STEP 4

STEP 5

Select the two points on the left using **RightClick** and [SHIFT] to extend the selection then extrude them two grid spaces using [E]. Constrain the points to the grid using [CTRL] while dragging. We now have created the hips.

Step3:

Deselect all points using [A] then select the top three points and extrude these up two grid spaces, repeat this again another two grid spaces. This creates the height of the torso, it is segmented so the arms and legs can be created.

Step4:

Deselect all again, and select the two bottom right points, This time try using box select as practice for at the end of the tutorial. You can access box select by pressing [B]. Extrude these two points down four grid spaces and across one. Repeat this to create the lower leg down four across one.

Step5:

Keep the end points selected or select them, and extrude them one grid space down. We need to add the extra vertices at the knee and foot so the mesh will bend when animated. If we extruded straight from the hips to the foot with no segments the knee couldn't bend!

STEP 2

MR BASIC

Step6:

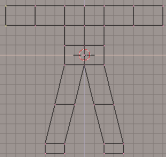
Select the two points in the top right and extrude these three grid spaces to create the arm, repeat this, another three grid spaces.



STEP 6

Step7:

Repeat from step four on the other side of the body.



STEP 7

Step8:

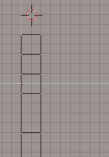
Go to side view by pressing NumPad [3], select all the points using [A] then extrude them two grid spaces. This gives the body some depth.



STEP 8

Step9:

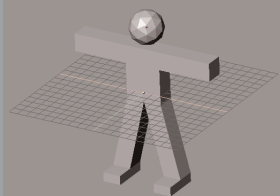
To create the feet select the bottom left points using box select [B]. It is important to use this tool as we want to select the points we can not see to extrude both sides at once, now extrude these points two grid spaces. Take note of where I have placed the 3d cursor, Leave edit mode [TAB], then you can add a simple sphere for a head using [SPACE] then add, mesh, icosphere, 2. You can make this bigger by using scale [S].



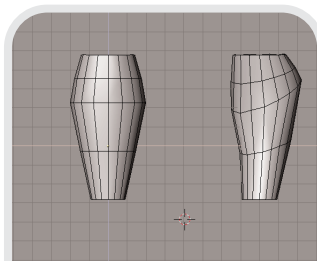
STEP 9

Step10:

And here we have our finished Mr Basic! This tutorial should give you some insight into how you can quickly create a simple character using polygons. Remember to save him, as he will be needed for the IKA tutorial later on.



STEP 10

**Adding detail:**

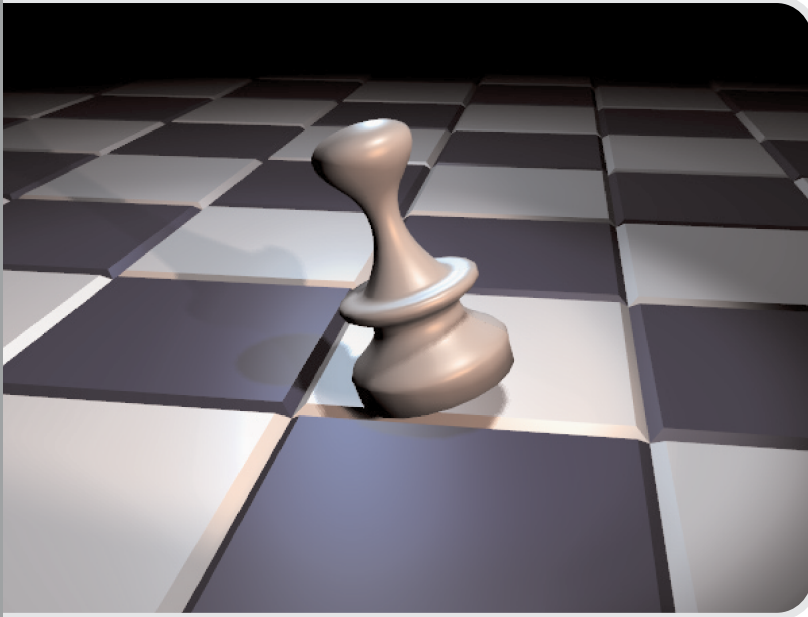
Using this very simple model you can subdivide [W], choose 'SUBDIVIDE' or 'SUBDIVIDE SMOOTH' in edit mode [TAB] and further refine the points to create more complex human or cartoon characters.

Tip:

When modeling more complex organic characters try to vary the curves that are formed. In nature it is rare for curves to be perfectly symmetrical as shown on the left. Rotating and offsetting rings of vertices as shown on right will help make models more natural.



a pawn in a hurry



Author: Bart Veldhuizen
Subjects: animation, keyframing, spinning
Level: Beginner

Introduction

You have already seen that you can use Blender to create interesting images. Adding objects, materials, lights and a camera allows you to set up a scene in exactly the way you like. Blender will calculate the correct lighting and shadows automatically for you.

But there is more! There is a complete animation system inside Blender. Making an object move is as easy as defining its beginning and ending position. Blender does the rest for you - calculation of all the frames between beginning and end are done automatically.

In this chapter I will create a simple scene consisting of a chessboard and a pawn. The pawn will jump happily

across the board and it will deform a bit when it hits the ground.

Creating the Pawn

To create the pawn I use a new technique called 'Spinning'. Using this, I will only need to draw an outline of the pawn and then Blender will calculate how the object should look based on this outline.

Start with a new Blender scene, delete the default plane and switch to front view. Add a new Bezier curve from the toolbox: press [SPACE], select 'Curve' from the right button bar and then select 'Bezier curve' from the list (Fig. 1).

The chapter 7 describes working with these curves in much more detail. For now, it is enough to know that you can add extra points to the curve by selecting an endpoint, holding down[CTRL] and LeftClicking. Try playing with the curve a bit before going on - also pay attention to the way the 'handles' affect the direction of the curve in a particular point.

Shape the curve as indicated in Figure 2, and pay special attention that the endpoints on the left are located on the blue axis (the Z-axis). I will be using the Z-axis as the axis of rotation later.

When you want to create a rotation object, you must indicate the location of the rotation axis with the 3D cursor (Fig. 3). I want to place this somewhere on the Z-axis. While still in front view, LeftClick on the blue Z-axis to place the 3D cursor there.

| | | |
|--------|----------------|---|
| CURVE | >Bezier Curve | A |
| VIEW | >Bezier Circle | A |
| EDIT | | |
| OBJECT | | |
| OBJECT | >Nurbs Curve | A |
| MESH | >Nurbs Circle | A |
| CURVE | | |
| KEY | >Path | A |
| RENDER | | |
| FILE | | |
| | >Duplicate | D |

FIG. 1

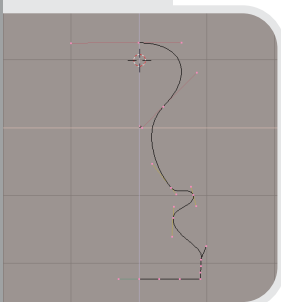


FIG. 2



FIG. 3

a pawn in a hurry

SNAP
Sel -> Grid
Sel -> Curs
Curs-> Grid
Curs-> Sel

FIG. 4

A nice trick to align the 3D cursor or objects is to use the snap function ([SHIFT][5] - Fig. 4). With this, you can do four things:

1 - Align a selection to the grid. For example, when in editmode you can place vertices exactly on grid corners with this

2 - Align a selection to the cursor. This moves the currently selected object or vertex to the 3D cursor location

3 - Align the 3D cursor with the nearest grid corner. Useful in our current case to match up the cursor exactly with the Z-axis (place the cursor somewhere near a grid corner and activate this option).

4 - Align the 3D cursor with the currently selected object or vertex.

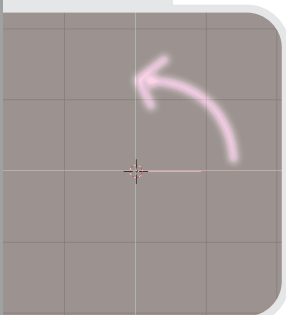


FIG. 5

Convert Curve to Mesh

FIG. 6

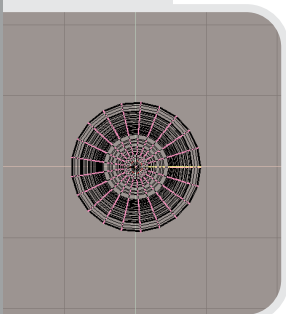


FIG. 7

The rotation axis is always perpendicular to the screen. Switch to top view with NumPad [7]. You now see the 3D cursor, indicating the position of the rotation axis and our curve which will move in the direction of the arrow in the illustration (Fig. 5).

I am almost set to create the pawn. There is only one more thing to prepare: the spin function only works on meshes, and not on curves. So first convert the outline curve into a mesh by leaving editmode ([TAB]), selecting it and pressing [ALT][C]. Select 'Mesh' (Fig. 6) or press [ENTER] to perform the conversion (this cannot be undone - converting a mesh back to a curve is not possible).

Now switch to the Edit Buttons screen. In the middle you see a button labeled 'Spin' (Fig. 8). Underneath it are inputs for 'Degrees' and 'Steps'. Set degrees to 360 and steps to 21. (This value determines the resolution of the resulting object - higher values increase the smoothness).

If you wanted to create only half an object, you would set the degrees value to 180.

All set? Press the 'Spin' button and watch the result (Fig. 7). The curve has been extruded and rotated, leaving behind a complete pawn.

If you have set up your screen to work with multiple 3D windows, Blender will need to know in which window you wish to perform the spin operation. The cursor changes into a question mark and you must click in the top view window to proceed.

All is not ready yet, though. It may not be obvious, but there is still a seam in the object where the 'beginning' meets the 'end' of our spin surface. I have found an easy trick to close it: use the 'Rem Doubles' (Remove Doubles) option in the Edit Buttons screen (Fig. 9). With the 'Limit' value you can determine the maximum distance between vertices that Blender will weld together. Set this value to 0.020 and press the 'Rem Doubles' button.

After performing this operation, Blender reports on the amount of vertices that have been deleted. Just confirm this requester.

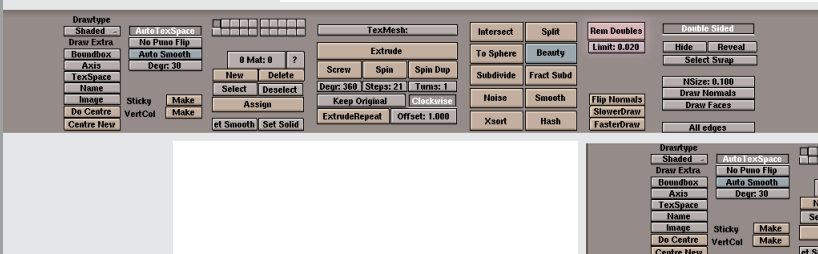


FIG. 8

Removed: 115



FIG. 9

a pawn in a hurry

If no vertices have been removed, try decreasing the limit value in the previous step and trying again.

As a finishing touch, smooth the pawn by clicking on 'Set smooth' (Fig. 10).



FIG. 10

There is a good chance that the button on your screen will say 'et Smooth' because of the way the user interface is scaled on your screen. Try holding down [CTRL] and dragging with the MiddleClick to modify the size of the interface elements. (And, yes, [SHIFT] and MiddleClick will translate the interface panels)

Show time! Switch to solid perspective mode by pressing [Z] and NumPad [5] and drag around with the MiddleButton to look around your object (Fig. 12).

Making it Move

The basic idea behind keyframe animation is to define objects properties like position and rotation for given moments in time. These definitions are called keyframes or keys. If you have defined at least two keyframes, Blender can interpolate their values (calculate the transition between the keyframes) and create a smooth animation for you.

I will now define five keyframes for the pawn in different positions, rotations and sizes. The end result will

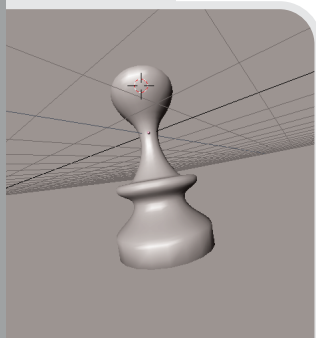


FIG. 11

be the pawn making a hop.

The first thing you need to know is how to navigate to other frames in your animation. Take a look at the figure 11. The current frame number is always displayed here. There are a number of ways to go to another frame number:



FIG. 12

- LeftClick and drag in the frame number indicator. This will change the frame number.

- Hold [SHIFT] and LeftClick in the frame number indicator. You can now enter a new value for the frame number.

- Use the keyboard:

- [>-] - frame +1

- [<-] - frame -1

- frame + 10

- frame - 10

- [SHIFT][>-] - start of animation (default=1)

- [SHIFT][<-] - end of animation (default=250)

I will now set up the first keyframe of the pawn. Go to frame 11 (the easiest way is to press once). Start the rotation mode [R], hold down [CTRL] to constrain the rotation to multiples of five degrees and give the pawn a rotation of -30 degrees.

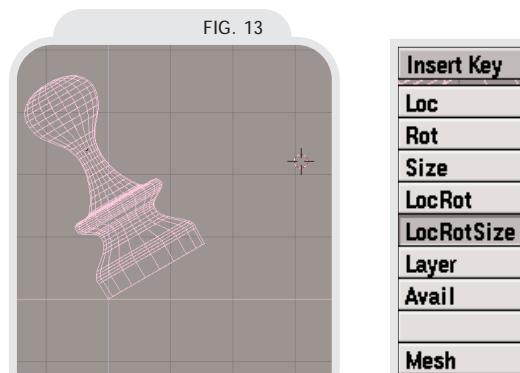


FIG. 13

FIG. 14

a pawn in a hurry



FIG. 15

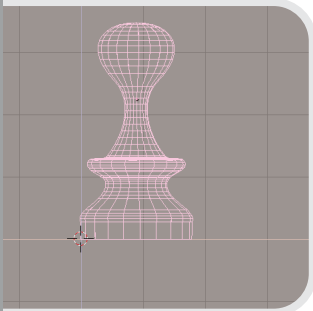


FIG. 16

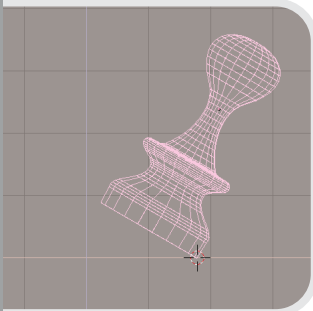


FIG. 17

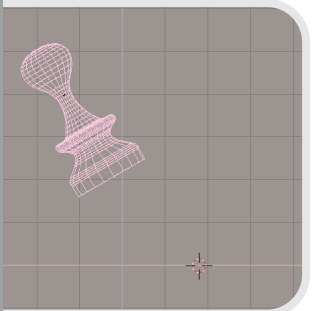


FIG. 18

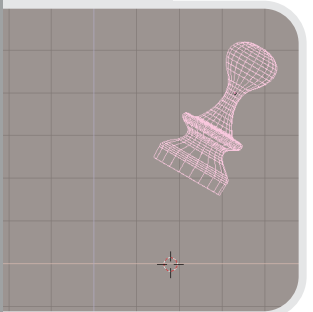


FIG. 19

Next, move it [G] so that the bottom is on the height $z=0$ (Fig. 13 - the brightly colored horizontal line). This height will later be used for the floor.

To set a keyframe, press [I]. This will bring up a requester with a lot of options - these are the different key types that you can set. In this tutorial, I will only use the types (or channels) 'Loc' (Location), 'Rot' (Rotation) and 'Size'. You can select one of the first three options to set only a Loc, Rot or Size key. If you wish to define multiple keys at once, select LocRot or LocRotSize.

For this frame, I want to set the location (make sure Blender remembers that I want the pawn exactly at $z=0$) and the rotation (the -30 degrees I just defined).

Later, I will also define a Size key on another frame. Because of this, I have to make sure Blender keeps the pawn's size on my current frame intact. For this reason, insert a key for Size too.

Take a look at the icon row at the bottom of the 3D Window. There are four buttons that define the behavior of the scaling and rotation tools. By default, the first button is selected. This will cause the scaling and rotation to use the pink dot in the middle of an object as the center.

Select the third button to rotate and scale around the 3D Cursor.

Go to frame number 16. Because the base of the pawn is already resting on the 'floor', I want to rotate the entire object around this point, and not around the object center.

Move the 3D cursor to the base of pawn (Fig. 16), start the rotation

mode [R], and rotate the pawn +30 degrees. It should be perfectly vertical now.

Insert a new locRotSize key to define this position.

For the next key, go to frame number 21, move the 3d cursor to the right base point (Fig. 17). This is the new center of rotation. Rotate the pawn +30 degrees and insert a new LocRotSize key.

Go back to frame 1. Translate the pawn up and to the left a bit (Fig. 18). This will be the position in which it comes flying into the animation. Insert a new LocRotSize key.

And for the final key, go to frame number 31. Like in the previous step, translate the pawn upward and to the right a bit (Fig. 19). Insert a new key.

If you want to see all the keys that you have defined for your animation, select the pawn and press [K]. You can now select a different key with [PG UP] and [PG DN]. Selected keys are drawn in yellow (Fig. 20). The

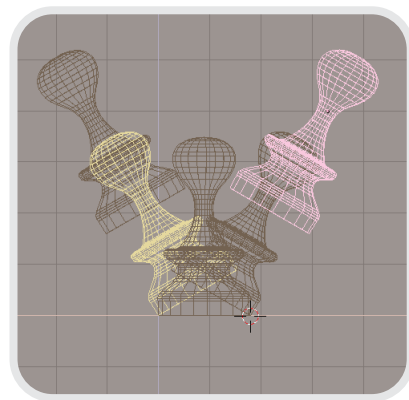


FIG. 20

selected key can be edited directly and the new key values are stored in the animation system immediately. If you want to change the entire

a pawn in a hurry

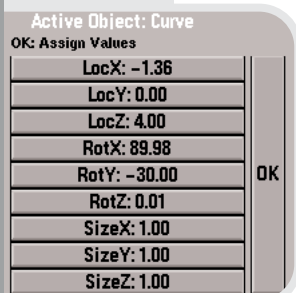


FIG. 21

animation at once, simply select all the keys with [A] and move, rotate or scale them. If

you want to see all the keys that you have defined for your animation, select the pawn and press [K].

(An alternative for editing key values is to go to a frame for which you have defined a key, change the object properties and then re-insert the necessary keys).

To hide of the keys, press [K] again.

If you want the object on frame 1 and 31 to have the exact same height, press [N]. This brings up the object properties screen in which you can enter numeric values for position, rotation and size. LocZ controls the object's height (Fig. 21).

You are now set to play back the first frames of your animation with [ALT][A]. Press [ESC] to stop playing.

(In figure 22 I have composed several frames of the animation together.)

Squasing the pawn

To give the pawn a comic-like character, it should appear to be soft. When it hits the ground, it must be squashed a little bit. This can be achieved by changing the size of the pawn on frame number 16.

On frame 16, Place the 3D cursor at the base of the object. Enter scale mode and start decreasing the object's size by moving your mouse vertically. Next, click the **MiddleButton** to indicate that you only want to change the objects Z size (Fig. 23).

Change the size to about 0.7 (this value is printed at the bottom of the 3D Window while you are sizing).

To make the squashed pawn look a bit more realistic, it should not only get shorter, but also a bit wider. After all, its volume should remain the same.

Repeat the previous step, but now move the mouse horizontally (as in Fig. 24) before you constrain the sizing process. Increase the object's width to 1.3.

Switch to top view and repeat the scaling to increase the object's Y size to 1.3, too.

To finish this part of the tutorial, insert a new LocRotSize key for frame 16 (Fig. 25). Take a look at your animation now - did you expect it would be this easy to create elastic-looking objects?

Creating the Chessboard

Snap cursor to grid

Of course, this scene would not be complete without adding a chessboard. I will use the extrusion techni-

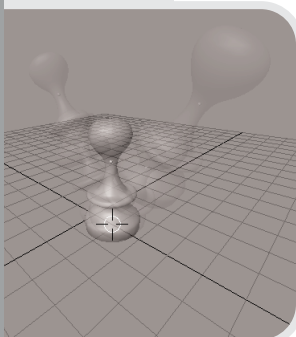


FIG. 22

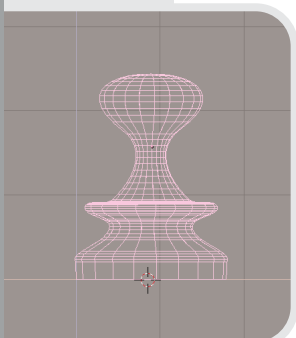


FIG. 23

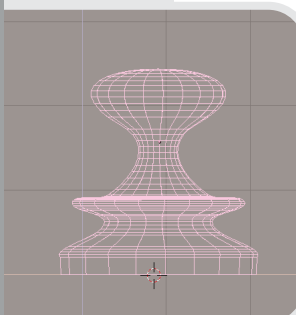


FIG. 24

| Insert Key |
|------------|
| Loc |
| Rot |
| Size |
| LocRot |
| LocRotSize |
| Layer |
| Avail |
| Mesh |

FIG. 25

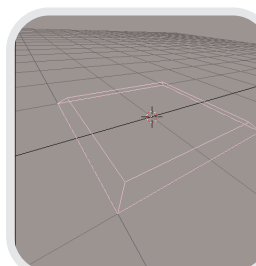


FIG. 26

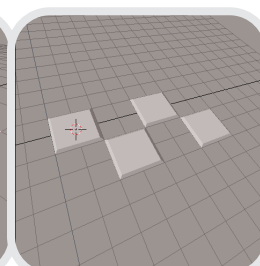


FIG. 27

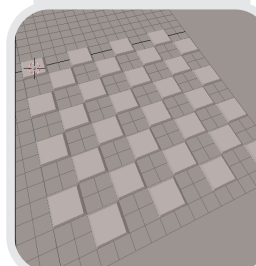


FIG. 28

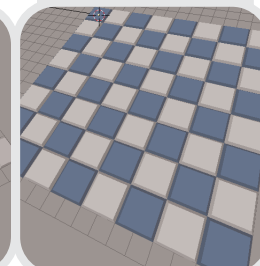


FIG. 29

a pawn in a hurry

que which I described in chapter 2 here once again.

I start by adding a new plane to my scene. In front view, enter editmode ([TAB]), select all vertices ([A]) and extrude the vertices upward a bit ([E]). With the vertices still selected, scale them down somewhat to create beveled edges (Fig. 26).

Still in editmode, I now duplicate the square, hold down [CTRL] and move the copy 2 grid units sideways and upward. Press [A] to select everything and repeat this step (Fig. 27). This time you can copy two fields at the same time. This way, you can create an entire chessboard (Fig. 28) in 5 steps!

In the previous step you have actually created half of the fields of the chessboard. Now leave editmode and copy the entire board. Rotate it 180 degrees (hold down [CTRL] again) and move it so that the copy 'fills the holes' that were remained in the original. You now have a chessboard that consists out of two objects: one for the white fields, and one for the black fields.

Add some material colors (I chose blue instead of black to make the board look more interesting) and take a peek at your new object in solid perspective mode (Fig. 29).

The Result

To finish your animation, set up some lights (read chapter 6 for more information on that) and set up your camera. Since your camera is just another object like the pawn, you can animate it, too. Try making it

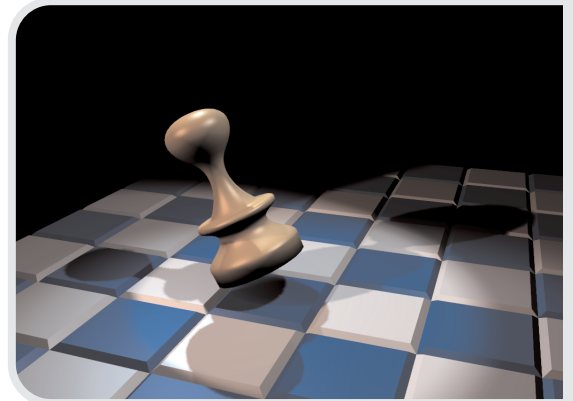


FIG. 30

rotate slightly from left to right (insert rotation keyframes only). A few degrees is already enough to make your final animation (Fig. 30) a lot more dynamic.

To render a single frame of your animation, go to the desired frame and press [F12] or click the 'Render' button.

Usually you will want to render an entire animation to disk, either as a series of images or as an AVI file. To set this up, first enter a filename in the filename box (Fig. 31). For a series of images (not for AVI files), this name will become the base prefix of the filenames. For example, entering '/render/pawn' will result in a series of images called 'pawn0001, pawn0002, ...' stored in the directory /render.

Set the correct file format (Fig. 32). Selecting 'AVI raw' or 'AVI jpg' here will cause Blender to store your animations not as single images, but as an AVI file. AVI jpg is the most compact way of storing your animations, but it comes with a slight quality loss. Change the 'Sta' (Start) and 'End' values (Fig. 33) to match your animation. For the current anima-

a pawn in a hurry

tion, values of 0 and 31 should be entered. Press the 'Anim' button to render the entire animation.

Play it back from within blender by pressing 'PLAY'. This opens a new window - press [ESC] to stop playing.

A Little Extra

There is an extra rendering option called 'Motion Blur'. Motion Blur simulates the effect of a shutter time - fast moving objects will become a bit blurred. Motion blur takes a lot of time to calculate, but in some cases it really adds to the realism of your scene.

Before rendering, select the button 'MBLUR' (Fig. 34). Leave the 'Bf' (Blur Factor) on 1.0; this value represents

the shutter time. A higher value corresponds to a longer shutter time.

Here is the result of the same image as before, but now motion blurred (Fig. 35).

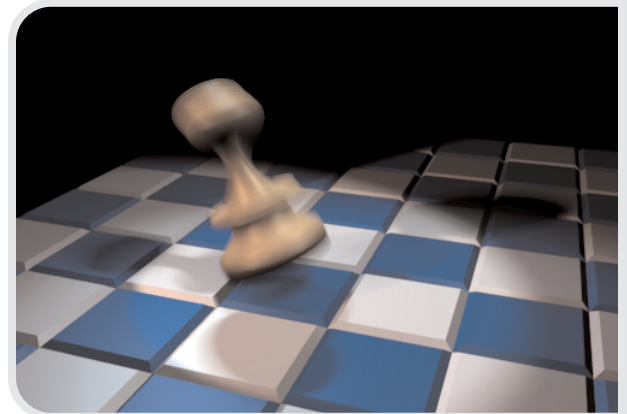


FIG. 35



FIG. 31



FIG. 32

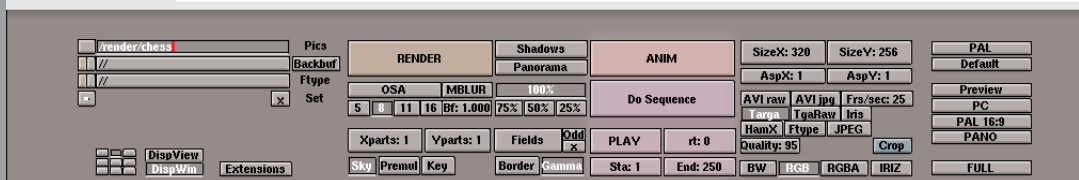


FIG. 33

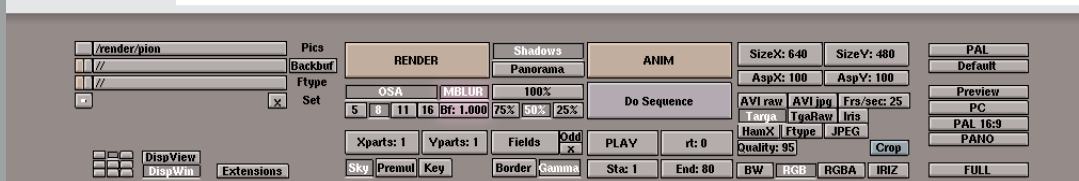


FIG. 34

selection sets

Author: Bart Veldhuizen
Level: Beginner
Topics Mesh Editing, Selections

Introduction

Sometimes when you are working on mesh objects, it would be convenient to be able to store selection groups of vertices. Suppose that you are working on the Blender Girl - wouldn't it be convenient if you could first work on her torso, then on her face, press a button and have the old torso selection back?

Since Blender does not support this feature yet, we have to find another way to achieve this (Blender is really good at allowing crazy usage of features!)

Title

To create selection groups, we will be using material indices. As you know, you can assign different materials to faces in the same mesh object by creating up to 16 material indices. To start, select your mesh object and enter edit mode. Switch to the EditButtons window with [F9].

Notice the button labeled '1 Mat: 1' (see figure 1). This means that this object has 1 (the first number) materials assigned to it, of which number 1 (the second number) is selected. After we have assigned a new index, these numbers will change. You can then browse through the indices by clicking on the left and right side of this button.

Make a selection and press the 'New' button. This adds a new material index to you mesh (The material index button now reads '2 Mat: 2'). Next, press the 'Assign' button to store your current selection in the material index. Please note that the

pink dot in the middle of figure 2 is the object center and not an unselected vertex.

Make another selection and repeat the last two steps. You have now stored two selection sets in the material indices.

Retrieving your selection

To retrieve your select, browse the correct material index and press the 'Select' button, indicated in figure 4.

Please note that material index 1 is treated specially within Blender - it contains all the faces that haven't been assigned a material index yet. In our case, selecting the faces of index one results in the selection as shown in figure 5.

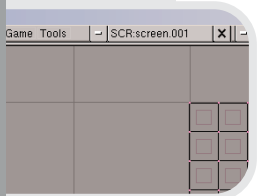
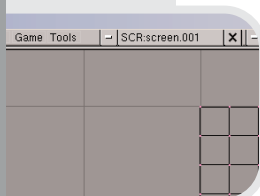
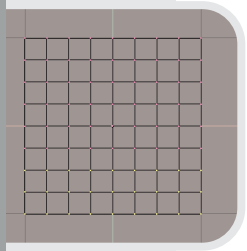
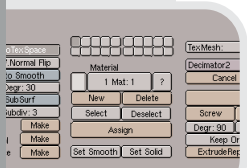
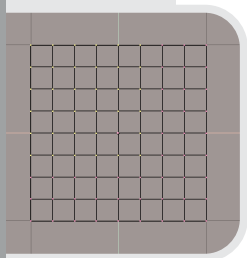
Miscellaneous tips

Please remember that each face can only be assigned to one material index (two materials for one face would not make sense!)

Create different materials for your selection sets if you want to be able to see them in a solid view ([Z]) or a rendered image.

Create different materials with different names if you want to display a meaningful selection set name above the material index selector button (see figure 6)

A limitation of this method is that you can only store selections of the faces and not of individual vertices. If you have problems with selection groups, it can help to turn on the Draw faces option in the EditButtons window (figure 7). In edit mode you can see the selected faces as shown in figure 8.



welding vertices

Author: Geno Ruffalo
Level: Beginner
Topics: Remove Doubles, Mesh Mirroring, Welding

Introduction

When modelling symmetrical meshes time can be saved by modelling one half of the mesh then 'mirroring' or duplicating the 2nd half. After this, the two halves are joined by welding the vertices that run along the seam. In Blender this can be by using a mesh function known as Remove Doubles.

Figure 1 is half of the skate board wheel from the "Proportional Mesh Editing" chapter. In front view select all the vertices of your object and place the 3D cursor along the edge of the object that you will duplicating and press `[.]` (This will cause scale and rotate actions to be centered around the 3D cursor instead of the object's center)

The object is easily mirrored (duplicated) with the use of the hot key combination of `[SHIFT][D]` then `[S]` and `[ENTER]`. Try not to move the mesh at all between keystrokes and the result should resemble figure 2. Move the new half of the mesh if needed to line up the 2 seams as close as possible.

Select the center row of vertices with the border select tool (`[B]`) as seen in figure 3.

In the Edit Buttons Window `[F9]` look for the 'Rem Doubles' button. Below is a button labeled 'Limit'. The value that you enter is the distance in grid units that two vertices must be from each other to be welded into one. In figure 4 the value has been set to 0.070. Press the Rem Doubles button.

An easy way to make sure that the vertices in the seam overlap is to select them with the border select tool and scaling them down in the X-direction only. Press `[S]`, move the mouse horizontally and press the MiddleButton to lock the scale action along the X-axis. Holding down `[CTRL]` will make it easier to set the scale value (in the bottom left corner of your 3D window) to zero.

The result should be a single mesh with both halves joined together. To test this place the mouse over any vertex of the mesh and press `[L]` to select linked vertices. In figure 5 you see that all the vertices will become selected as long as all the vertices along the seam were successfully welded together. If any vertices did not get joined simply increase the limit value and repeat the remove doubles process.

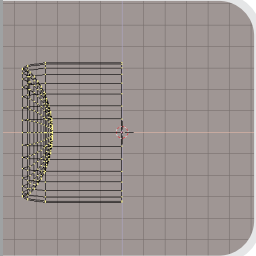


FIG. 1

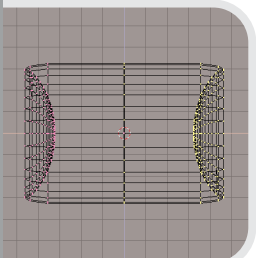


FIG. 2

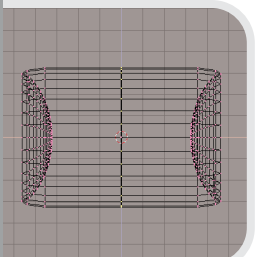


FIG. 3



FIG. 4

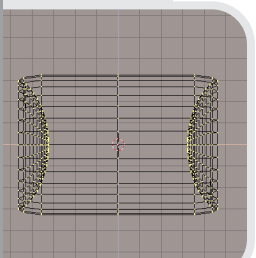


FIG. 5

MICRO TUTORIALS



FIG. 1

Height Maps

Height Maps, also known as Displacement Maps, are a fast and easy way to model landscapes and other special meshes in most 3D applications. Fortunately Blender also offers this feature. It's a breeze to do, and can give you some quick landscapes. Start off with a Grid Mesh and add a Material and Image Texture to it. I chose this skull (Fig. 1).

Enter edit mode and click the 'Noise' button a few times (Fig. 2).

You may want to click the 'Smooth' button after every few Noise clicks, but that is up to you. Here is the result after a few clicks (Fig. 3).



FIG. 2

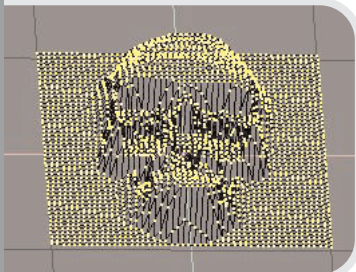


FIG. 3



FIG. 4

And here is what you can do with them (Fig. 4).

The skull was joined to an existing mesh of a mountainous landscape scene and the result is this abstract image. Create Grid, add Image, add Noise, not bad for Three Steps!

Aligning Vertices

Did you ever wonder how to align a group of vertices the same value along one axis. Well in Blender this can be done by, believe it or not, the size translation. The first step is to place the 3D Cursor in the location that you want to align the vertices on. Select the vertices and press the 5. Move the mouse towards the 3D Cursor and press the 8MiddleButton to restrict the movement to one axis (Fig. 5).

The result is a group of vertices lined up nicely (Fig. 6).

We might as well try it one more time just for practice. Place the 3D cursor at the center of the sphere (Fig. 7).

Scale along one axis using the 5 and 8MiddleClick combination. This little trick works just as well for curve handles and surface knots too! (Fig. 8)

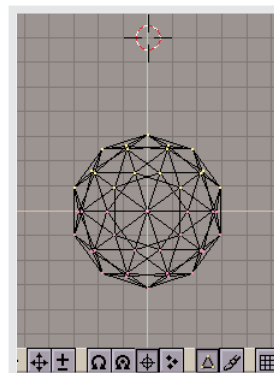


FIG. 5

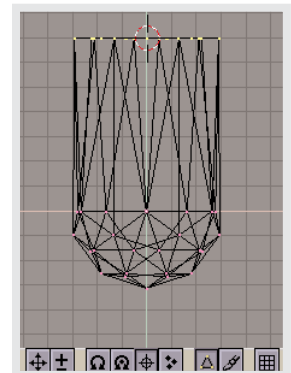


FIG. 6

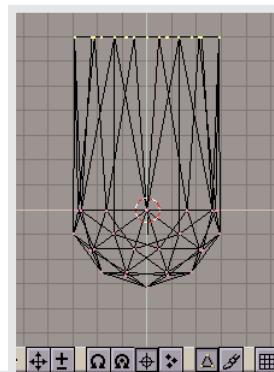


FIG. 7

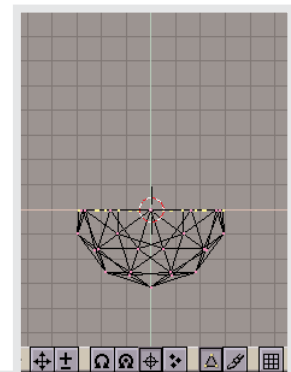


FIG. 8

THE NUMERIC KEYPAD

| | |
|---------|--|
| [/] | local view, resize 3D view to show selected object(s) and hide all other objects. press again to unhide all objects. |
| [*] | copy the rotation of the active object to the current 3D window. |
| [9] | force a complete recalculation of the animation systems and draw again. |
| [.] | resize 3D view to show selected object(s) |
| [ENTER] | confirmation |
| [-] | zoom out. |
| [+] | zoom in |
| [7] | top view. |
| | with [SHIFT]: bottom view |
| [1] | front view. |
| | with [SHIFT]: back view |
| [3] | right view. |
| | with [SHIFT]: left view |
| [8] | rotate the current 3D view around the Y axis. |
| [4] | rotate the current 3D view around the Z axis. |
| [6] | rotate the current 3D view around the Z axis. |
| [2] | rotate the current 3D view around the Y axis. |
| [0] | camera view. |
| [5] | toggle perspective/ortho mode. |
| | use with [CTRL] to set the active camera. use with [ALT] to revert to the previous camera object. |

BLENDER HOTKEYS

BASIC EDITING

| | |
|------------|--|
| [SPACE] | toolbox. |
| [G] | grab the selected object. |
| [S] | scale the selected object. |
| [R] | rotate the selected object. |
| [TAB] | toggle editmode |
| [SHIFT][D] | duplicate the selected object. |
| [ALT][D] | create an instanced copy of the selected object (geometry data is reused). |
| [X] | erase the selected object. |
| [CTRL][X] | erase the entire scene. |
| [A] | toggle select all/select none. |
| [B] | box select. |
| [P] | parent the selected object to the active object. |
| [T] | make the selected objects track the active object. |
| [Q] | quit Blender |



EDIT MODE KEYS

| | |
|------------------------------|--|
| [W] | specials menu |
| [E] | extrude selected vertices |
| [CTRL][N] / [CTRL][SHIFT][N] | recalculate normals |
| [X] | erase selected vertices/edges/faces |
| [B] + [B] | circle select. set circle size with NumPad [+] and [-] |
| [L] | select linked vertices. |
| [SHIFT][L] | deselect linked vertices |

3D WINDOW

| | |
|-----------|--|
| [Z] | toggle solid/wireframe mode. |
| [CTRL][Z] | turn on shaded mode. |
| [HOME] | resize 3D view to show all the objects in scene. |

ANIMATION

| | |
|---|--|
| [ALT] [A] | play back animation. |
| [ESC] | stop animation playback. |
| [I] | insert key. |
| [K] | shows keys of selected object; [PG UP] and [PG DN] switch to previous/next key |
| [SHIFT][K] | show and select all keys. |
| [<-] | go to the previous frame |
| [>-] | go to the next frame |
|  | increase current frame number by 10. |
|  | decrease current frame number by 10. |
| [SHIFT][<-] | go to the beginning of the animation |
| [SHIFT][>-] | go to the end of the animation |

OTHER WINDOWS/ MISC. FUNCTIONS

| | |
|-------------|---|
| [F1] | load file window. |
| [F2] | save file window. |
| [F3] | save the last rendered image. |
| [SHIFT][F5] | change the current window to the 3D window. |
| [SHIFT][F6] | change the current window to the IPO window. |
| [SHIFT] | pfefl maximize the current window. repeat to restore the original view. |
| [K][CTRL] | go to the next Blender screen. |
| [CTRL] | got to the previous Blender screen |