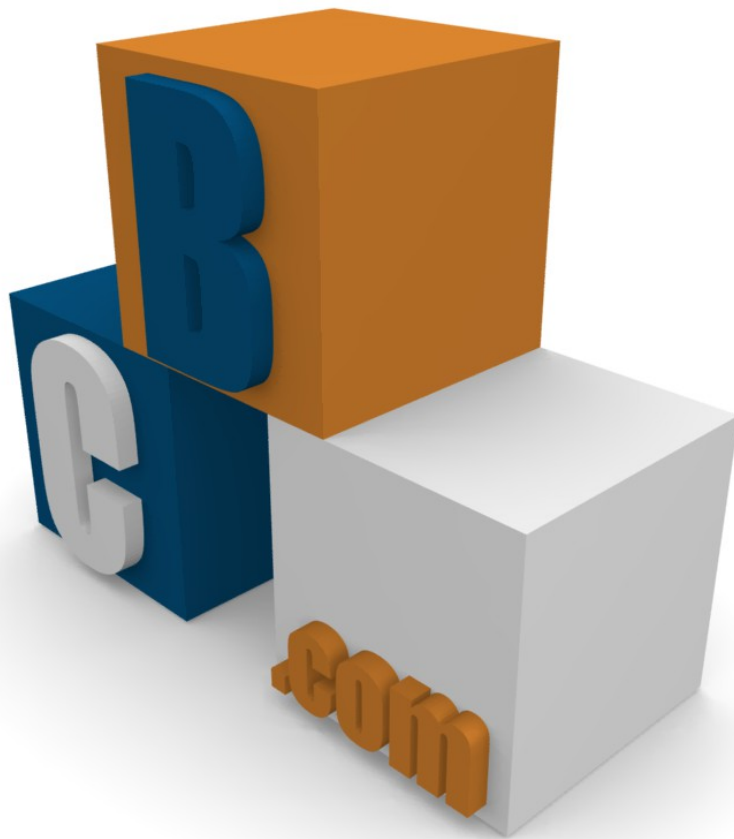


BlenderCourse.com

Basics V2.1



Bas van Dijk

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Preface

BlenderCourse teaches you about 3D modelling and provides you short tutorials about a specific subject. The main thought is: 'Just do it!' During different courses you will learn various techniques. If necessary, there is a small instruction, but in my opinion you will learn best by doing the exercises yourself.

BlenderCourse is intended for everyone who can use a computer. This means you must understand terms as "double click" and "tab-key".

You do not need any 3D-modelling knowledge; the terms used, will be explained during the different courses.

BlenderCourse started back in 2006. At the time it was one of the few coherent e-books about Blender. Since the Blender 2.60 release the whole user interface has been changed. Therefore I decided to rewrite the BlenderCourse Basics book and mark this edition with "V2". Here and there I have changed some of the Courses in order to make them more readable and teach you even more techniques.

If you see an error or something unclear, do not hesitate to contact me via feedback@blendercourse.com. More BlenderCourse material can be found at <http://www.blendercourse.com>.

You might also want to visit the BlenderCourse Facebook page at <http://facebook.com/blendercourse> If there are new updates these will be published on this Facebook page.

Are you a teacher who is using this ebook for education? Please drop me an e-mail! As an author it is great to know which schools are using the book you have written.

Have fun with this BlenderCourse!

Bas van Dijk

Purmerend, the Netherlands, October 2013

Introduction

Before you start reading this e-book, please make sure your ebook is the latest version available. You can download the latest version from <http://blendercourse.com>

During these lessons we will be using the 3D modelling tool Blender 3D, but what is this kind of tool for? With Blender you can create 2D- and 3D-images and it is possible to make animations/movies. Blender is an open source project and freely available at <http://blender.org>

The "Appendix 4: Blender gallery" is a small showcase about the possibilities of Blender.

Before you can start with a lesson you first have to read a small piece of text which describes the techniques of the lesson. At the end of every lesson is an image of "The challenge". The idea is that you can reproduce the image by using the techniques learned during the lesson. The last two chapters do not have a challenge because these are about animation.

All Blender files needed are provided with this BlenderCourse. You can find these in the "Course Material" folder.

BlenderCourse uses the same notation for every document. Below is the explanation of this notation:

- An arrow (→) means instruction. This means you have to follow the step after it.
Example: → Click with the right mousebutton on the object.
- A text between < and > means a key on the keyboard.
Example: Press <Enter> to confirm the operation.
- A combination of more than one key will be written with the plus sign (+).
Example: Press <Alt> + <F4> to exit the program.
Note: If in this book <Ctrl> is mentioned, Mac OSX users should use <Cmd> instead.
- A button on the screen will be written between [and].
Example: Click at [OK] to close the window.
- If there is an arrow (→) between two words, this means a click sequence in a menu.
Example: Choose File → Save

- A new technique or additional information will be written inside a grey box.

Example:

This is how this technique works.

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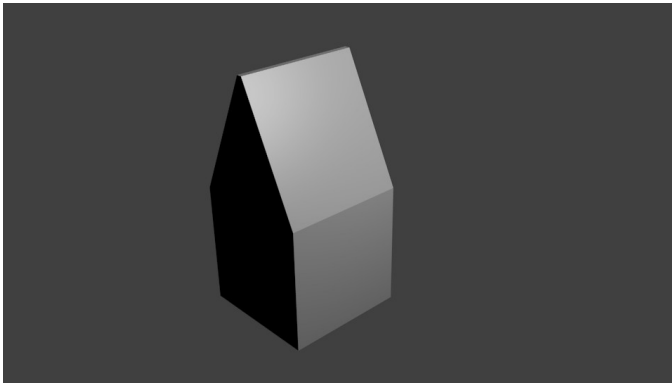
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Results per course

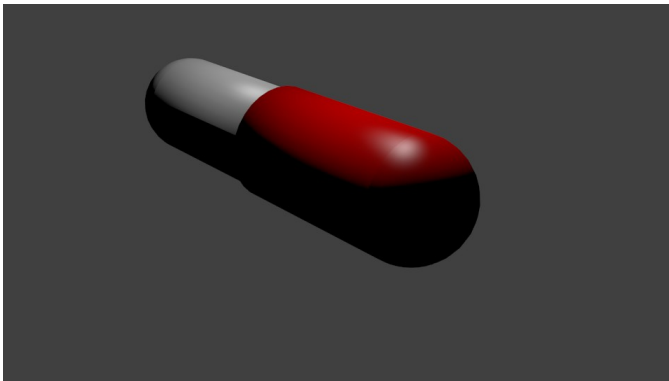
Below are all the results from the different exercises in this BlenderCourse.

Course 1 - Mesh and vertex editing I



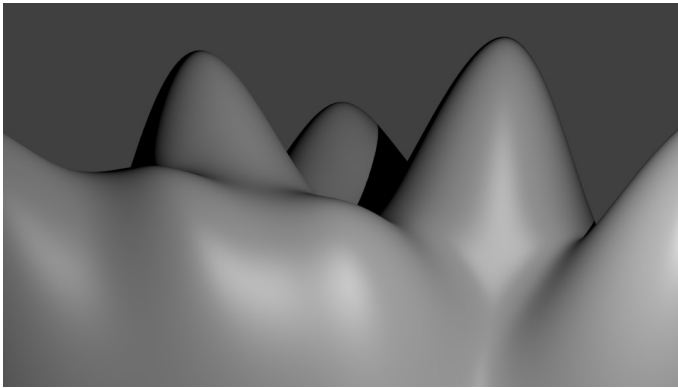
House

Course 2 - Mesh and vertex editing II



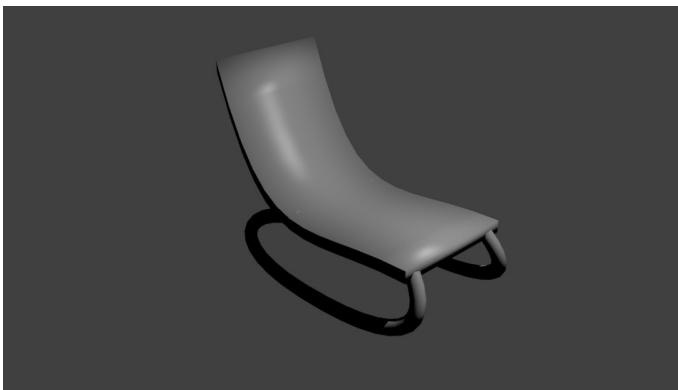
Pill

Course 4 - Proportional Editing



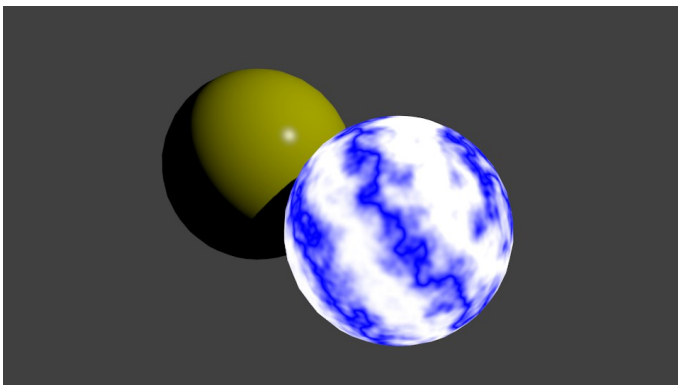
Mountain scenery

Course 5 - Curves

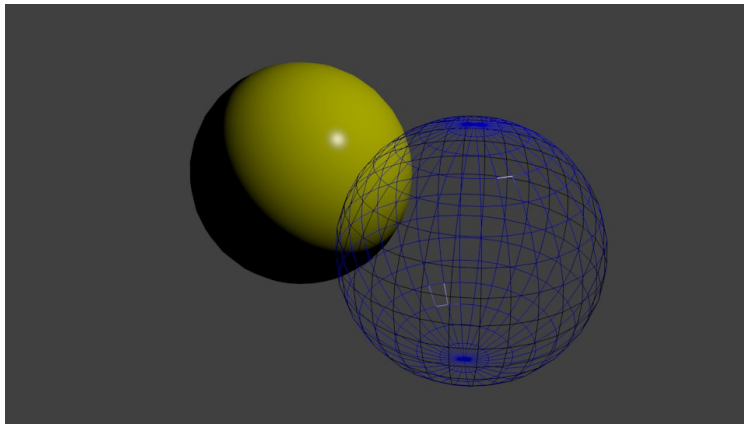


Chair

Course 6 - Materials and Textures

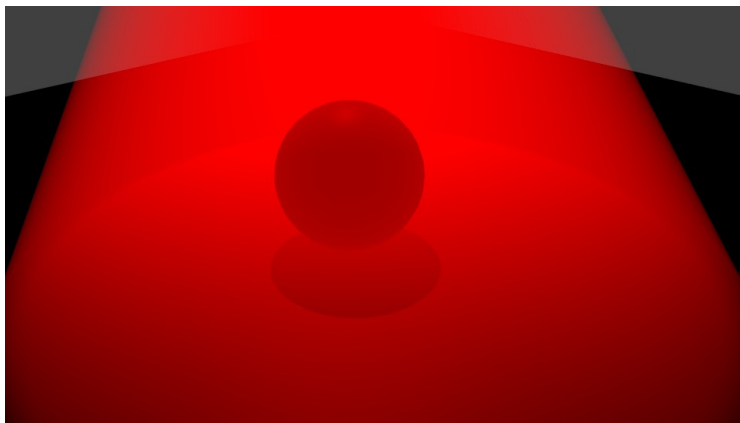


Material



Wireframe

Course 7 - Light



Fog light

Blender Quick Tour

Before we start with Course 1 we first need to know some basics about the Blender user interface. If you are already familiar with the Blender interface, feel free to skip this chapter and continue with Course 1 – Mesh and vertex editing I.

➔ Install Blender according to Appendix 1: The installation of Blender

➔ Start Blender

When Blender starts, the centre of the screen shows like figure 1.

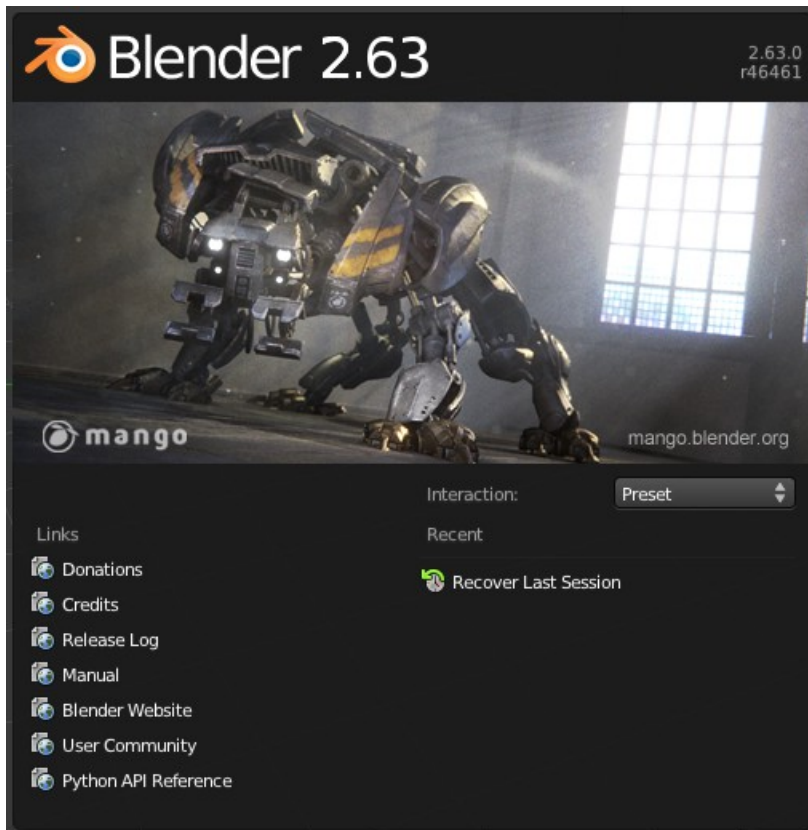


figure 1

In this startup window you are able to quickly open the last Blender scene you have been working on. The left part contains some useful links to websites as well.

➔ Press the <ESC> key in order to close the window shown in figure 1.

We now see the whole Blender workspace like figure 2.

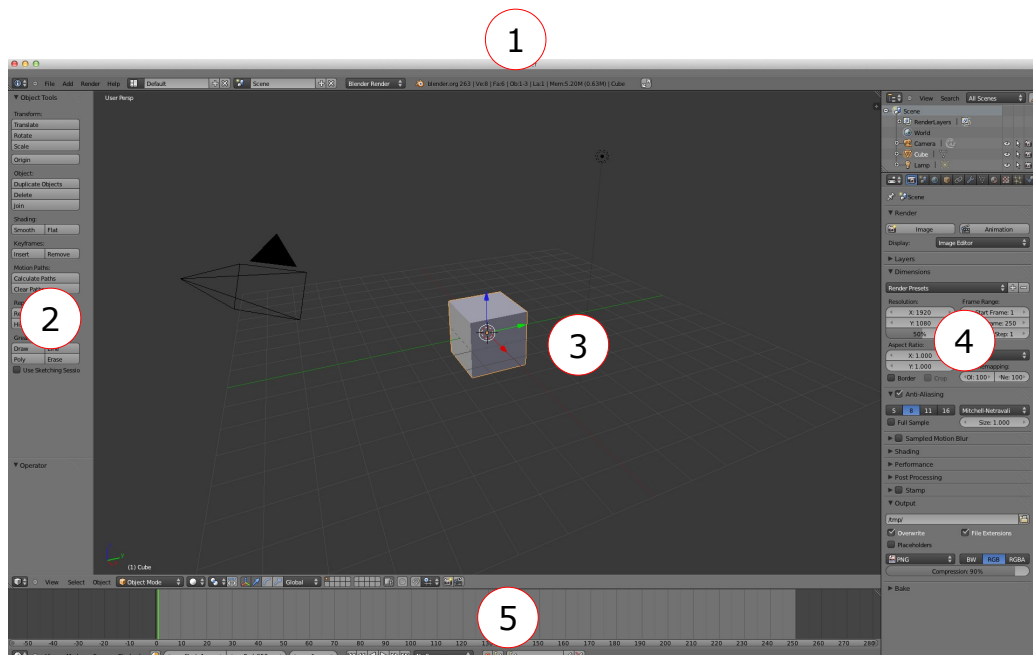


figure 2

By default the Blender workspace has five different sections:

1. Menubar

The menubar is used for menu actions like file saving

2. Tools panel

Used to select operations like duplicate, rotate, scale etc.

3. 3D View

Shows a the content of a scene in 2D or 3D

4. Properties panel

Allows you to set measurements and coordinates etc.

5. Timeline

Shows where in time we are working on the scene

This is all you need to know in order to start with Course 1.

Course 1 – Mesh and vertex editing I

Meshes, vertices and faces

A 3D-object, like a cube, sphere or cylinder is called a **mesh** (figure 1). This cube consists of eight points. One of these points is called a **vertex** (plural vertices). In a cube, four vertices together form a **face**. Each face has at least three vertices.

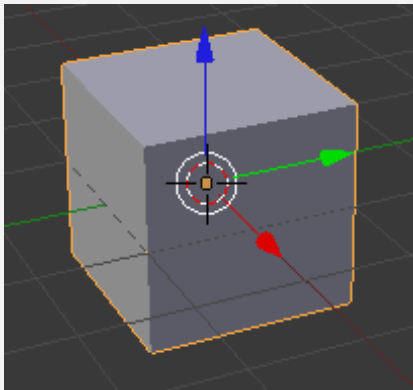


figure 1

Views and axis

In 3D space we are using three axis: X-, Y- and Z-axis. In the bottom left of the 3D view (figure 2) is shown in which direction these axis are pointing. Figure 3 is a screenshot of the cube which is shown when Blender starts. Here you can see how the axis match the object.

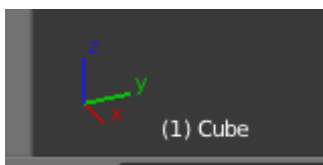


figure 2

Rendering

In Blender we are working with some kind of wireframe (figure 3). This wireframe is not the actual result of your design (figure 4). The wireframe needs to be “translated” into an image, this process is called rendering. During this process the CPU calculates things like light, shadow, reflections etc.

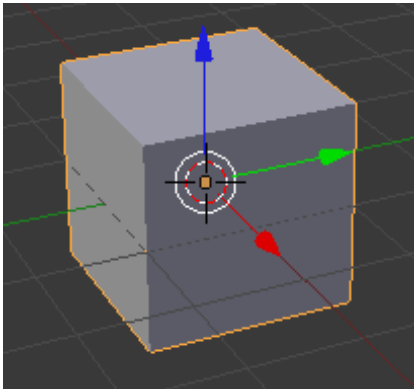


figure 3

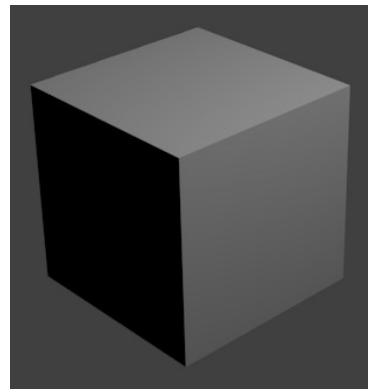


figure 4

Modelling a house

During this course we are going to build a simple house.

- ➔ Start Blender.
- ➔ Move with your mouse cursor to the centre of the cube and click with the right mousebutton to select the cube.

In the bottom left of the view you can see which object you have selected (marked in red in figure 5).

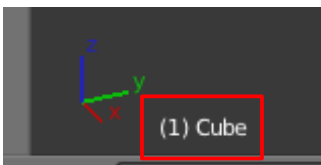


figure 5

The green and red lines mark the 0-level. The cube is located half below these 0-lines. The next steps show you how to move the cube upwards.

- ➔ Switch by using the numeric <1> (this is the right part of the keyboard) to the Front View. You now see "Front Persp" in the top left corner of the 3D view (figure 6).

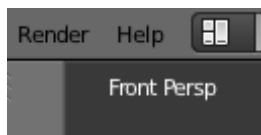


figure 6

There are more views available than just the Front View. The other numeric keys correspond to the following views:

<1>	Front Perspective View	<4>	Rotate View Left
<3>	Right Perspective View	<6>	Rotate View Right
<7>	Top Perspective View	<8>	Rotate View Top
<0>	Camera Perspective View	<2>	Rotate View Bottom
<.>	User Perspective View	<+>	Zoom View In
		<->	Zoom View Out
<5>	Switch between Perspective and Orthographic View		

- ➔ Move with the mouse cursor to the centre in the Front View and press <G> (move), you are now able to move the cube around freely.
- ➔ Press <Esc> to cancel the movement; the cube is placed back to its original location.
- ➔ Press the numeric <5> in order to switch to Orthographic view.

- ➔ Move the cube around, just like we did before and notice the difference between Perspective and Orthographic View.
- ➔ Move the cube around and click the left mousebutton to release. Switch with the numeric keys between views to see the result.

You might notice that moving a cube around is not very easy. You can lock the movement on the axis of your view. In order to do this press <G> (move) and the letter of the axis which you like to lock (<X>, <Y> or <Z>).

If you hold down <Ctrl> during the movement you make sure the object moves along the grid.

- ➔ Move back with your cursor in the centre of the cube in the Front View and press <G> for move and <Z> to lock the Z-axis.

The 3D View shows which of the axis you have locked, in this case the light blue Z-axis (figure 7).

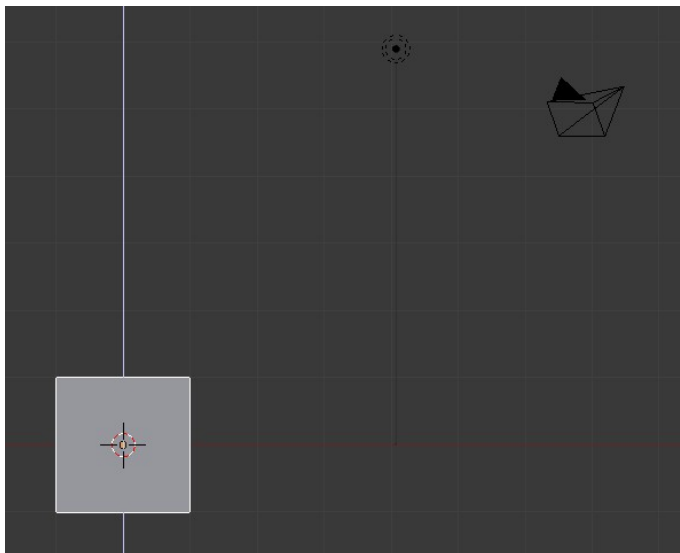


figure 7

- ➔ Now hold <Ctrl> down while moving the cube upwards till it is on the 0-line.
- ➔ Click with your left mousebutton or press <Enter> to confirm the movement.

If everything worked out well your screen should look like figure 8.

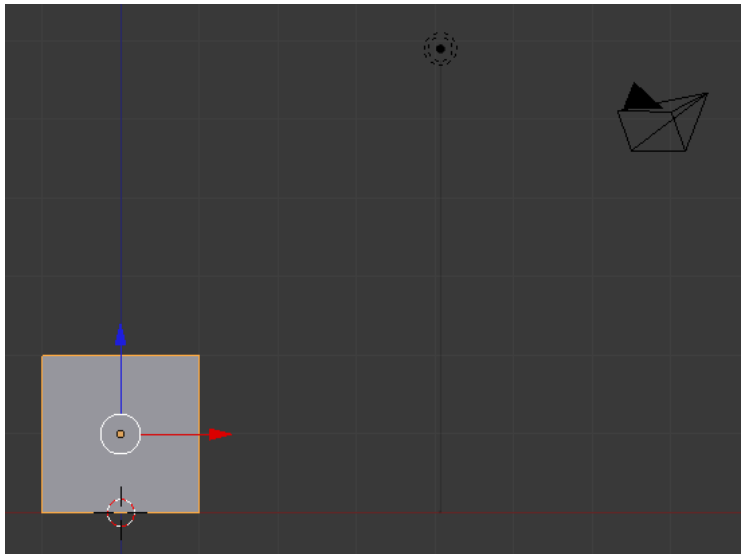


figure 8

This cube is the base of our house, we now need to create the roof. In order to build the roof we need another cube on top. To achieve this we are about to duplicate the old one.

- ➔ Select in the Front View the cube (move cursor to the centre of the cube and press the right mousebutton).
- ➔ Press <Shift> + <D> (duplicate object).

You can now move the duplicated cube freely around.

- ➔ Press <Z> to lock the Z-axis.
- ➔ Hold down <Ctrl> and move the cube till it is on top of the first one.
- ➔ Click with the left mousebutton or press <Enter> to confirm the movement.

If everything worked out well you now have two cubes as shown in figure 9.

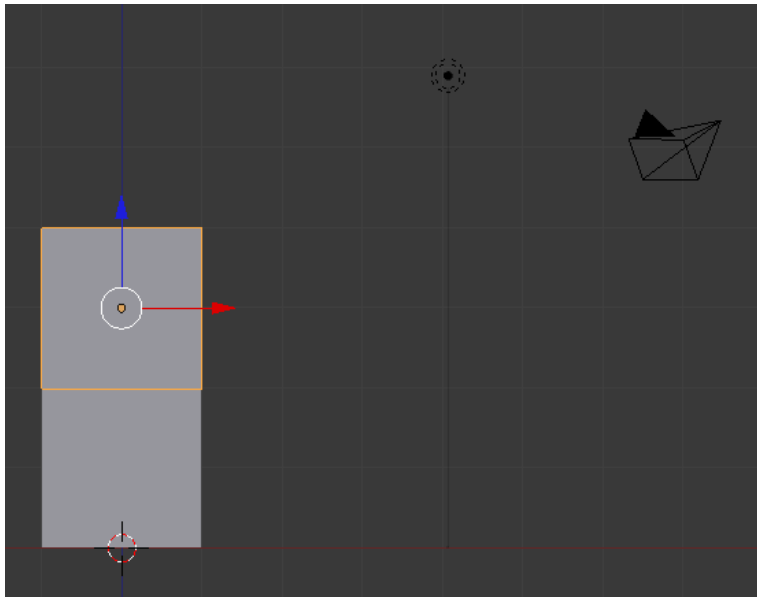


figure 9

With the scrollwheel (<Scrl>) you are able to zoom or out.

- ➔ Hold <Shift> while moving the scrollwheel up and downwards. You will notice you scroll the view vertically.
- ➔ Hold <Ctrl> while moving the scrollwheel up and downwards. You will notice you scroll the view horizontally.

Blender uses two different modes: **Object Mode** and **Edit Mode**. In Object Mode you are working with the object as a whole. In Edit Mode you can edit the object per vertex or multiple vertices.

You can switch between these modes by pressing <Tab>.

- ➔ Select the top cube.
- ➔ Press <Tab> for switching into Edit Mode.

You have now switched into Edit Mode. You will be able to know this by the visible vertices and the text "Edit Mode" in the view menu bar (red marked figure 10).

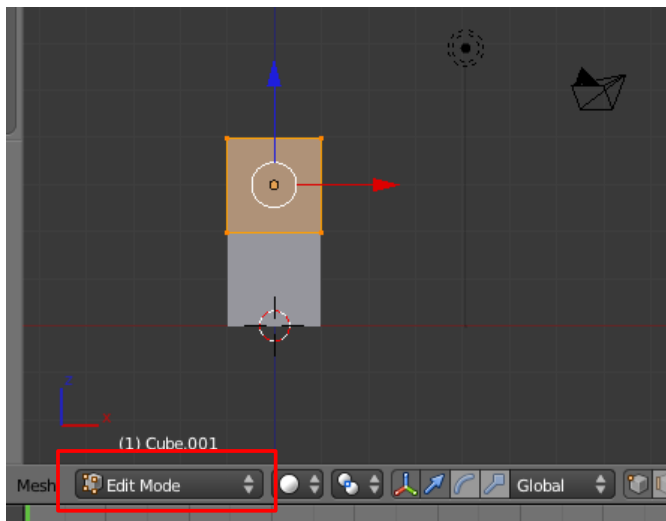


figure 10

In the next steps we are going to make the roof sharp.

- ➔ Switch, by using the numeric <7> key to the Top View
- ➔ Press <A> to deselect all vertices.
- ➔ Make sure "Limit selection to visible" is enabled (marked red in figure 11), otherwise you will select the vertices at the bottom of the cube as well.

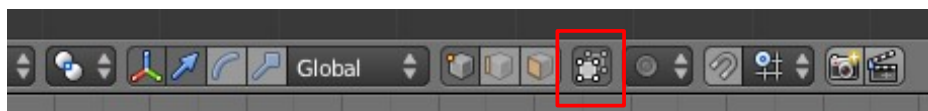


figure 11

- ➔ Press for block selection and drag a rectangle around four vertices (figure 12).

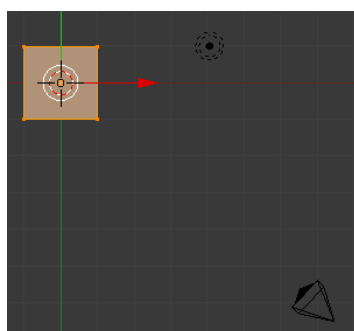


figure 12

You can scale objects by pressing <S>, to rotate you can press <R>. Also with these operations you can use <X>, <Y> and <Z> to lock the axes.

- ➔ Move your cursor in a corner of the view and press <S> followed by <X> to lock the X-axis. If we did not lock on the X-axis we would have a pyramid.
- ➔ Move your cursor to the centre of the view till the roof is getting sharp like figure 14.



figure 13

- ➔ Confirm your operation by pressing the left mousebutton or press <Enter>.

If everything worked out well, you now have a house with a sharp roof just as (figure 15).

- ➔ Switch to the Camera View by pressing the numeric <0> key.

As you can see the house falls partly out of the camera view (figure 14). We are going to correct this.

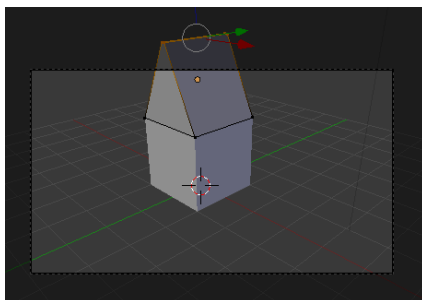


figure 14

- ➔ Switch to the Front View by pressing the numeric <1> key.

- ➔ Press <Tab> to switch back to Object Mode.
- ➔ Select (with the right mousebutton) the camera in the Front View (marked red in figure 15). Its colour changes to orange.

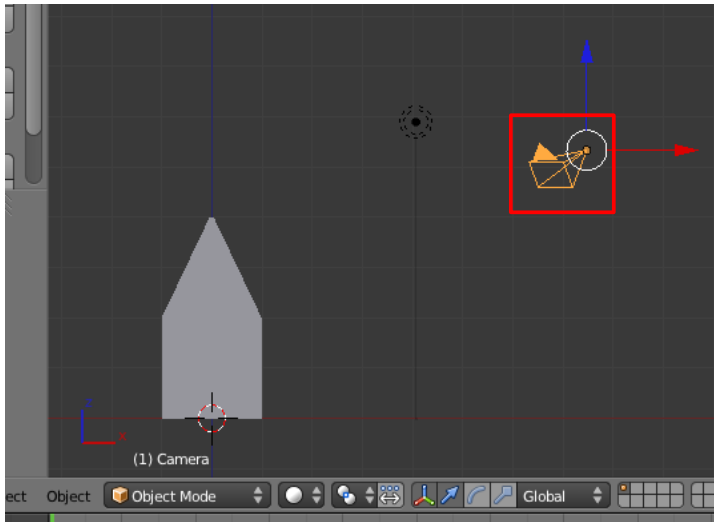


figure 15

- ➔ Press <G> followed by <Z> and move the camera upwards till the whole house shows up in the Camera View (switch with the numerical <1> and <0> in order to see if the camera is at the correct position).
- ➔ Confirm your movement by pressing the left mousebutton or press <Enter>.

Your Camera View should now look like figure 16.

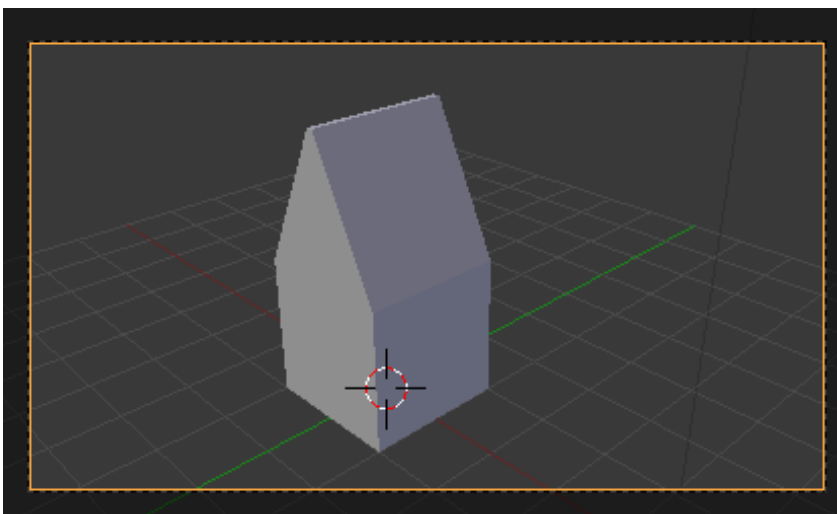


figure 16

It is time to save our work.

In Blender you can save by pressing <Ctrl> + <S> or choose File → Save. The first time Blender prompts you for a filename, every next time your file is overwritten automatically.

➔ Press <Ctrl> + <S>.

The 3D View changes into a save dialog (figure 17).

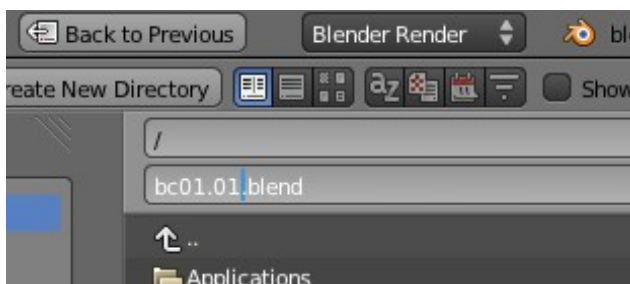


figure 17

➔ Change untitled.blend into bc01.01.blend and press <Enter>.

➔ Browse to the correct folder and click [Save As Blender File].

Your file is saved; you can see this in the window title of Blender (figure 18). This is the filename in which your file is saved.



figure 18

Finally we are about to “render” our house. As described earlier, this operation transforms our wireframe into the final image.

- Choose Render → Render Image (figure 19) or press <F12> in order to start the render process. Another option is to press [Image] on the render tab in the properties pane (marked red in figure 20).

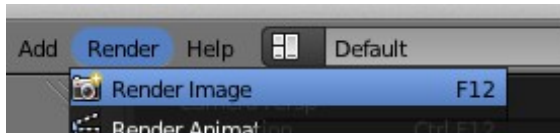


figure 19

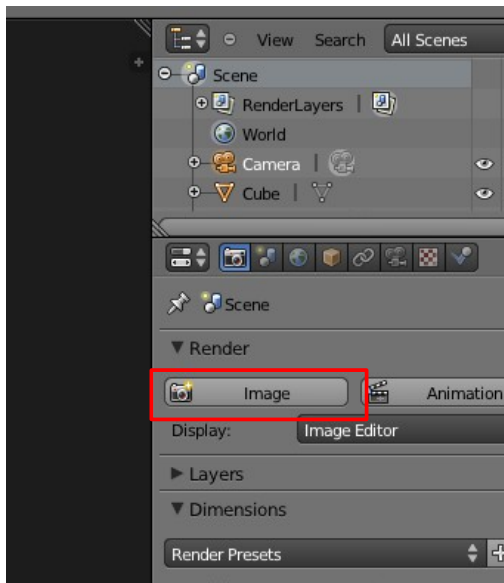


figure 20

The 3D window changes into the render view, which shows the rendering process (figure 21).

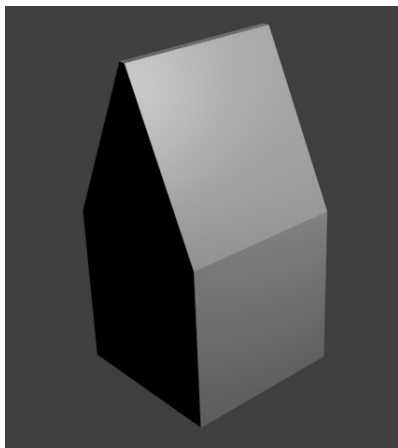


figure 21

- ➔ Press <ESC> to close the render window.
- ➔ Press <Shift> + <Ctrl> + <S> which is Save as
- ➔ Change bc01.01.blend into bc01.02.blend and press <Enter>.

Sometimes it is hard to see how the different objects within a scene are shaped since there are solid objects in front of it. Pressing the <Z> key switches between solid and wireframe viewport shading. You can also pick other viewport shading methods from the selection menu at the bottom of your 3D View as shown in figure 22.

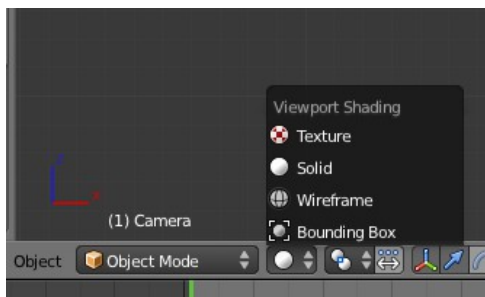


figure 22

- ➔ Press <Z> and notice how the shading looks in wireframe mode (figure 23).

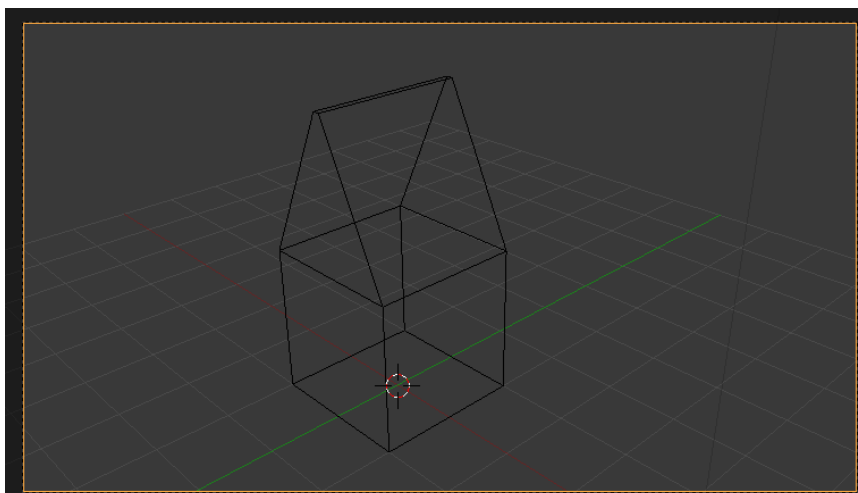


figure 23

- ➔ Press <Z> again to switch back to solid viewport shading.

The challenge

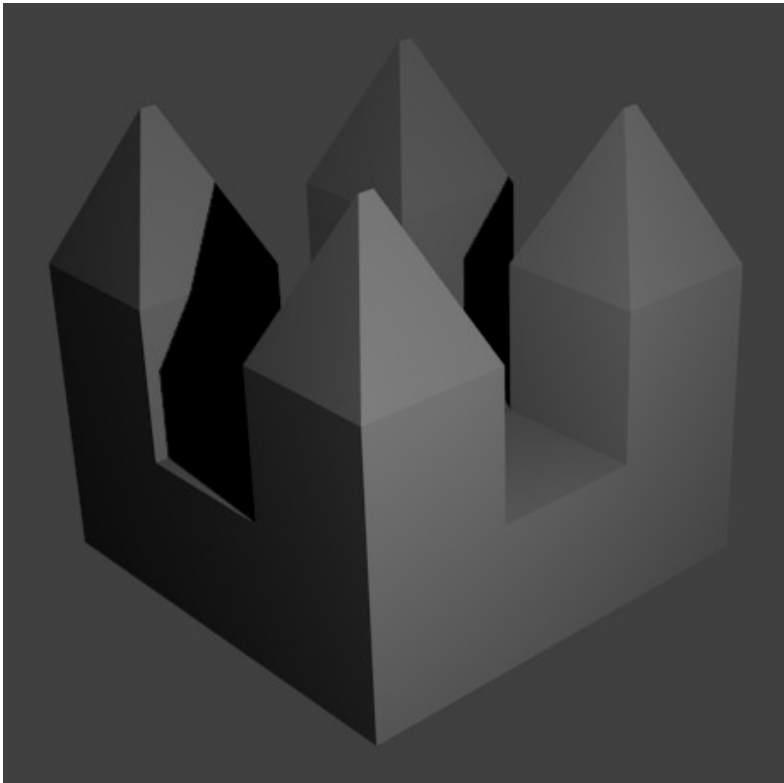


figure 24 – castle – bc01.03.blend

Skills from this course

- Moving, rotating and scaling objects
- Locking axis
- Editing vertices of an object
- Duplicating objects
- Saving files
- Rendering scenes

Course 2 - Mesh and vertex editing II

In this course we are continuing with editing meshes and learn to work with some new Blender meshes as well.

Basic meshes

Before you start drawing your 3D-model, you need to keep in mind which primitives help you to create the basis of your 3D-model. For example, our house of Course 1 was build out of the "cube" mesh.

Blender contains the following basic meshes: Plane, Cube, Circle, UVSphere, Icosphere, Cylinder, Tube, Cone, Grid and Monkey.

Figure 1 shows all the renderable meshes. A circle for example is not visible when rendering.

The mesh Monkey is the mascot of Blender and is named Suzanna. You can use this mesh as a ready-to-use mesh which might be useful when checking materials.

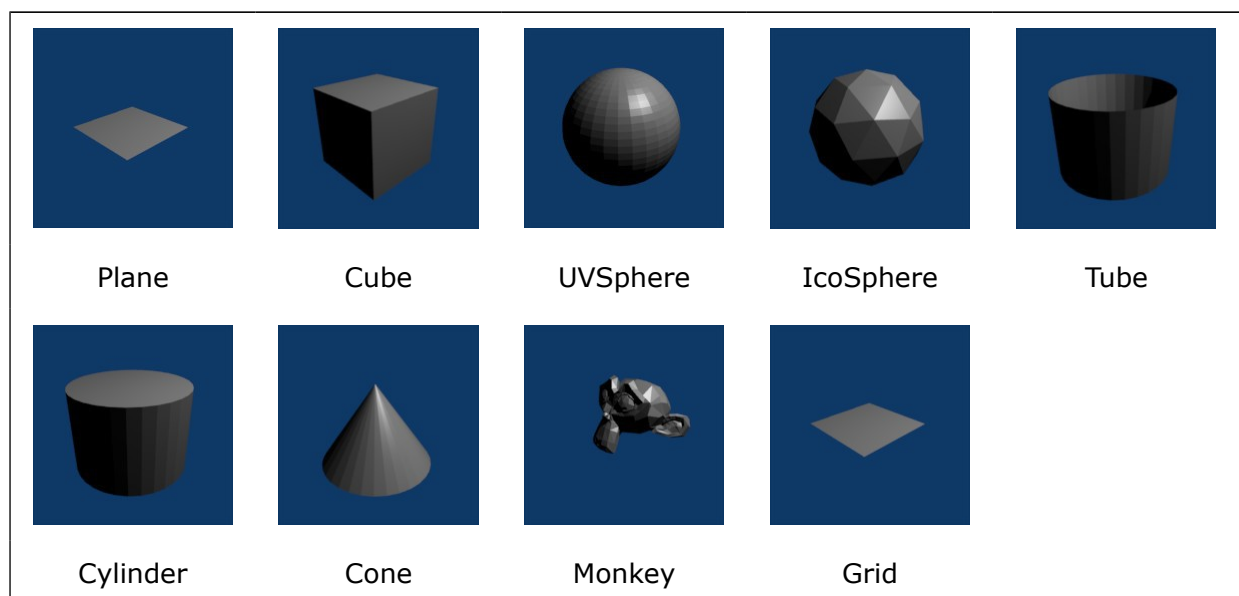


figure 1

Creating a pill

In this chapter we are about to make a pill (figure 2).



figure 2

The first question we can ask ourselves: which basic meshe(s) are we going to use for making this pill? A logical answer would be a Cylinder with two UVSpheres on each end. Instead, we are going to use only one mesh: the UVSphere.

- ➔ Start Blender.
- ➔ Choose File → New (figure 3) or press <Ctrl> + <N>.

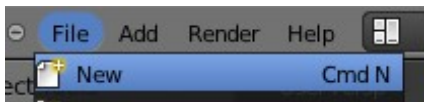


figure 3

- ➔ Click with the right mousebutton on the cube in order to select the cube.
- ➔ Press <X> to delete the cube.

A menu appears (figure 4).

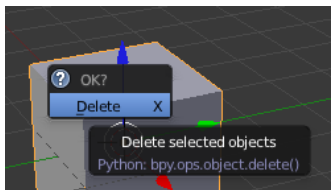


figure 4

- ➔ Choose [Delete].

The cube is deleted now.

- ➔ From the top menu choose Add → Mesh → UV Sphere (figure 5).

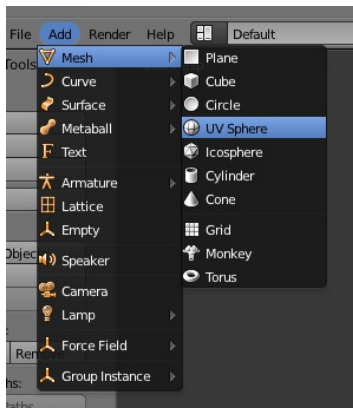


figure 5

You have now added a sphere to your scene (figure 6). We are now going to make one half of the pill.

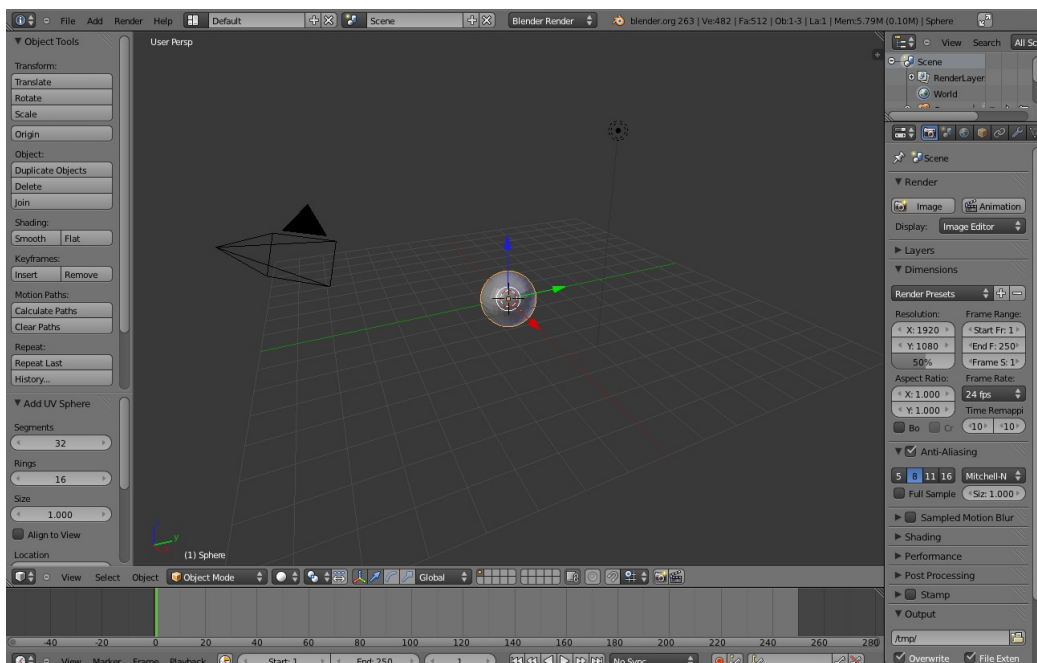


figure 6

- ➔ Press <1> in order to switch to the Front View.
- ➔ Press <5> to switch from Orthographic to Perspective mode

Sometimes you do not need the properties menu. You can maximize a view by pressing <Ctrl> + <↑>. Pressing <Ctrl> + <↑> again switches you back.

- ➔ Hide the properties menu by pressing <Ctrl> + <↑>.

The Front View is maximized now (figure 7).

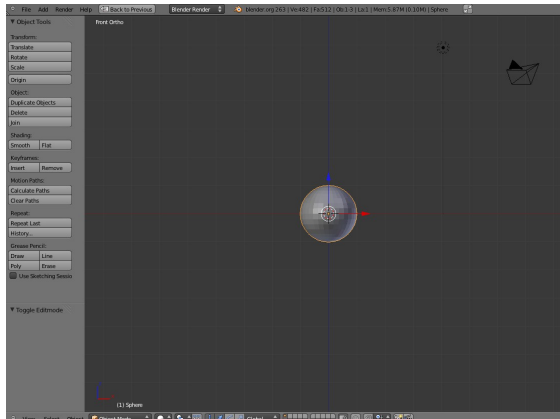


figure 7

- ➔ Press <Z> to switch to wireframe mode
- ➔ Zoom in (Scrollwheel up) till the sphere takes about 25% of the view. (figure 8).

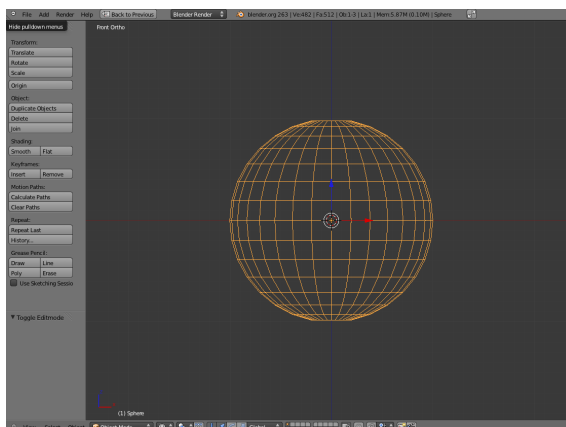


figure 8

In order to select multiple vertices we are using **Block Select**. You use block select by pressing while in Edit Mode. If you hold down your left mousebutton, you can drag a rectangle around the vertices. All vertices in this rectangle will be selected (yellow coloured are the selected ones).

In Edit Mode you can press <A> to select or deselect all vertices.

- ➔ Press <Tab> to switch to Edit Mode
- ➔ Press <A> to deselect all vertices.
- ➔ Press and drag a rectangle around all the vertices right from the centre-line (figure 9).

Do not select the centre line itself, only the vertices on the right side of it!

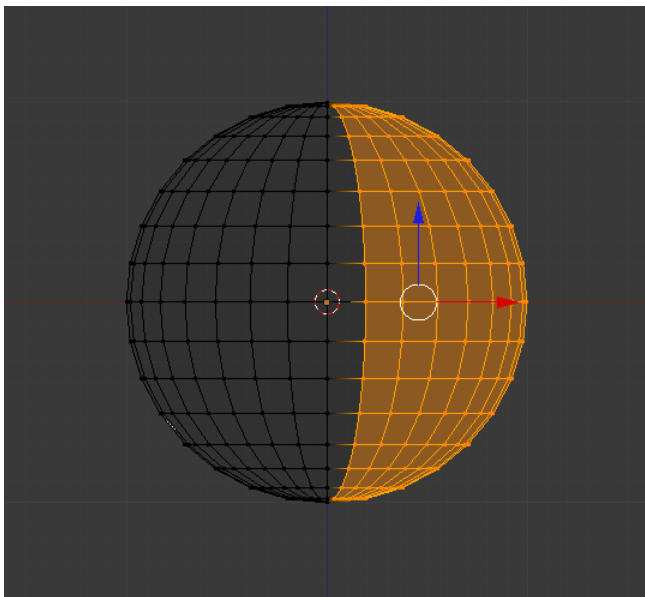


figure 9

- ➔ Press <X>

A menu appears (figure 10).

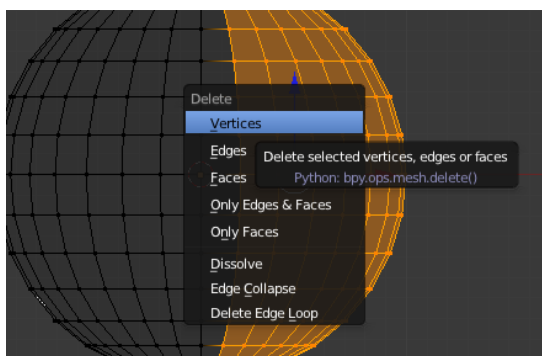


figure 10

- ➔ Choose [Vertices]

You are now seeing half a sphere (figure 11).

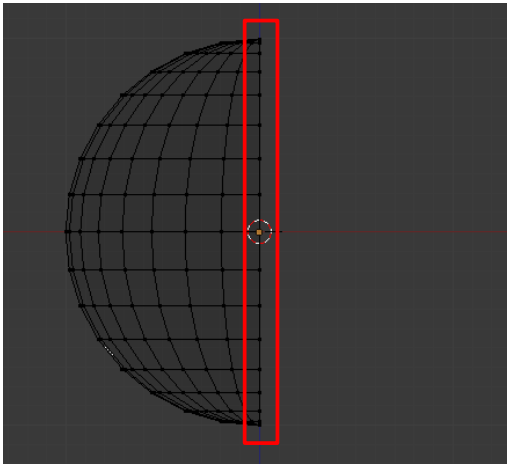


figure 11

- ➔ Select with the rightmost row of vertices (marked red in figure 11).
- ➔ Press <E> for Extrude.
- ➔ Press <X> to lock the X-axis.
- ➔ Move the mouse to the right.

In the bottom left of the view is displayed how far the “pill” is stretched (figure 12).

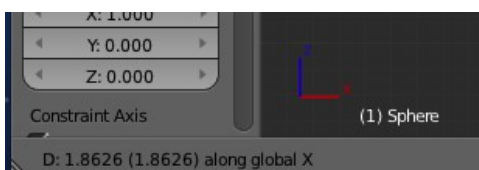


figure 12

This number has an accuracy of five decimals. Precisely adjust to 3.0000 is hard.

- ➔ Press <ESC> to cancel the Extrude operation.
- ➔ Press <E> again
- ➔ Press <3>

The bottom left of the view menu bar shows 3 (figure 13).



figure 13

- ➔ Press <Enter> to finish the Extrude operation.
- ➔ Zoom out with your <Scrollwheel> till the half covers your view.

You are now having half a pill (figure 14).

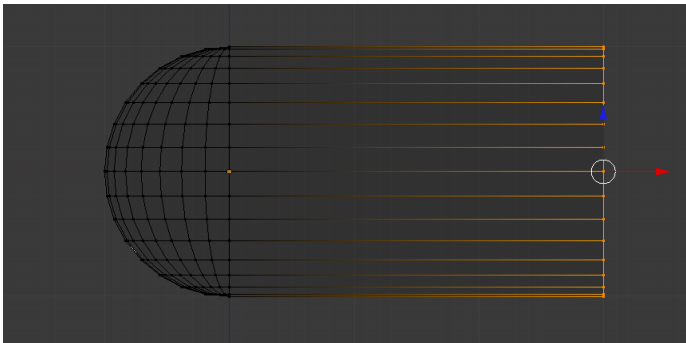


figure 14

- ➔ Press <0> for Camera View
- ➔ Press <Z> to switch to solid viewport shading.

You can see the pill is still hollow (figure 15).

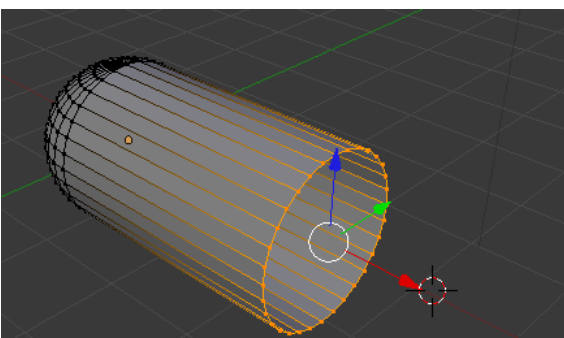


figure 15

➔ Click in the viewport menubar at [Mesh]

A menu appears (figure 16).

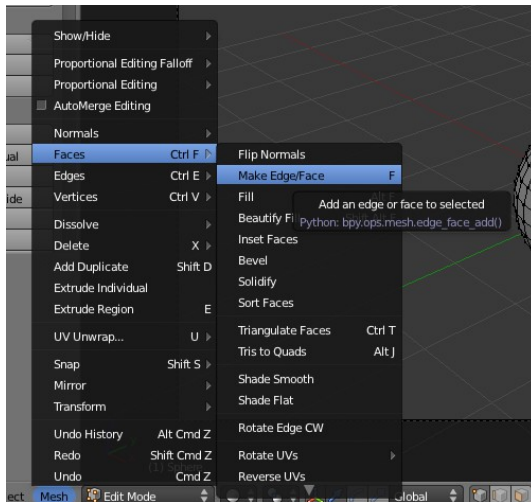


figure 16

➔ Choose Faces → Make Edge/Face or press <F>

The 3D View now shows a “closed” pill (figure 17).

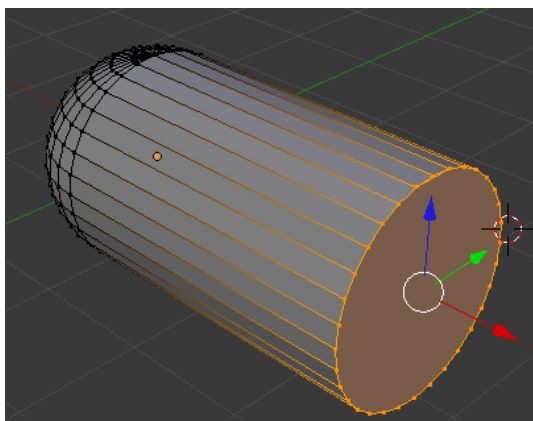


figure 17

➔ Save your work as bc02.01.blend (<Ctrl> + <S>).

The left part of our pill is ready, now we are continuing with the right part.

➔ Press <7> to switch back to the Front View

- ➔ Use <Ctrl> + Scrollwheel in the Front View for moving the pill to the left side of the screen (figure 18).

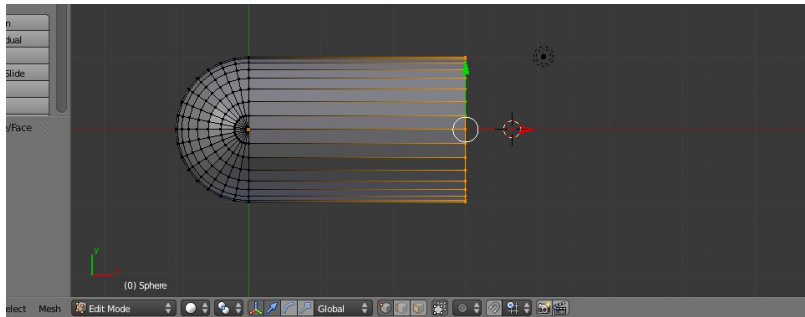


figure 18

- ➔ Press <Tab> for Object Mode.
- ➔ Press <Z> for wireframe viewport shading.
- ➔ Press <Shift> + <D> to duplicate the mesh.
- ➔ Press <Enter> to confirm the duplication.

The pill is now duplicated, but the duplications are still on top of each other.

- ➔ Press <R> for rotate.
- ➔ Type <1> <8> <0> to rotate the half pill 180 degrees and press <Enter>.

There are now two half pills over each other (figure 19).

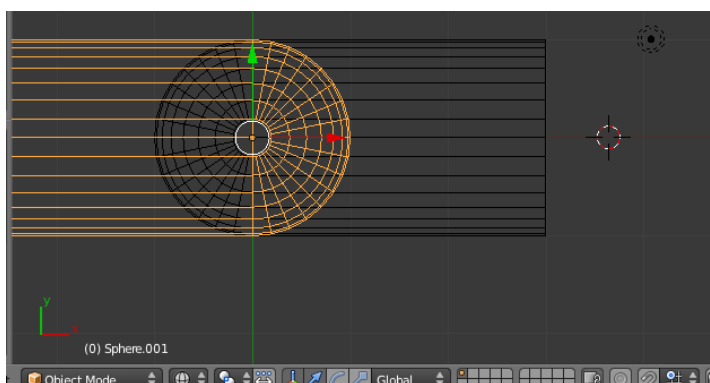


figure 19

➔ Press <G> to move the mesh.

➔ Type <6> and press <Enter>.

The meshes are now tight together (figure 20).

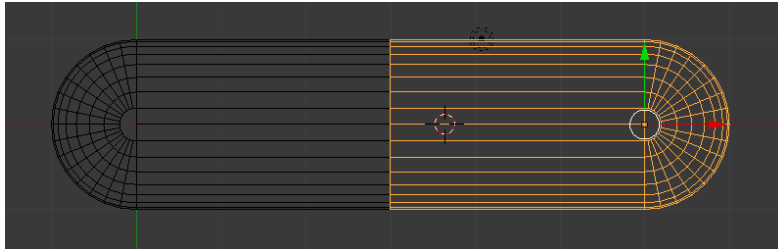


figure 20

Figure 21 shows the red part of the pill is slightly bigger than the white part. We can achieve this by using the scale method.



figure 21

➔ Select the right part of the pill.

➔ Press <S> for scale.

➔ Type <1> <.> <1> and press <Enter>.

The Front View shows the right part bigger than the left one (figure 22). Because of the scaling the two parts overlap each other.

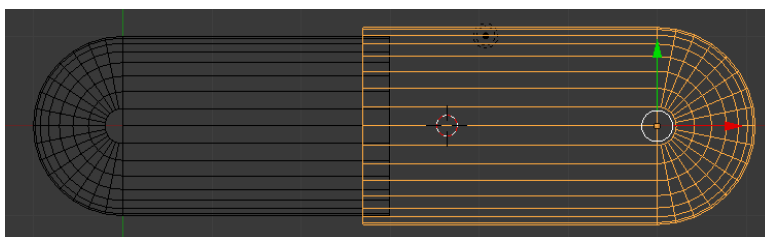


figure 22

- ➔ Press <G> for move.
- ➔ Press <X> to lock the X-axis.
- ➔ Type <0> <. > <3> and press <Enter>.

Materials

Blender uses **materials**. A material describes properties of a material such as colour, reflection, softness and structure. Course 6 describes materials in more detail.

- ➔ Select the right part of the capsule.
- ➔ Press <Ctrl> + <↑> to show the properties panel.
- ➔ Click on the sphere icon for the material tab.

The Material Panel appears (figure 23).

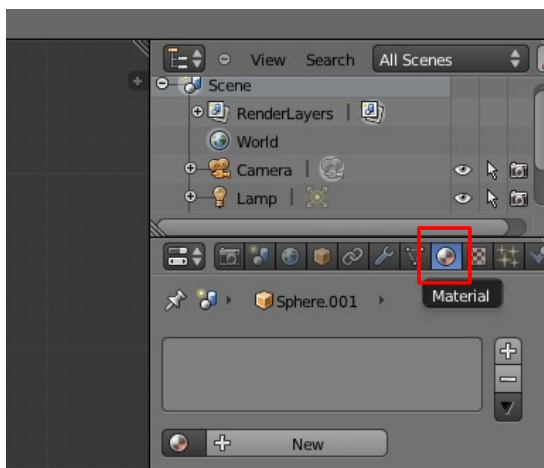


figure 23

- ➔ Click at [+ New] to add a new material.

You have now added a new material. A new panel appear (figure 24).

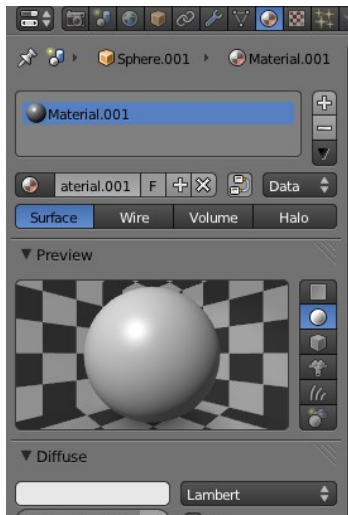


figure 24

The materials preview is shown in the Preview Panel. The colour of this object is grey. The name is "Material.001".

- ➔ Click in the textbox which shows the name (marked red in figure 24) and change Material.001 into Red.

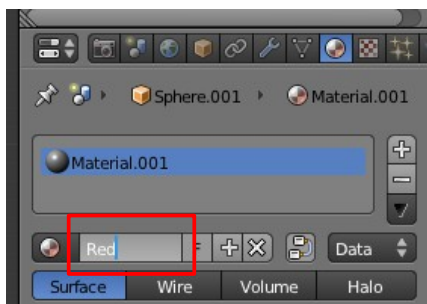


figure 24

Each colour consists of three primitive colours: red, green, blue.

- ➔ Click on the white area under the diffuse header (figure 25).

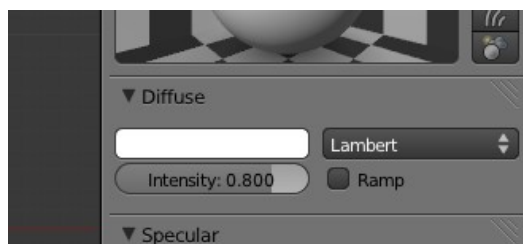


figure 25

A colourpicker pops up (figure 26).

- ➔ Drag the sliders to the following values: R at 1.000, G at 0.000 and B at 0.000.

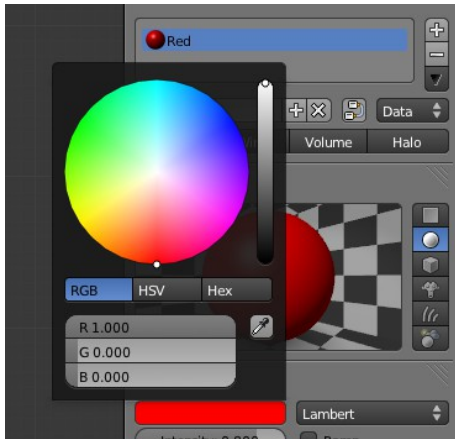


figure 26

- ➔ Now select the left part of the pill and make a material called "White" with the values: R at 1.0, G at 1.0 and B at 1.0.
- ➔ Click on the material panel to close the colourpicker
- ➔ Press <Z> for solid viewport shading

You now see a white and a red part on the pill:

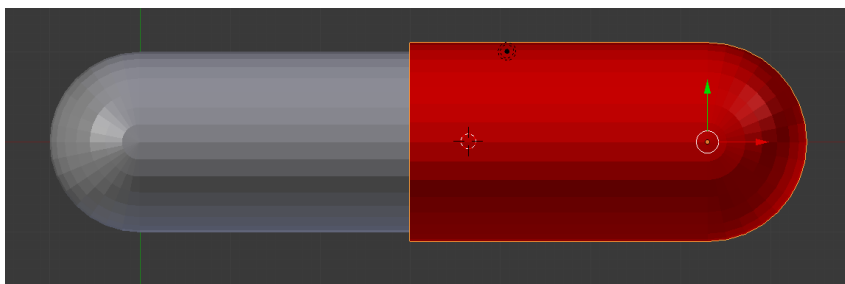


figure 27

- ➔ Press <0> for the Camera View

You see the pill is not centred in the camera.

- ➔ Press <7> for the Top View

- Zoom out so you can see the camera
- Select the camera with the right mousebutton.
- Press <G> to move the camera.
- Move the camera in a so the whole pill is displayed in the Camera View.
- Save your work (<Shift> + <Ctrl> + <S>) as bc02.02.blend
- Press <F12> to render your model. If everything worked out fine the image should look like figure 28.

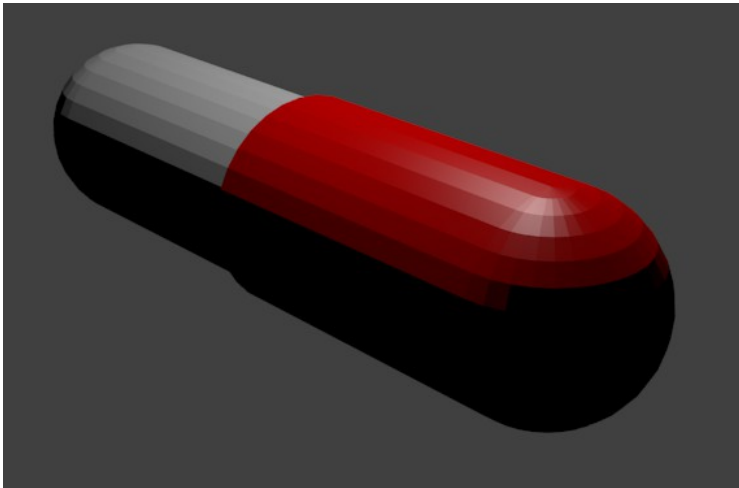


figure 28

Everything looks serrated. Blender has a technique called **smoothing**. This makes your object smoother. The "smoother" your object, the longer it takes to render.

- Select the red part of the pill.
- From the Tools Panel select [Smooth] under the shading header (marked red in figure 29).

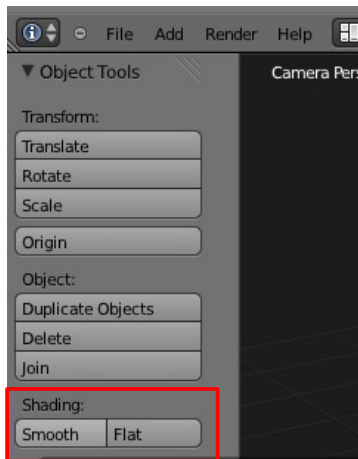


figure 29

➔ Set smooth shading for the white part as well.

➔ Press <F12> to render.

You can see the red part is a lot smoother than the white part (figure 34).

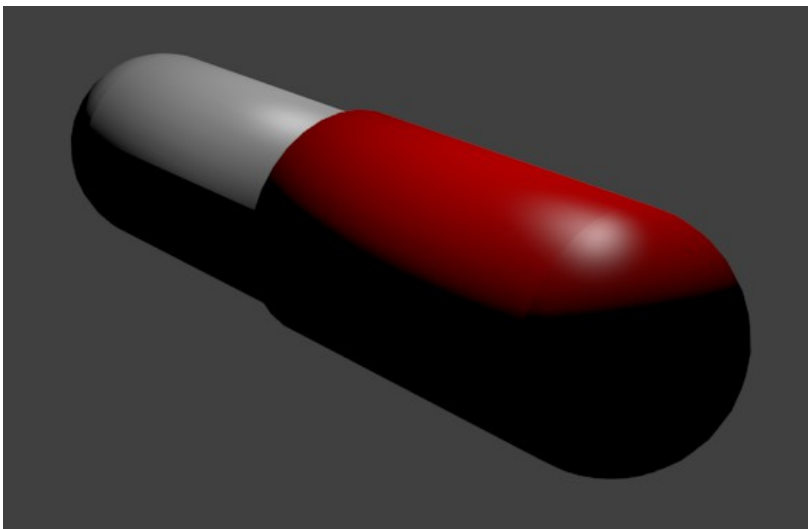


figure 30

➔ Save your work (<Shift> + <Ctrl> + <S>) as bc02.03.blend

The challenge

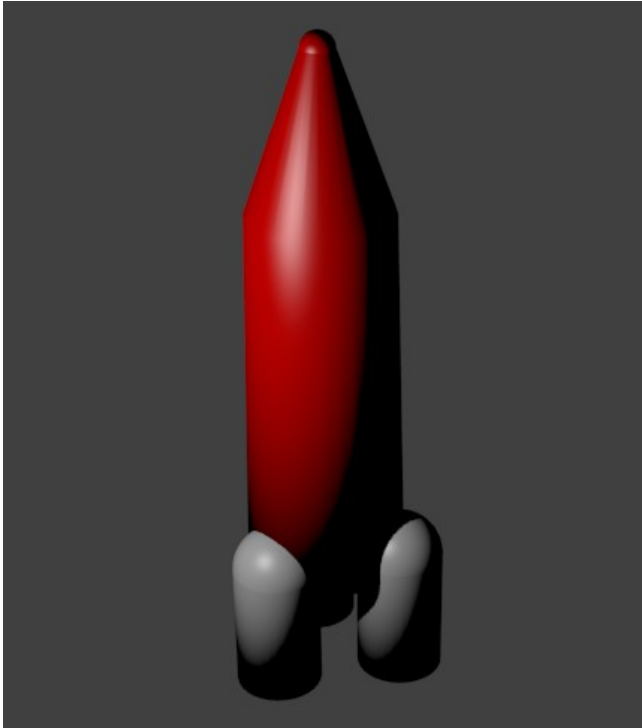


figure 36 – rocket – bc02.04.blend

Skills from this course

- Recognizing basic meshes
- Vertex editing
- “Smooth” objects
- Entering coordinates manually
- Naming and recognising Materials
- Changing the Material colour

Course 3 – Render options

During this course we are going to explore a little bit more of the Scene Panel's possibilities.

Scene Panel

The Scene Panel shows a wide variety of settings regarding the rendering. An example of such a setting is the image size of the final rendered image.

Blender renders frame by frame. If we create a still image only frame 1 is rendered. Animations are sequences of multiple stills. The render engine gets its information from our 3D scene. The more complex the scene the longer it takes to render the image. The same hold for the image size: rendering a 5000x5000 image take a lot more time than a 100x100 image since a lot more pixels needs to be calculated.

We are going to adjust several render setting in order to see their influence on the final render.

- ➔ Open bc02.03.blend (<Ctrl> + <O>) from the previous course.
- ➔ Press <F10> for the "Scene Panel" or click on the camera icon (figure 1).



figure 1

The Scene Panel shows lots of other Panels including: Render, Layers, Dimensions, Shading and Output.

→ Uncheck the [Anti-aliasing] checkbox, if this one was enabled.

→ Press <F12>.

Watch closely to the border between the red and the white part of the pill (marked red in figure 2). This border looks serrated.

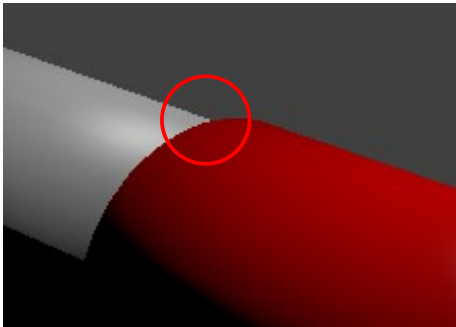


figure 2

Blender can apply a technique which is called **anti-aliasing**. This makes the edges of our meshes look a lot smoother. Sometimes this technique is called **oversampling (OSA)**.

Below the [Anti-aliasing] checkbox are several other buttons: [5], [8], [11] and [16] (figure 3). These buttons are the grade of anti-aliasing. Keep in mind: the higher the number, the slower the rendering process.

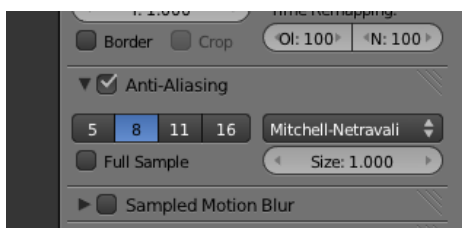


figure 3

→ Check the [Anti-aliasing] checkbox and [8] to enable both (figure 3).

→ Press <F12>.

The result (figure 4) is smoother borders than figure 2.



figure 4

The render of the previous exercises are rendered at 960 by 540 pixels (50% of 1920x1080). This size can be adjusted in the "Dimensions Panel" (figure 5).

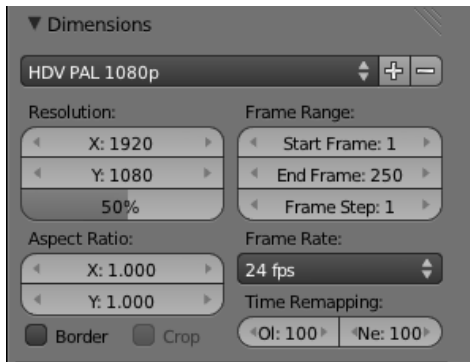


figure 5

➔ Change 1920 into 1024 and press <Enter>.

➔ Change 1080 into 768 and press <Enter>.

Image sizes

Although you can select any size for your image, Blender has some predefined images sizes. From the list shown in figure 6 you can pick predefined sizes.

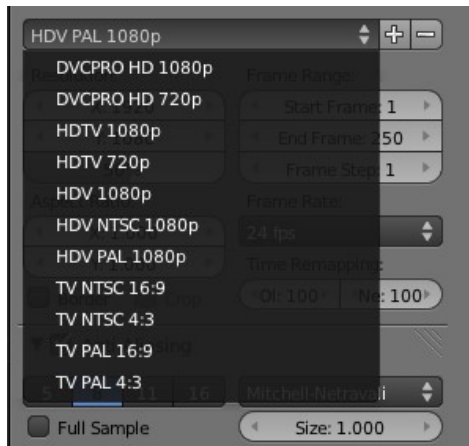


figure 6

➔ Press <F12> to render the scene.

Sometimes you want to make a test render to see the final result. In this situation you don't want to render the full image size all the time. For this reason Blender has a slider which represents the percentage of the full image size to render (figure 7).

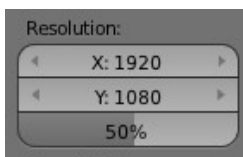


figure 7

➔ Slide the slide to 25%

➔ Press <F12>.

Now you can see your image rendered at 25% of the original format.

Till now we have rendered images, but not stored them on the hard disk. Blender can render images in various formats like JPEG, PNG and BMP.

The image format can be set in the Output Panel (figure 8).

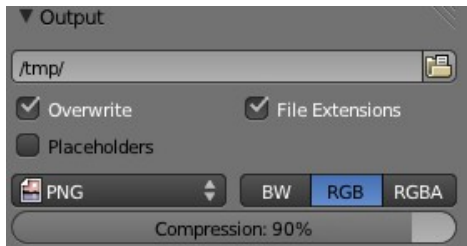


figure 8

- ➔ Press <F11> to show the last rendered image.
- ➔ Press <F3> to save your rendered image or select Image → Save As Image from the 3D view toolbar (figure 9).

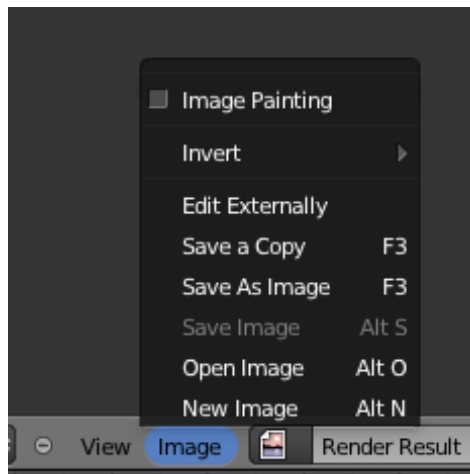


figure 9

The 3D View changes into a File Panel.

- ➔ Type "capsule.png" as filename (figure 10).

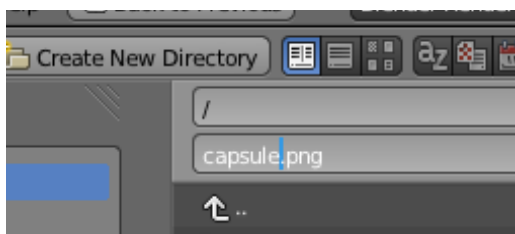


figure 10

- ➔ Click on [Save As Image] (figure 11).

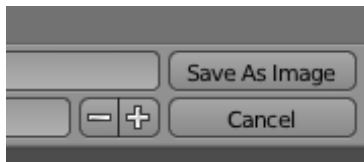


figure 11

The image is saved as "capsule.png".

Sometimes you want to print some meta data within the image. In order to achieve this we use the "Stamp Panel" as shown in figure 12.

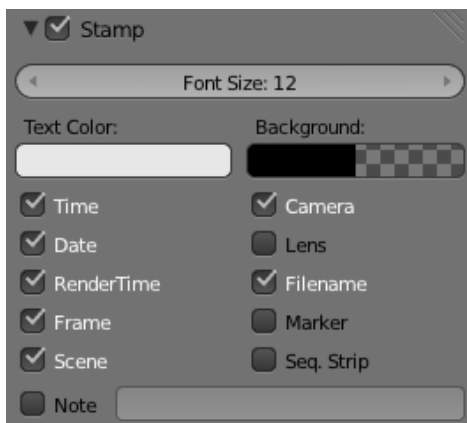


figure 12

In the Stamp Panel you can select all the information you want to be rendered over your image as well as the font, font size and colour.

- ➔ Check the [Stamp] checkbox.
- ➔ Press <F12> to render the image.

As shown in figure 13, all the metadata is printed over the image.

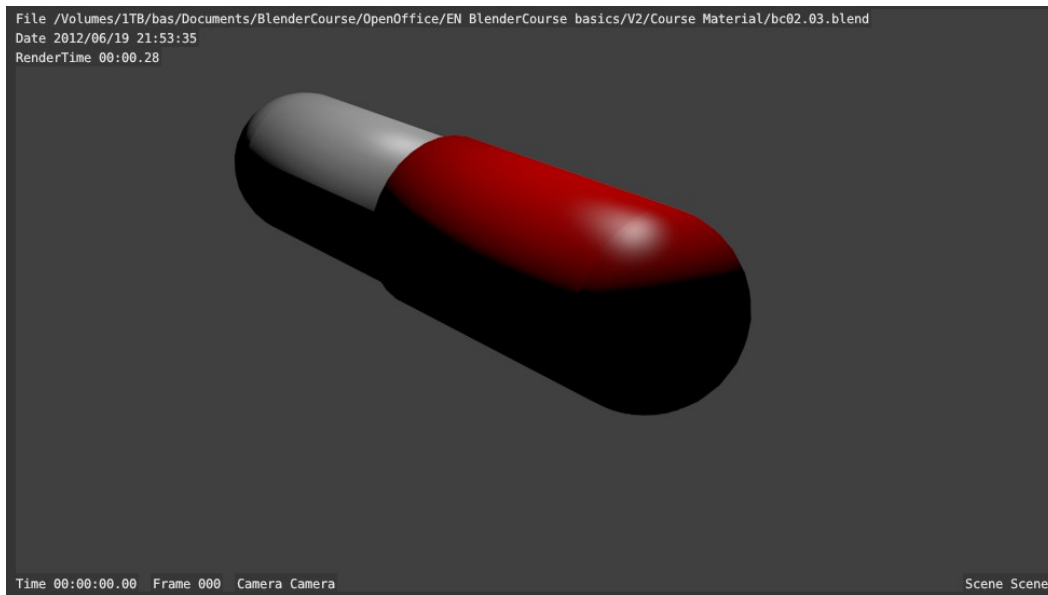


figure 13

Skills from this course

- Change image size
- Change the amount of anti-aliasing
- Save your rendered image as a PNG file
- Print metadata on top of the image

Course 4 - Proportional Editing

This chapter teaches you how to create a mountain scenery with the Proportional Editing technique.

- ➔ Start Blender with a new scene.
- ➔ Erase the cube (select with the right mousebutton, press <X> and choose [Delete]).

Now our scene only contains a lamp and a camera.

- ➔ Press <7> for Top View
- ➔ Press <Spacebar> type "plane" as shown in figure 1.

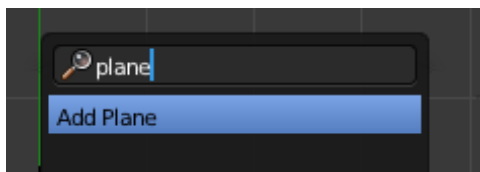


figure 1

- ➔ Press <Enter> to add the primitive Plane to your scene.
- ➔ Press <0> for Camera View. You now see a flat surface as shown in figure 2.

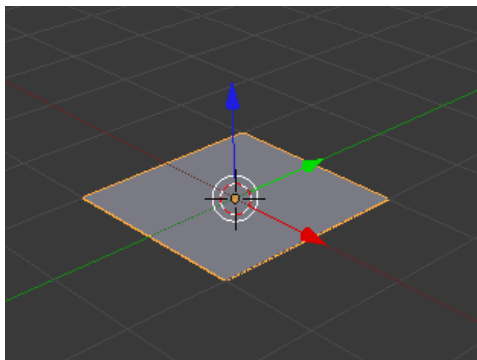


figure 2

- ➔ Press <S> to scale the Plane.

- Type <1><0> to scale the Plane times and press <Enter> (figure 3).

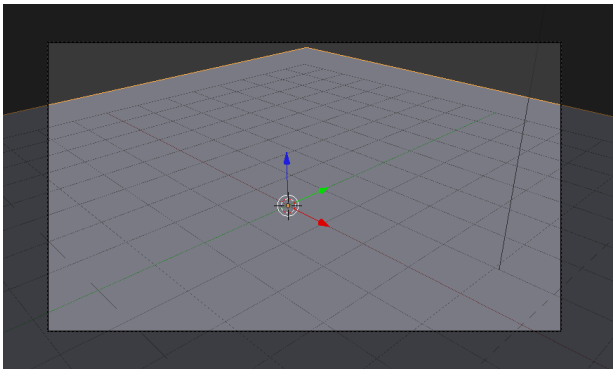


figure 3

- Press <7> for Top View
- Zoom the Top View till the whole Plane covers the view (<Scrl> downwards).
- Press <5> for Orthographic Perspective
- Press <Tab> for Edit Mode

The Plane consists out of four vertices (one on each corner).

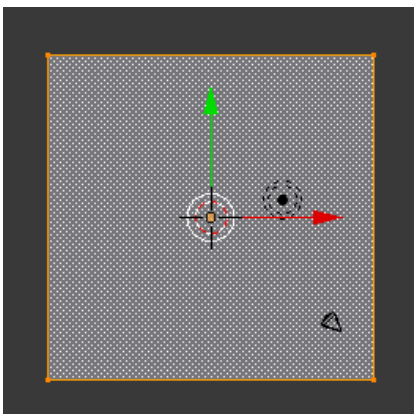


figure 4

On the left of the 3D view is a panel called "Mesh Tools". This panel contains a button called "Subdivide" (marked red in figure 5). This divides the mesh.

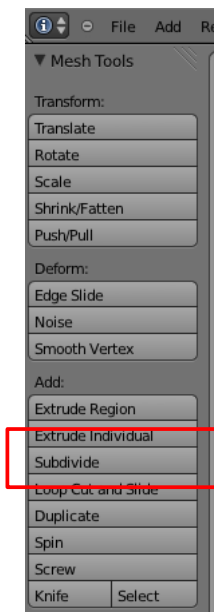


figure 5

➔ Press the button once and see what happens to the Plane.

The Plane is now splitted and consists out of nine vertices as shown in figure 6.

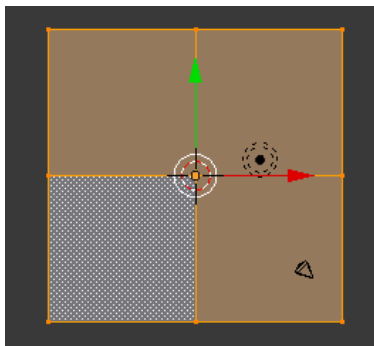


figure 6

➔ Click 3 more times on [Subdivide].

The Plane now consists out of a lot of vertices (figure 7).

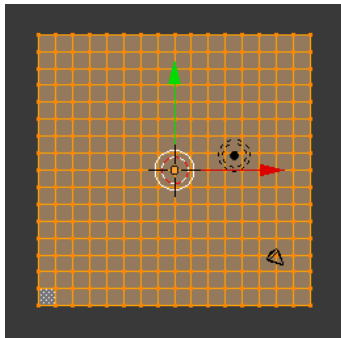


figure 7

We are about to enable Proportional Editing.

- ➔ In the 3D View menu bar click at the circle and choose [Enable] (figure 8).

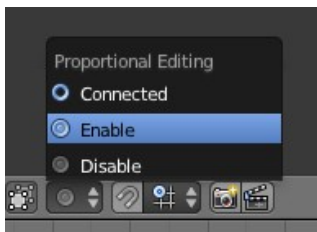


figure 8

The short key for **Proportional Editing** is <O> in Edit Mode.

- ➔ Press <A> to deselect all vertices.
- ➔ Select (with the right mousebutton) the vertex shown in figure 9 (4th from left and 4th from the top).

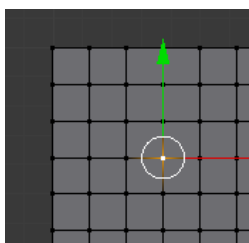


figure 9

- ➔ Press <1> for the Front View

➔ Press <G> for move and <Z> to lock the Z-axis.

➔ Move the mouse upwards.

You will notice the mountain is very sharp instead of smooth (figure 10).



figure 10

➔ Press <Esc> to cancel the movement.

Figure 10 shows a white circle at the initial location of the vertex. The vertices within this circle will be stretched in the direction of the moving vertex.

➔ Press <G> again and press <Z> to lock the Z-axis.

➔ Move the vertex up again.

➔ Do not confirm the movement yet, first press <Page-Up> 10 times or <Scrollwheel> Up.

<Page-Up> increases the radius. The bigger the radius the more vertices will follow the movement.

➔ Click to confirm the movement.

The mountain now looks like figure 11.

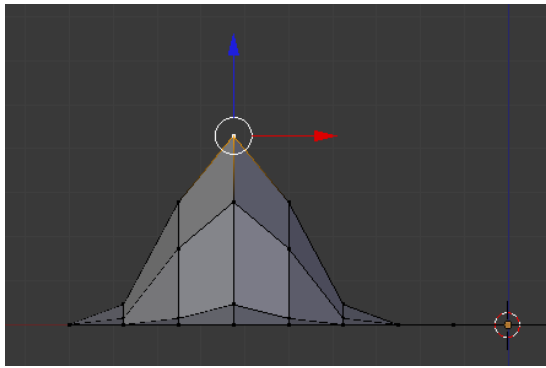


figure 11

- ➔ Press <Tab> for Object Mode.
- ➔ Select the Camera
- ➔ Press <G> for move and <Z> to lock the Z-axis. Move the camera until the mountain fits the camera (Use <0> to switch to Camera View and back to the Front View).
- ➔ Save your work (<Shift> + <Ctrl> + <S>) as bc04.01.blend
- ➔ Press <F12> to render the image.

The result should look like figure 12. You will notice the angular look of the mountain. This is what we are going to change with the "subsurf" technique.



figure 12

Proportional Edit Falloff

There are different ways of creating the “mountain”. The button right from the button to enable Proportional Editing shows an icon of a sharp chart (figure 13). When clicking this button a list appears in which you can set the way the vertices are reacting to the movement of one vertex.

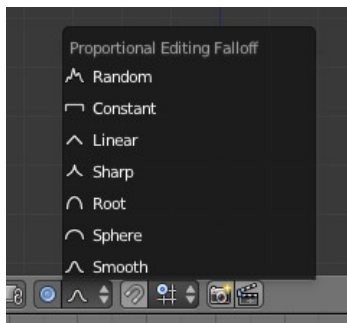


figure 13

SubSurf

SubSurf means Subdivisions Surface. Remember: the more divisions the smoother the surface. You can specify the amount of divisions. With this you can control the smoothness of the final result.

- ➔ Select our “mountain”
- ➔ On the Properties Panel select the tab with the wrench image (figure 14).



figure 14

- ➔ Click on [Add modifier] and choose [Subdivision Surface] (marked red in figure 15).

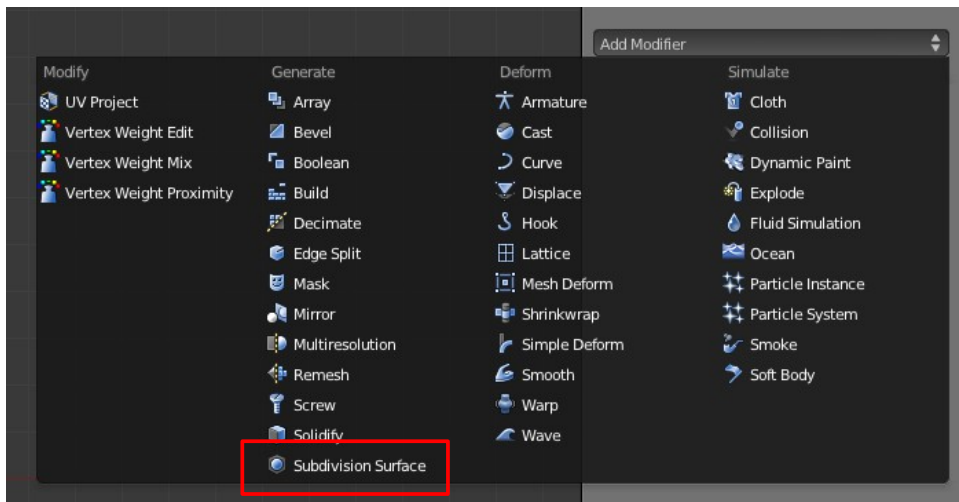


figure 15

- ➔ Watch carefully to the effect of the SubSurf modifier. Figure 16 is without SubSurf, while figure 17 uses SubSurf.

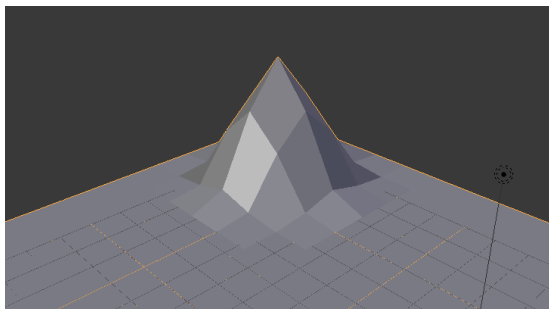


figure 16

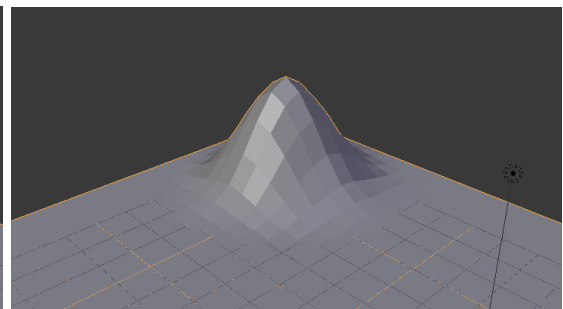


figure 17

Subdivision level

The SubSurf modifier panels shows two kind of levels (figure 18). The "Views" means the subdivision level shown in the views, the "Render" means the subdivision level during render time. For a good result during render time it is recommended to keep the "Views" low and only adjust the "Render". This makes working in the view easier and faster. Keep in mind: the higher the "Render" the longer the render process takes.

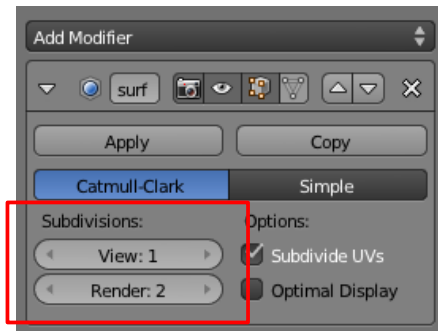


figure 18

- ➔ Adjust the Render Levels to 4.
- ➔ Press <F12> to render the scene.

Your mountain should look a lot smoother (figure 19).

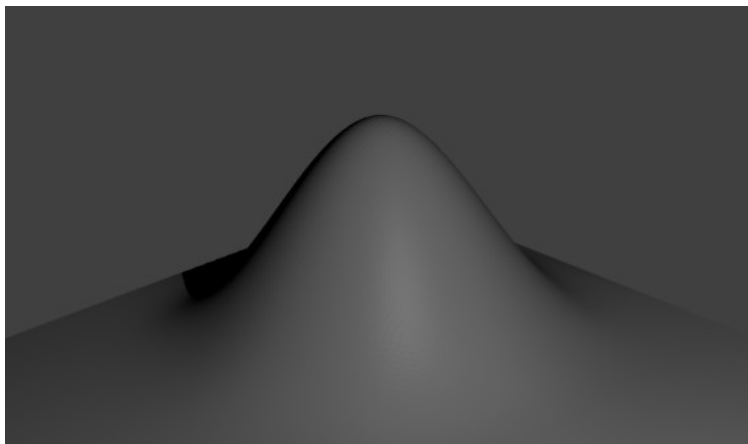


figure 19

- ➔ Save your work (<Shift> + <Ctrl> + <S>) as bc04.02.blend
- ➔ Press <Tab> for Edit Mode.
- ➔ Now you can move several other vertices in order to create a mountain scenery. Experiment with changing the radius with <Page-Up> and <Page-Down>. Keep in mind if the mountains after rendering don't look smooth you increase the "Render" value of the SubSurf modifier.

Figure 20 shows an example of a possible result for the previous exercise.

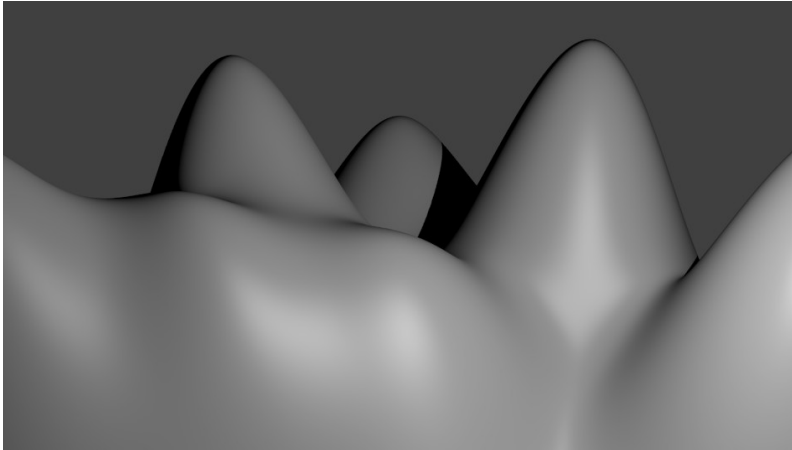


figure 20

➔ Save the result (<Shift> + <Ctrl> + <S>) as bc04.03.blend

The Challenge

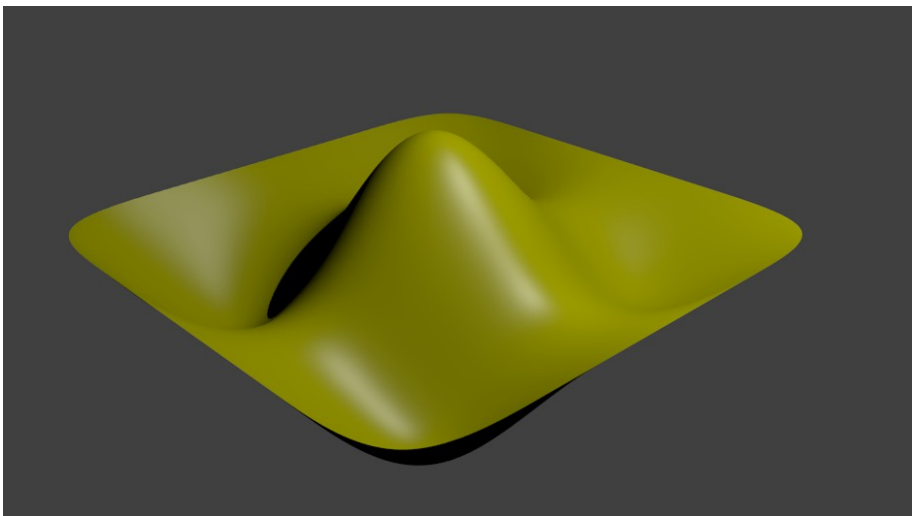


figure 21 – scale – bc04.04.blend

Skills from this course

- Using the SubSurf modifier
- Changing the number of divisions of the SubSurf modifier
- Proportional Editing

Course 5 - Curves

A chair out of Curves

Blender has the ability to model with curves. These curves can be quite handy when creating organic shapes like a round vase or tree leaves.

Blender contains two types of curves: Bezier and NURBS. This course focuses on the Bezier Curves.

- ➔ Start a new scene (<Ctrl> + <N>).
- ➔ Erase the cube (select the cube with the right mousebutton. Press <X> and choose [Delete]).
- ➔ Press <7> for Top View.
- ➔ Press <5> for Orthographic Perspective.
- ➔ Choose Add → Curve → Bezier (figure 1).

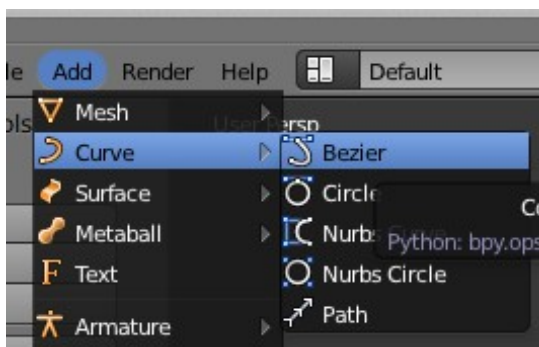


figure 1

- ➔ Zoom in till the curve fits the screen.

Bezier Curve

The front view now shows a **Bezier Curve**. This curve has a couple of anchor points. Each of them has two handles; these handles are used to bend the curve.

- ➔ Press <Tab> for Edit Mode.
- ➔ Select the left anchor point with the right mousebutton (figure 2).

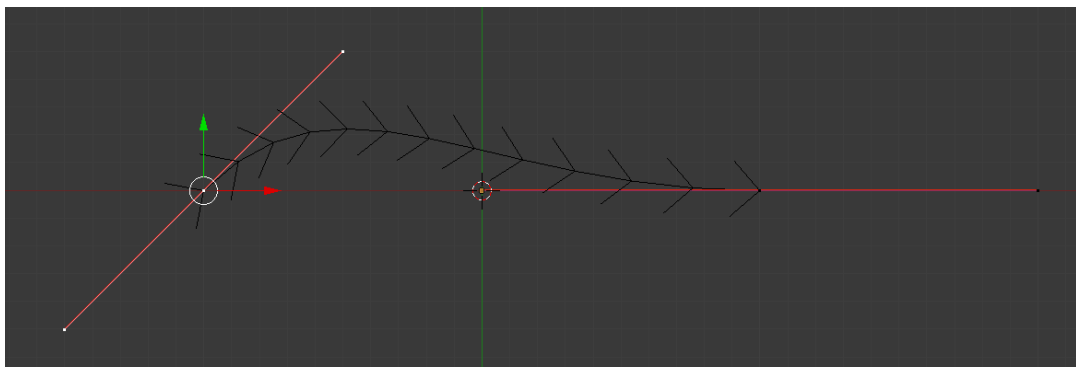


figure 2

- ➔ Press <G> to move this anchor point and <Y> to lock the Y-axis.

Notice how the curve reacts on the movement.

- ➔ Type <1> and confirm the movement with <Enter>.

The curve is now moved upwards (figure 3).



figure 3

- ➔ Centre the curve in the viewport with <Shift> + <ScrL>.
- ➔ Select the upper handle (marked red in figure 3).
- ➔ Press <G> to move and <Y> to lock the Y-axis.
- ➔ Type <-> <2> and press <Enter>.

The side view shows the seat of the chair (figure 4).

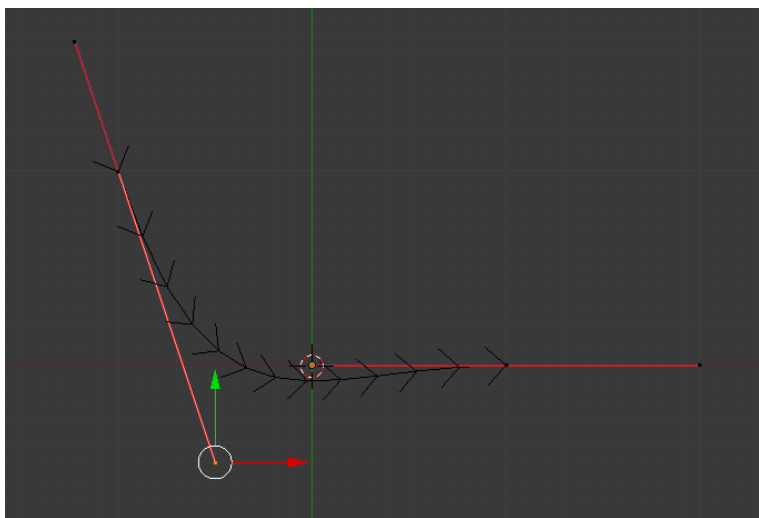


figure 4

- ➔ Save your work (<Ctrl> + <S>) as bc05.01.blend
- ➔ Press <Tab> to return to Object Mode.

Convert to mesh

Our curve is just a simple line. We like the seat to have some more depth. In order to do this, we have to convert our curve into a mesh.

- ➔ Choose in the view bar Object → Convert To → Mesh from Curve/Meta/Surf/Text or press <Alt> + <C> (figure 5).

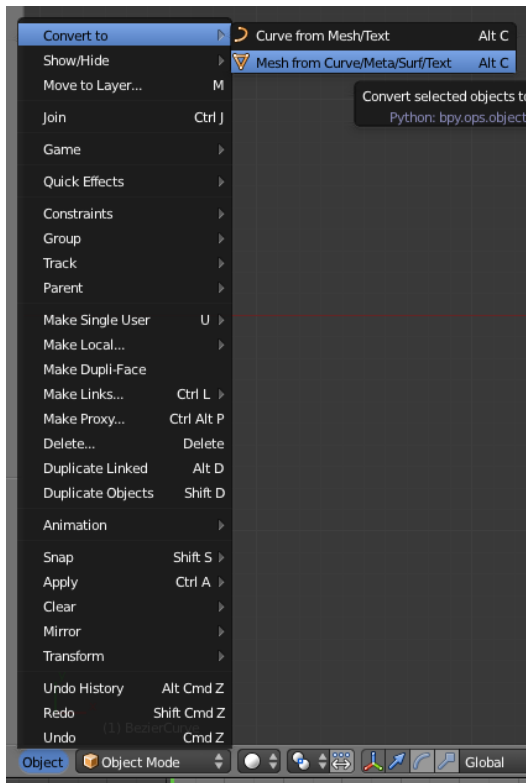


figure 5

Your curve is now converted into a mesh.

- ➔ Press <R> to rotate and <X> to lock the X-axis.
- ➔ Press <9> and <0>
- ➔ Press <Enter> to confirm the rotation
- ➔ Press <Tab> for Edit Mode.
- ➔ Press <A> to select all vertices.
- ➔ Press <E> for extrude.
- ➔ Press <Y> to lock the Y-axis.
- ➔ Type <1> and press <Enter>.

The seat now becomes 3D (figure 6).

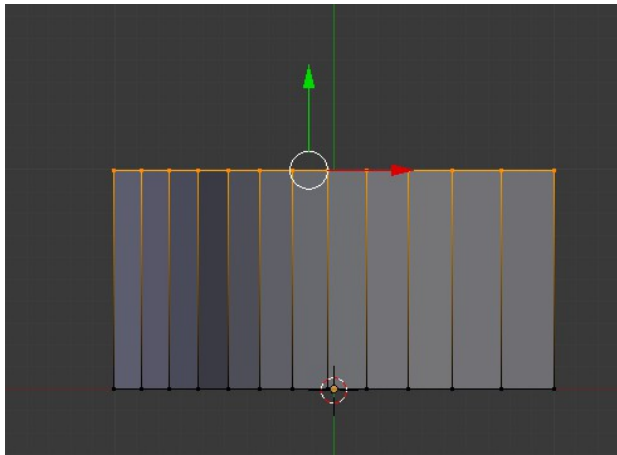


figure 6

- ➔ Press <0> for Camera View.
- ➔ In the Camera View zoom in till the chair fits the viewport (figure 10).

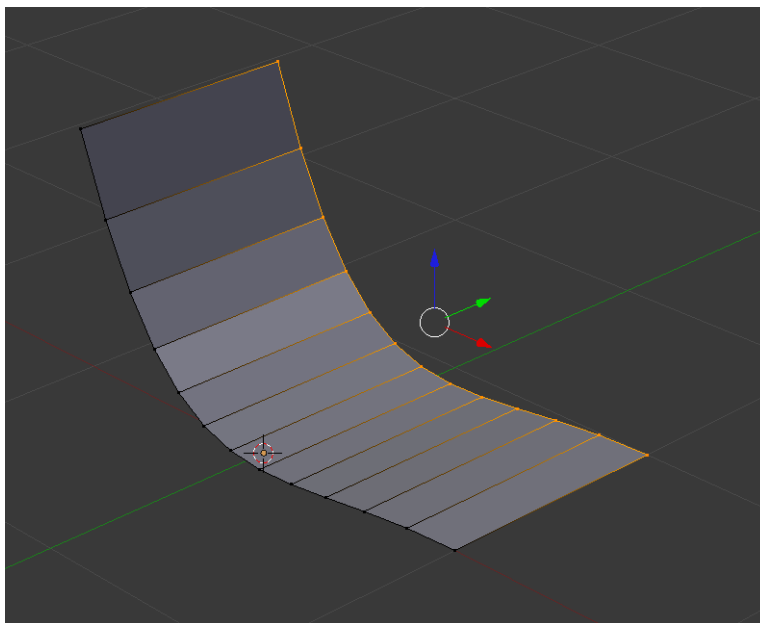


figure 7

The seat looks a little bit crude.

- ➔ Press <Tab> for Object Mode.
- ➔ Press [Smooth] in the Shading Panel (marked red in figure 8).

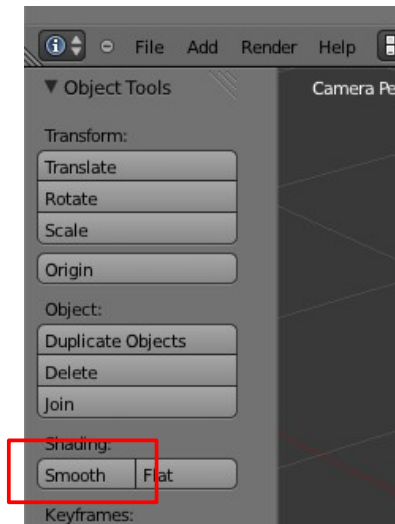


figure 8

Now you can see the seat having a smooth surface (figure 9).

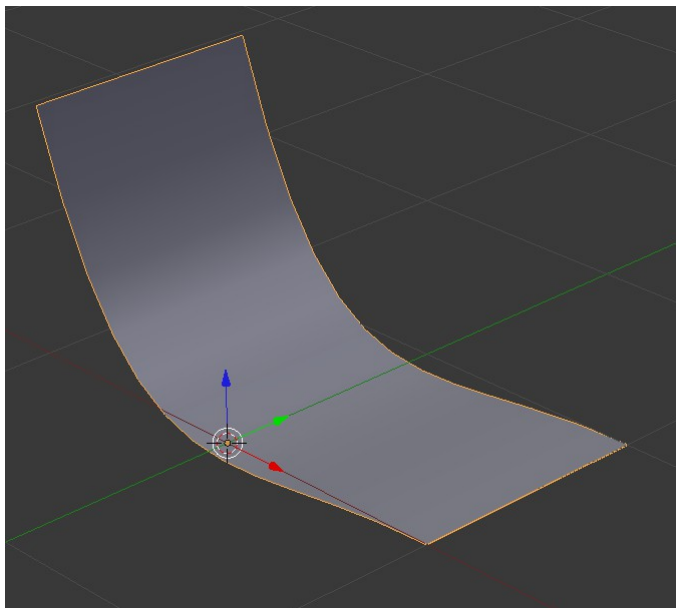


figure 9

- ➔ Press <F12> to see the result.
- ➔ Press <Tab> for Edit Mode.
- ➔ Press <A> to select all vertices.
- ➔ Press <E> to extract the mesh.
- ➔ Press <Z> in order to lock the Z-axis.

➔ Type <-><0><.><1>.

Now the seat got also depth (figure 10).

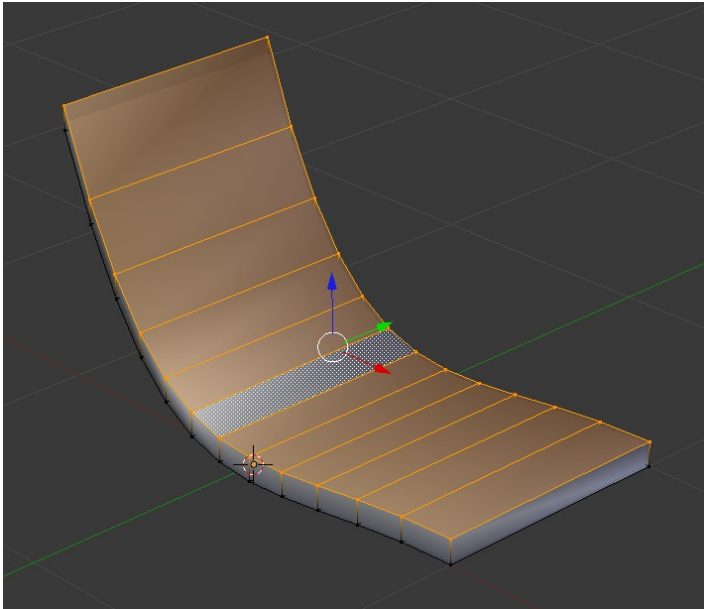


figure 10

➔ Save your work (<Ctrl> + <S>) as bc05.02.blend

➔ Press <Tab> for Object Mode.

➔ Press <1> for Front View.

➔ Choose Add → Curve → Bezier

➔ Press <R> for rotate and <X> to lock the X-axis.

➔ Type <9><0> and press <Enter>.

➔ Press <Tab> for Edit Mode.

➔ Select the leftmost handle (marked red in figure 11).

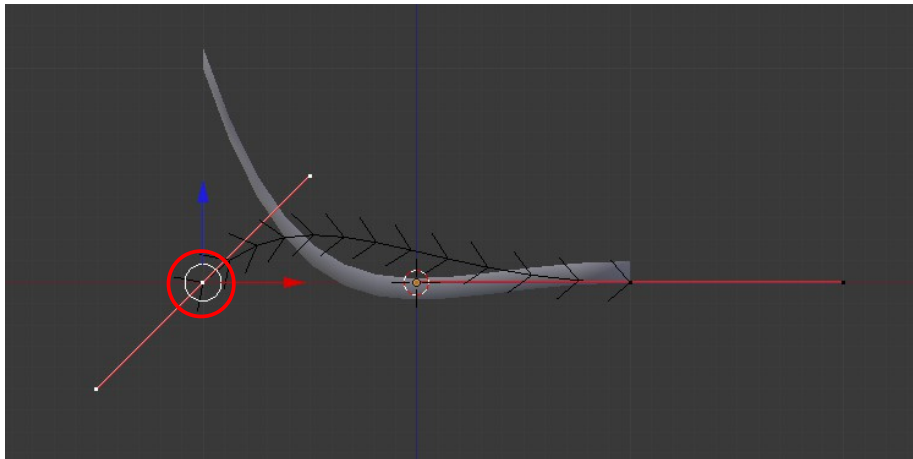


figure 11

- ➔ Press <G> for move and <X> to lock the X-axis.
- ➔ Move the selected handle until it touches the side of the seat (figure 12)
- ➔ Click with the left mousebutton in order to confirm the movement.

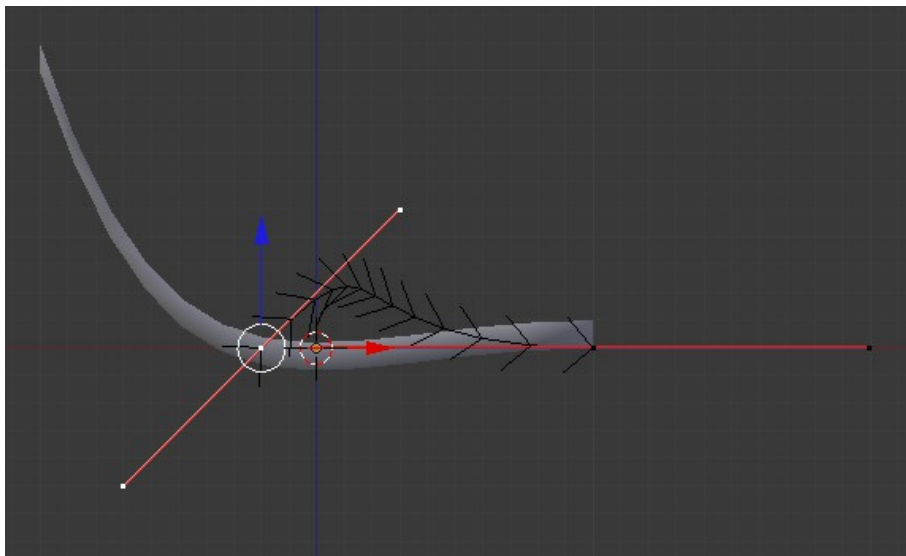


figure 12

- ➔ Press <R> for rotate.
- ➔ Type <1><8><0> and press <Enter>.

After rotation the curve should look like figure 13.

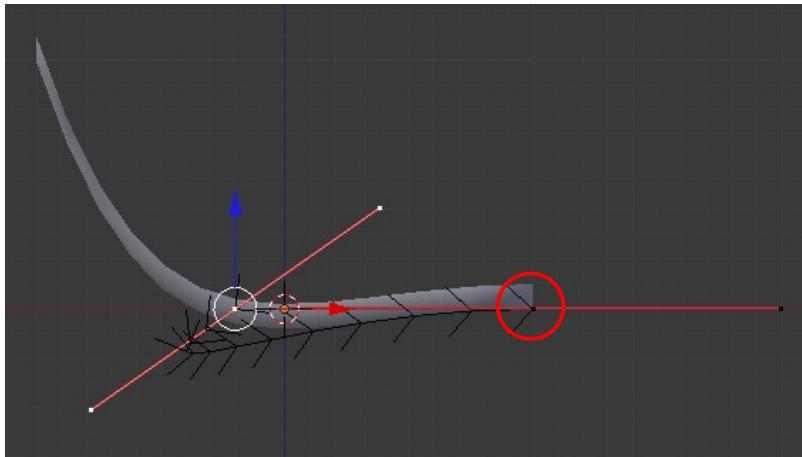


figure 13

- ➔ Select with the right mousebutton the most right handle (marked red in figure 13).
- ➔ Press <G> for move. Move the handle to the position marked red in figure 14.

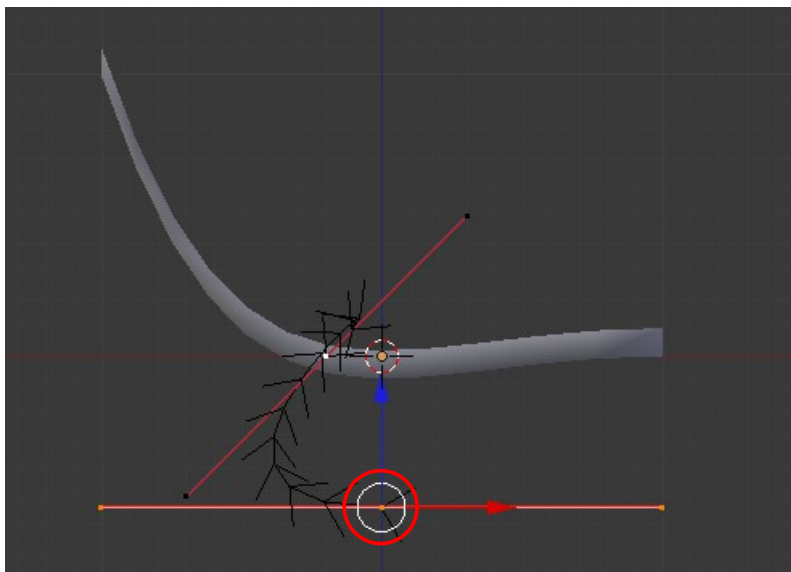


figure 14

Our curve is a little bit too short. This is not a problem. Blender can extend curves with as much anchor points as you like.

- ➔ Hold <Ctrl> and click (with the left mousebutton) on the spot marked red in figure 15.

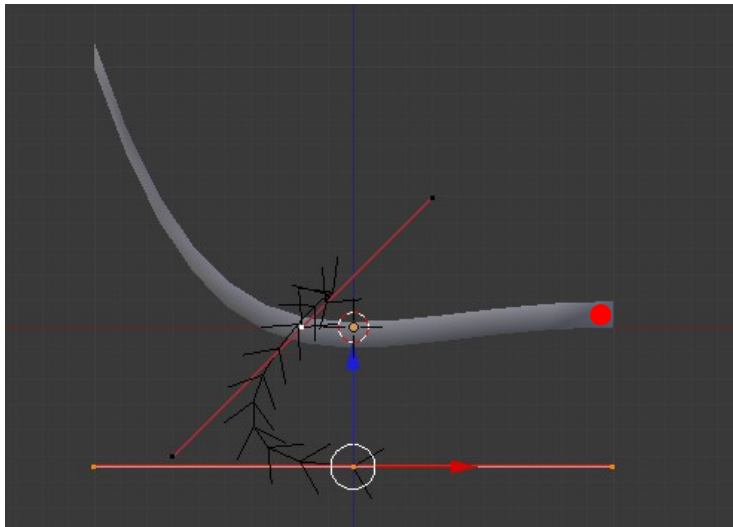


figure 15

The curve has a new anchor point. (figure 16).

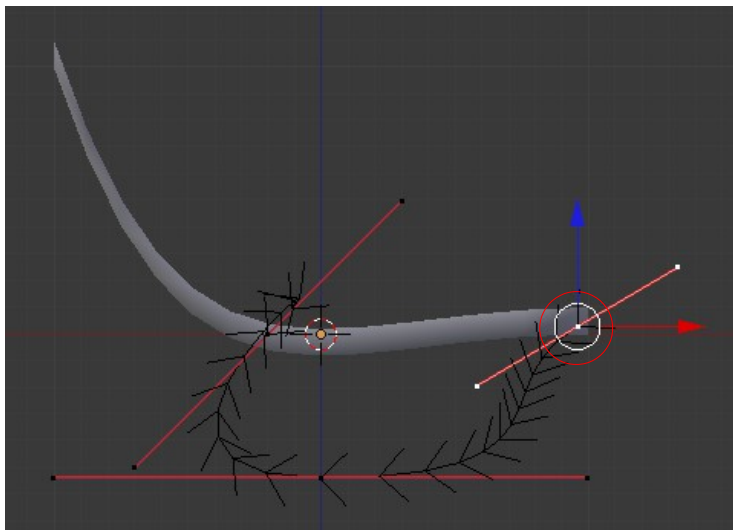


figure 16

- ➔ Select (with the right mousebutton) the handle which is marked red in figure 16.
- ➔ Press <R> for rotate.
- ➔ Type <-><1><0><0> and press <Enter>.

Your chair should look like figure 17.

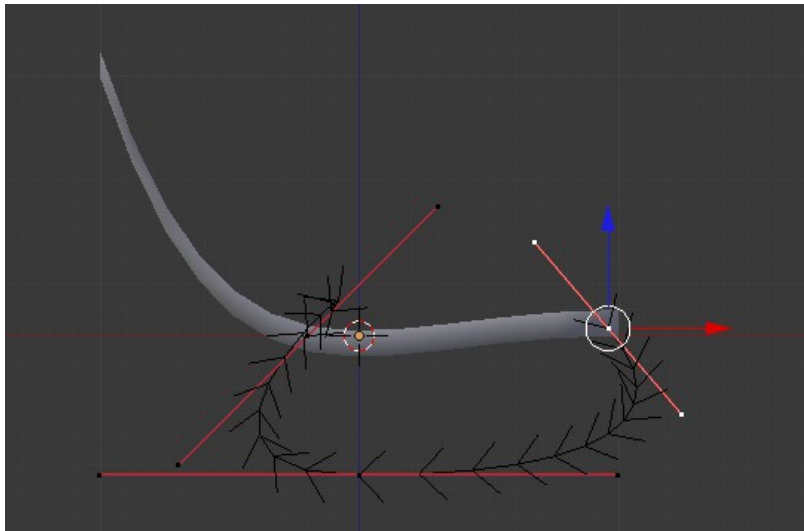


figure 17

- ➔ Press <Tab> for Object Mode.
- ➔ Save your work (<Shift> + <Ctrl> + <S>) as bc05.03.blend
- ➔ Choose Add → Curve → Circle (figure 18).

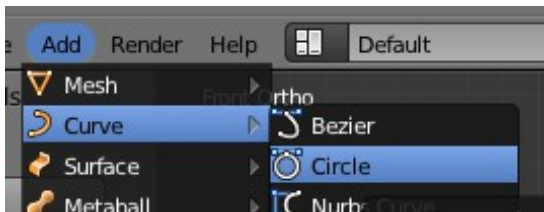


figure 18

- ➔ Press <0> for Camera View.

This circle is far too large (figure 19).

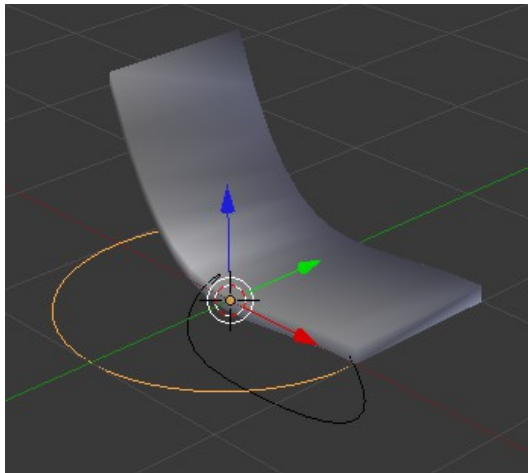


figure 19

- ➔ Press <S> for scaling.
- ➔ Type <0><. ><0><6> and press <Enter> to confirm.

The bottom left of the 3D View shows the name of our circle: "BezierCircle" (figure 20).

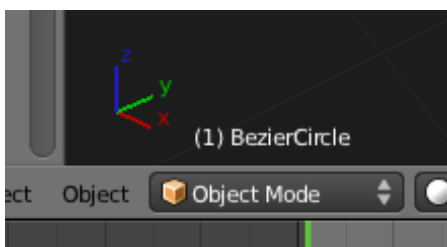


figure 20

- ➔ Select our first curve with the right mousebutton.
- ➔ Open the Object Data Panel (figure 21)



figure 21

- ➔ On the Geometry section select "BezierCircle" from the Bevel Object dropdown list (figure 22).

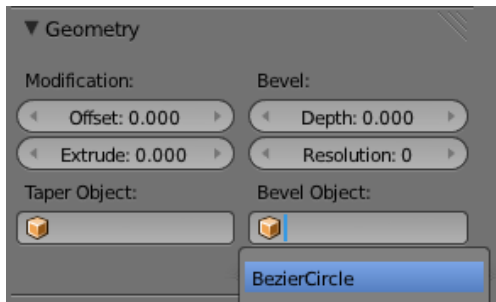


figure 22

The circle now follows our curve which makes it look like a hollow tube (figure 23).

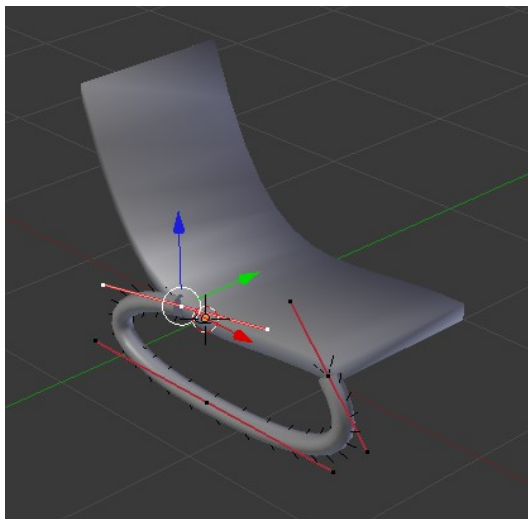


figure 23

- ➔ In the Top View (<7>) zoom in till the chair fills the view.
- ➔ Select the CurveCircle.
- ➔ Press <S> for scale. Notice what happened (the tube is also scaled!).
- ➔ Press <7> for Top View
- ➔ Press <Shift> + <D> (duplicate).
- ➔ Press <Y> to lock the Y-axis.
- ➔ Type <1> and press <Enter>.

The chair now has two supporting tubes (figure 24).

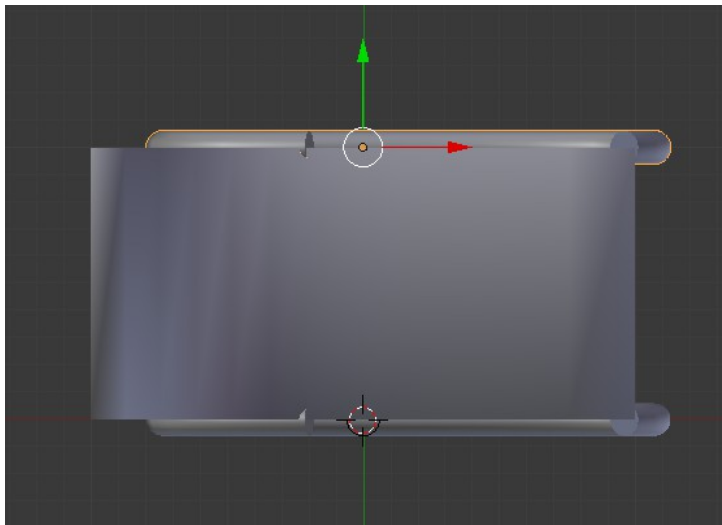


figure 24

- ➔ Press <3> for Right View.
- ➔ Press <R> for rotate.
- ➔ Type <-><1><5> and press <Enter>
- ➔ Select the other tube
- ➔ Press <R> for rotate.
- ➔ Type <1><5> and press <Enter>
- ➔ Press <F12> to render the chair.

If we look closely to the chair we still see our CurveCircle. It is not possible to just delete the circle. If we do, the curve does not know the bevel object anymore.

- ➔ Select the BezierCircle from the Outliner Panel (figure 25)

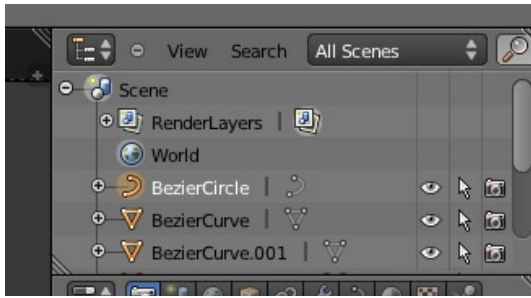


figure 25

- ➔ Click on BezierCircle with the right mousebutton
- ➔ Select [Delete] from the menu

Finally we scale up our chair because it appears a little bit small.

- ➔ Press <3> for the Right View
- ➔ Select the two supporting tubes by holding <Shift> during the selection.
- ➔ Press <S> for scale and <Y> to lock the Y-axis.
- ➔ Type <0><.><8> and press <Enter> to confirm.
- ➔ Press <F12> again to render.

The result is a screen filling chair (figure 26).

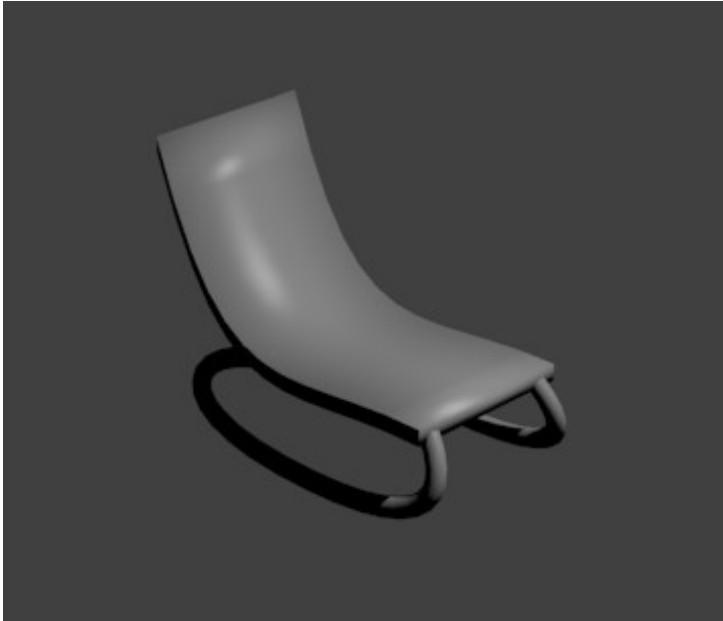


figure 26

➔ Save your work (<Shift> + <Ctrl> + <S>) as bc05.04.blend

The challenge

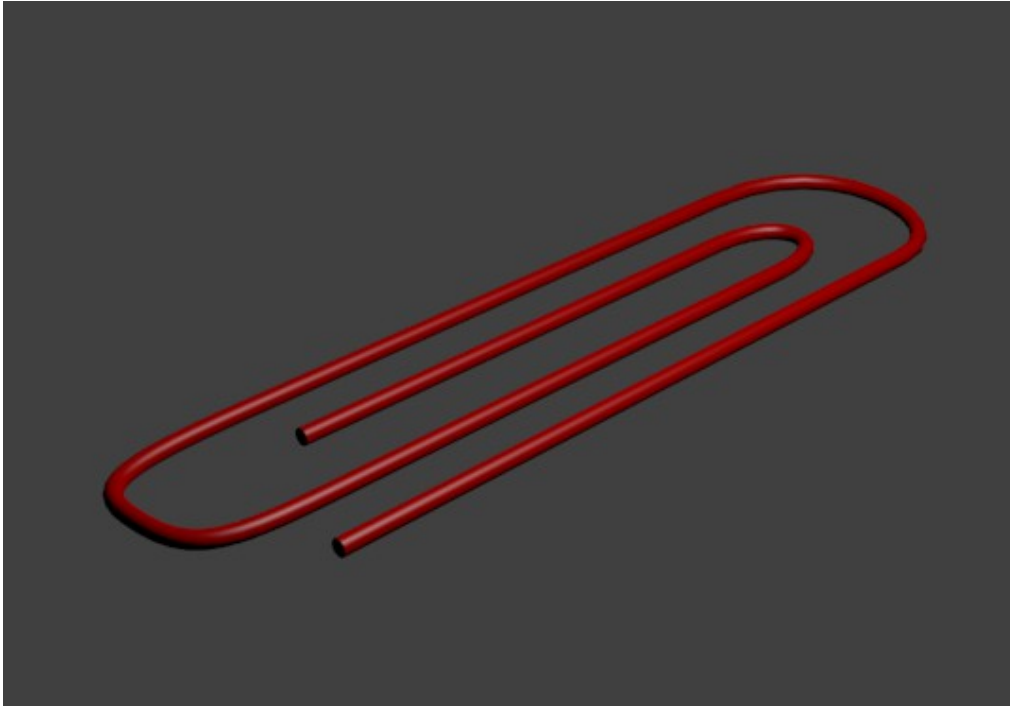


figure 27 – paperclip – bc04.05.blend

Skills from this course

- Smoothing meshes
- Creating Bezier Curves
- Adding anchor point to a curve
- Beveling curves
- Converting a curve into a mesh

Course 6 – Materials and Textures

In course 2 we applied different colours to the pill by using “materials”. This chapter shows how we can change material properties.

- ➔ Start a new scene (<Ctrl> + <N>).
- ➔ Select the cube and delete it from the scene (<X> → [Delete]).
- ➔ In the Top View (top left) press <Spacebar> and type: Uvsphere.
- ➔ Select Uvsphere from the list.

The centre of your scene now contains a sphere. We are about to smooth this sphere and add a material.

- ➔ Choose [Smooth] from the Object Tools Panel (marked red in figure 1).

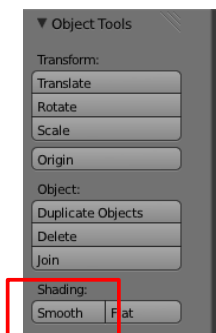


figure 1

- ➔ Open the Material Panel (figure 2).

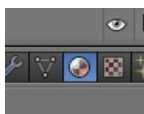


figure 2

- ➔ Press [New] to add a new material to the sphere.

- ➔ Name the material "YellowPlastic" (marked red in figure 3).

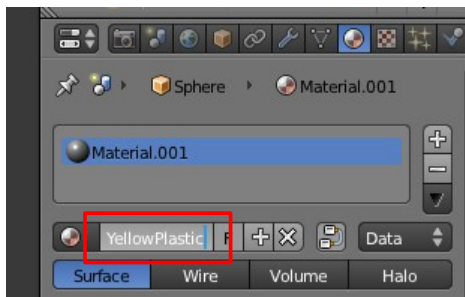


figure 3

RGBA colours

Every colour is built out of the colours Red, Green and Blue. In Blender you can specify a value for each colour. This value should be between 0.000 and 1.000. Besides R, G and B, beside these three, there is a fourth value affecting colours. This value is the Alpha value. This value means the degree of transparency. 1.000 means opaque, 0.500 means 50% transparent.

You will find the Alpha value under the "transparency" section.

There are three ways to specify a colour value: typing (click on a value while holding <Shift>), sliders (slide the slider) or click on a colour (a colour pick dialog appears).

- ➔ Adjust the YellowPlastic Diffuse colour values to R: 1.000, G: 1.000 and B: 0.000 (figure 4).

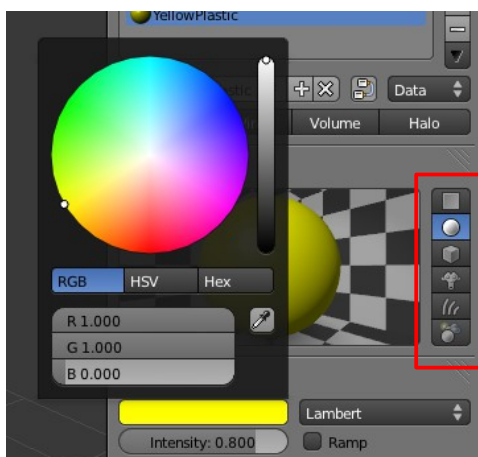


figure 4

The "Preview" Panel shows an example of your material. The six buttons (marked red in figure 4) specify which object is shown in the Preview Panel.

➔ Press <F12> to render our scene (figure 5).

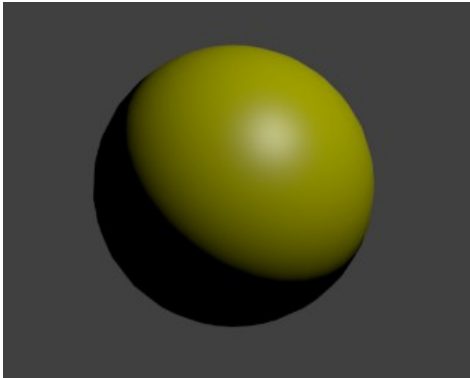


figure 5

The sphere does not look like it is made out of plastic because the material does not reflect the light in a shiny way.

➔ Look at the Specular Tab (figure 6).



figure 6

The white area is the specularity colour, the intensity is how bright the specular reflection is. Hardness is how hard (sharp) the specular reflection is.

➔ Set hardness to 511 (maximum).

➔ Set intensity to 1.00 (maximum).

➔ Press <F12> to render the scene (figure 7).

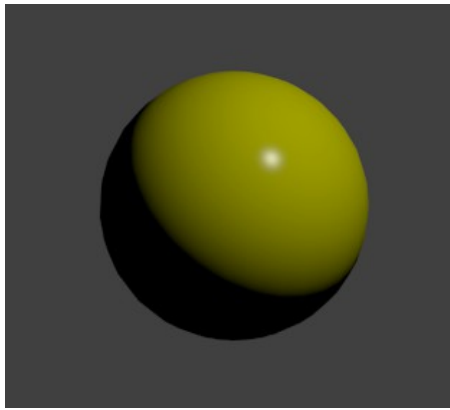


figure 7

The surface of the sphere looks more glossier.

- ➔ Press <Shift> + <D> to duplicate the sphere.
- ➔ Press <X> to lock the X-axis.
- ➔ Type <2> and press <Enter> to confirm the movement.
- ➔ Press [+] (marked red in figure 8) to add a new material.

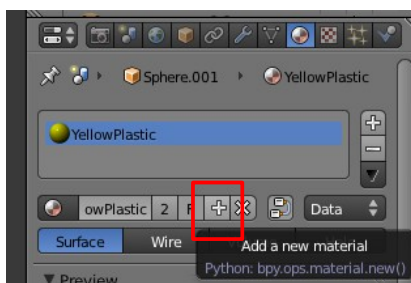


figure 8

- ➔ Change the name of the material from YellowPlastic.001 to BlueTransparent (figure 9).

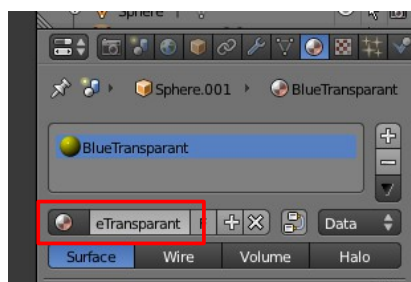


figure 9

- ➔ Adjust the BlueTransparent colour values to R: 0.000, G: 0.000, B: 1.000 (figure 10).



figure 10

We are now going to make the blue sphere transparent.

- ➔ Check the [transparency] and adjust the Alpha slider to 0.500.

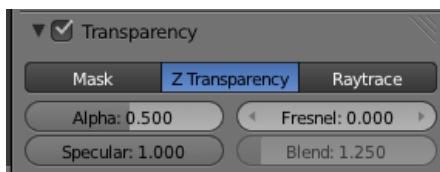


figure 11

- ➔ Press <F12> to render the result (figure 12).

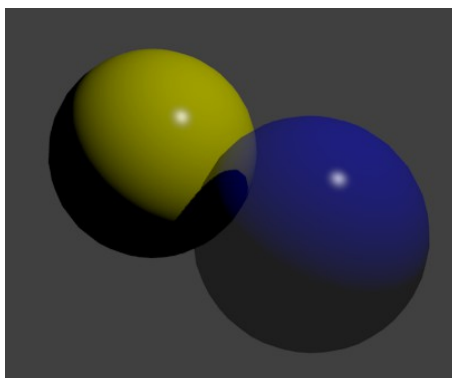


figure 12

- ➔ Save your work (<Ctrl> + <S>) as bc06.01.blend

You can also create a wireframe material which makes the object rendering as a wireframe.

- ➔ Click on [Wire] in the Links and Pipeline Panel.

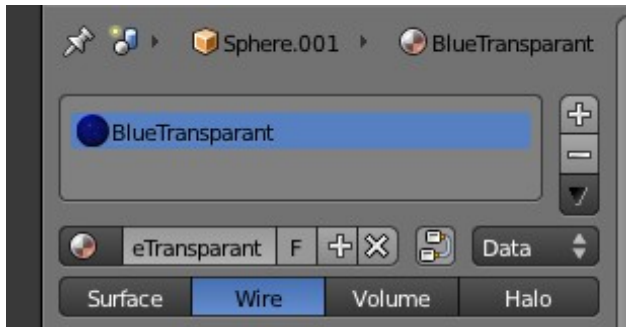


figure 13

- ➔ Set the Alpha slider back to: 1.000.
- ➔ Press <F12> to render the image.

You can now see the blue sphere being rendered as a blue wireframe (figure 14).

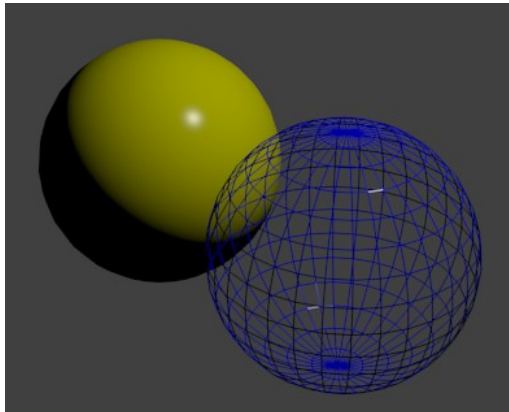


figure 14

- ➔ Save your work (<Shift> + <Ctrl> + <S>) as bc06.02.blend

Textures

In the previous part we only adjusted the reflection of the material. A material also has some kind of structure. This structure is defined with one or more **textures**.

- Turn on [Surface] for the “BlueTransparant” material instead of [Wired].
- Open the Texture Panel (<F6>).

The Texture Panel contains a list (marked red in figure 15). This list can contain layers which construct a texture. These layers are called Texture Channels.

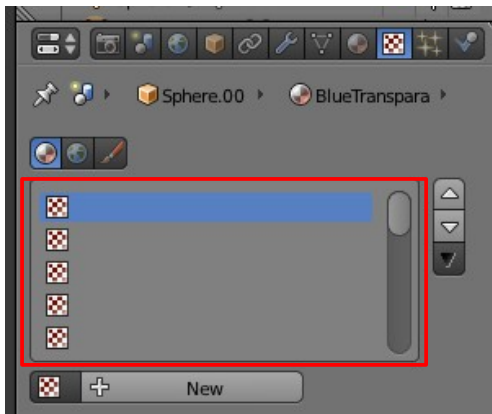


figure 15

- Click on [+ New] to create a new texture.

In the dropdown box below “Type” (figure 16) you can select different types of textures. Each of these textures do have specific properties.

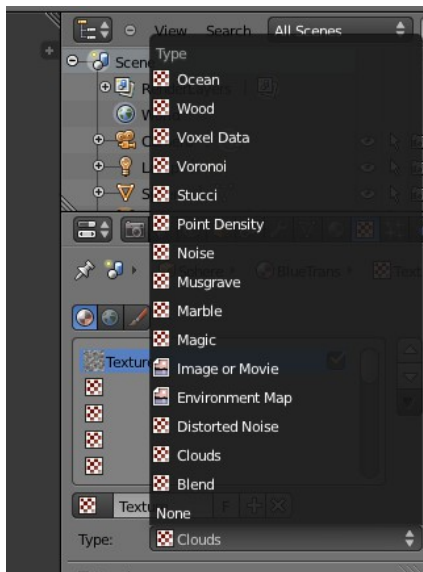


figure 16

- ➔ Choose for [Marble].
- ➔ Name your texture "Marble" (marked red in figure 17).

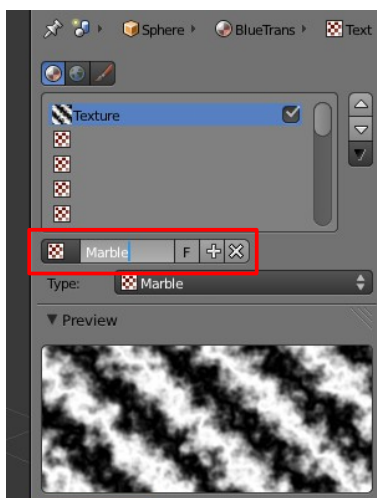


figure 17

You can see the Marble Panel containing several properties which can be adjusted.

- ➔ Press <F5> for the Material Panel.

Figure 18 shows our texture is being used for our new material. The Preview Panel shows pink marble parts on our material.

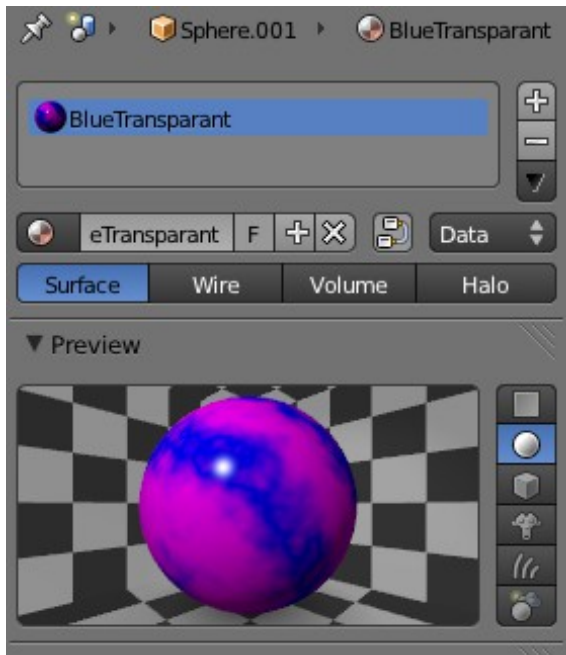


figure 18

➔ Press <F12> to render our scene (figure 19)

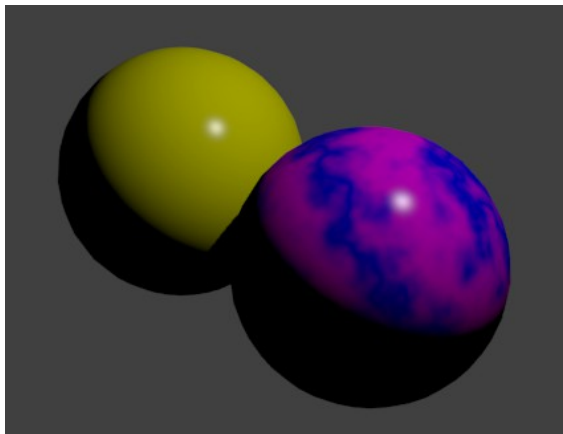


figure 19

The default colour for a texture is pink. We are about to adjust this colour.

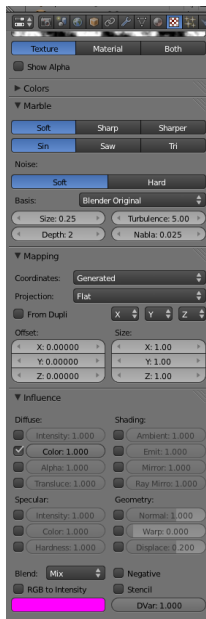


figure 20

- ➔ Click on the Texture Panel and scroll to the bottom of the Texture Panel (figure 20).
- ➔ Change the pink colour to R: 1.000, G: 1.000 and B: 1.000. Which are the values for the colour white.
- ➔ Press <F12> to render the scene.

You can see the pink colour has become white (figure 21).

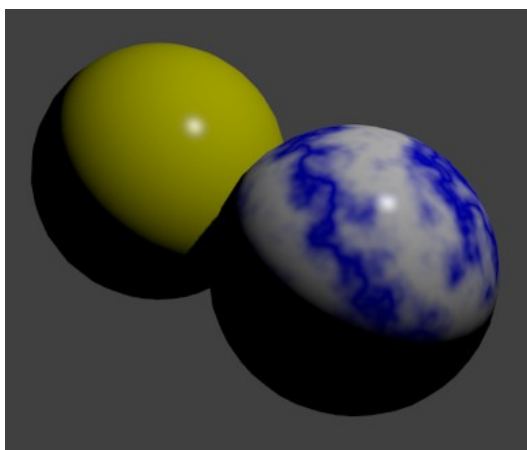


figure 21

The Map To Panel allows you to adjust where the texture will be applied to.

Emitting material

Like a lamp, a material can emit light. This is done by changing the emit value of the material, but also by enabling [Emit] at a texture.

➔ In the Shading Panel set the [Emit] value to 1.00 (marked red in figure 22).

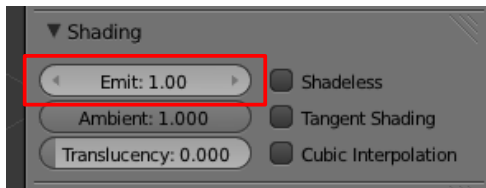


figure 22

➔ Press <F12> to render your scene.

You can see it looks like the white part of your sphere is emitting light (figure 23).

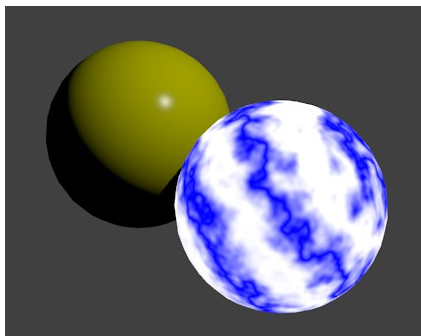


figure 23

➔ Save your work (<Shift> + <Ctrl> + <S>) as bc06.03.blend

Skills from this course

- Creating spheres
- Making materials transparent
- Render meshes as wireframes
- Apply textures to a mesh
- Create an emitting material

Course 7 - Light

A 3D-scene without light would result in a black image. Blender has five different light sources: lamp, area, spot, sun and hemi. In this course we are just looking at the lamp and spot light source. A spot is a light source which comes from one point where the light spreads in a cone shape whereas a lamp is a light source which emits light to every direction.

- ➔ Start a new scene (<Ctrl> + <X>).
- ➔ Erase the cube.
- ➔ Add a plane.
- ➔ Press <N>

The Transform Panel appears (figure 1).

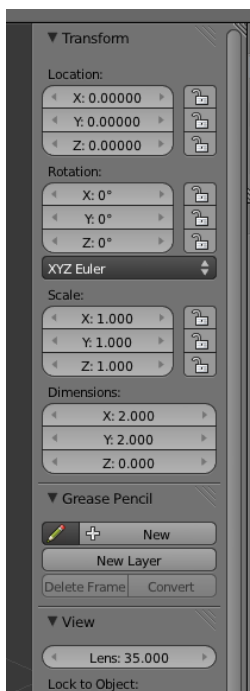


figure 1

In the transform properties you can adjust the position, rotation and scale of an object.

- ➔ Set the following values, ScaleX: 10, ScaleY: 10.
- ➔ Press <N> to close the Transform Properties.
- ➔ Press <Spacebar> and type "uv sp" and press <Enter>

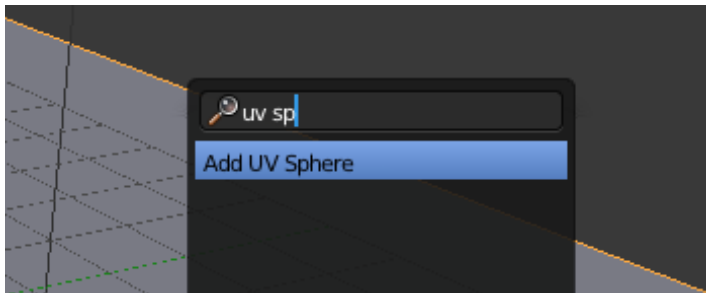


figure 2

- ➔ Press <N>.
- ➔ Type for LocZ, 1.0
- ➔ Press <N> to close the Transform Properties.
- ➔ Set the shading to [Smooth] on the Object Tools Panel (marked red in figure 3).

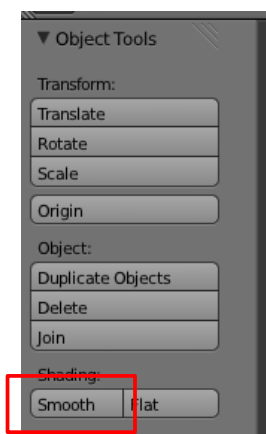


figure 3

- ➔ Press <F12> to render the scene.

Now you can see a shadow appearing at the sphere. This is made by the one and only lamp in our scene.

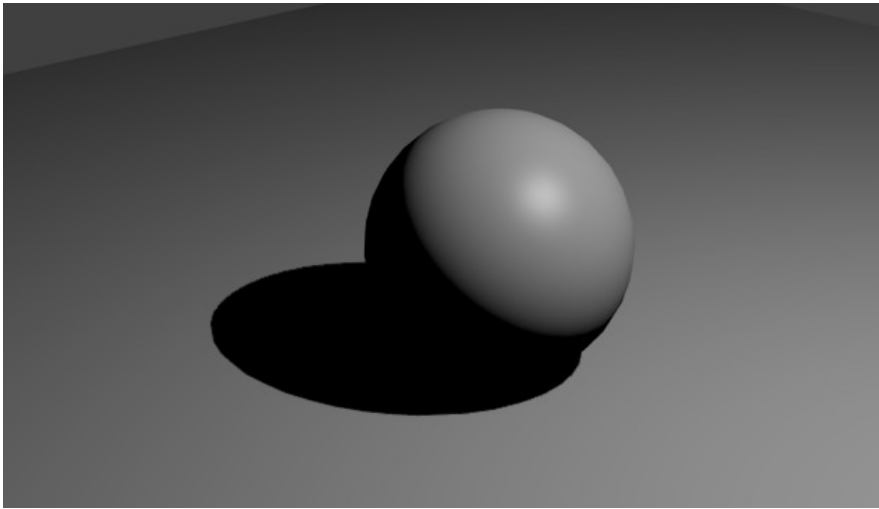


figure 4

➔ Press <1> for Front View.

A lamp appears in a scene as a dot with a dashed circle around (marked red in figure 5).

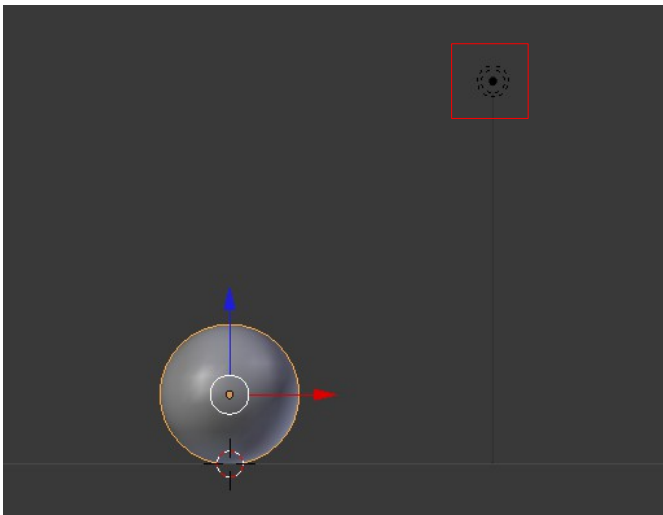


figure 5

➔ Press <7> for Top View.

➔ In the Top View press <Spacebar> and type "lam" and press <Enter>.

➔ A menu appears. Choose "Point"

You have now added a new light to your scene.

- ➔ Press <N>.
- ➔ Fill in these values under location: X: -4, Y: 3 and Z: 10. You can use <Tab> to jump quickly between the textfields.
- ➔ Press <N> to close the Transform Properties.
- ➔ Press <Z> for Wireframe Shading

You can see a lamp shining from the back of our sphere to the front (figure 6).

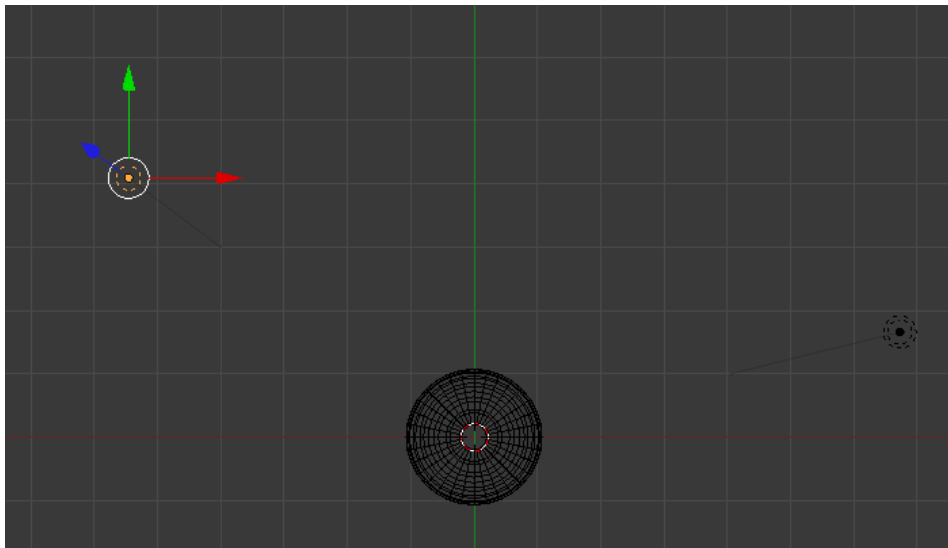


figure 6

- ➔ Press <F12> and imagine where you think the shadow should appear.

The result is not what we expected. The shadow of only one lamp is visible instead of two shadows (figure 7).

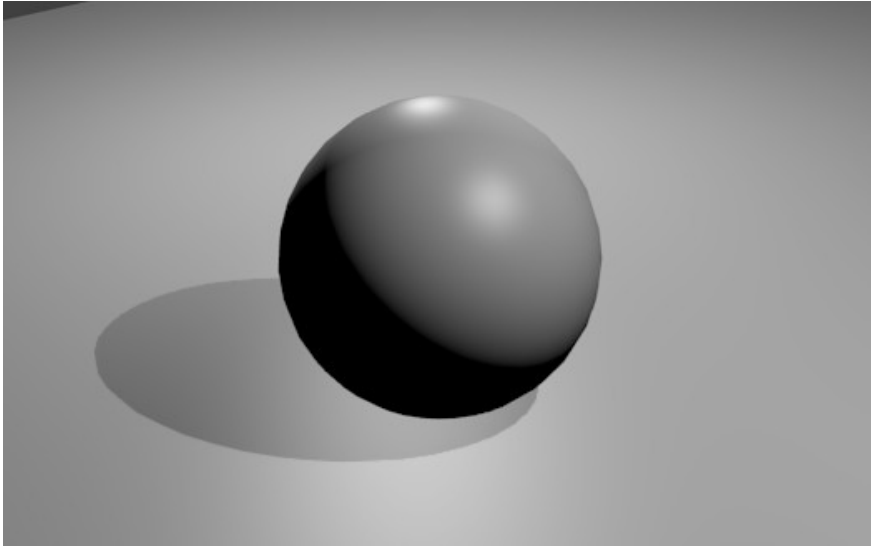


figure 7

➔ Press <F5> for the Object Data Panel (figure 8).

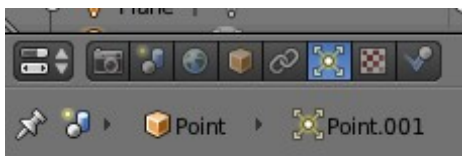


figure 8

➔ Click in the Shadow Panel on [Ray Shadow] (figure 9).



figure 9

➔ Press again on <F12>.

Now you see two shadows (figure 10).

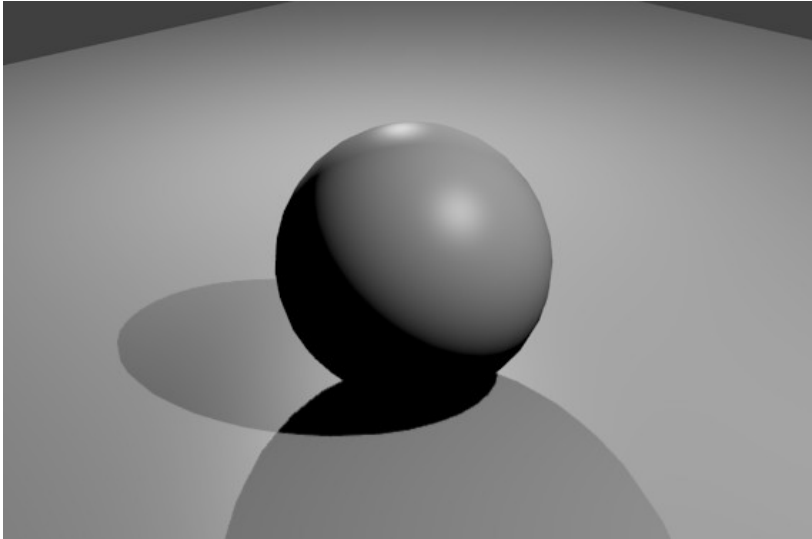


figure 10

- ➔ Save your work (<Ctrl> + <S>) as bc07.01.blend
- ➔ Select the right-hand lamp.
- ➔ Press <X> and choose [Delete] to delete the lamp.

We are about to make a spot out of the left lamp.

- ➔ Select the left-hand lamp.
- ➔ Open the Object Data Panel
- ➔ Select [Spot] in the Lamp section (figure 11).

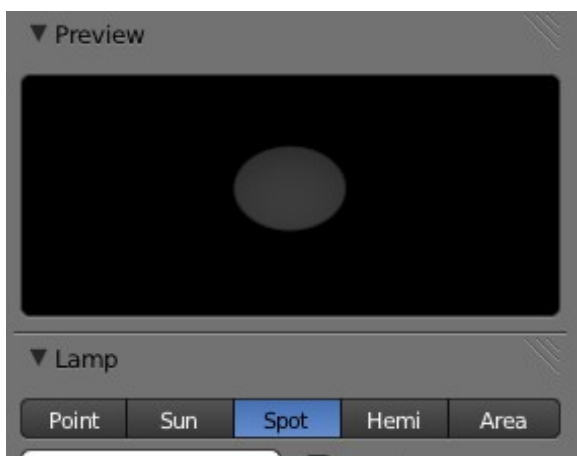


figure 11

The lamp has become a spot instead of a lamp (figure 12).

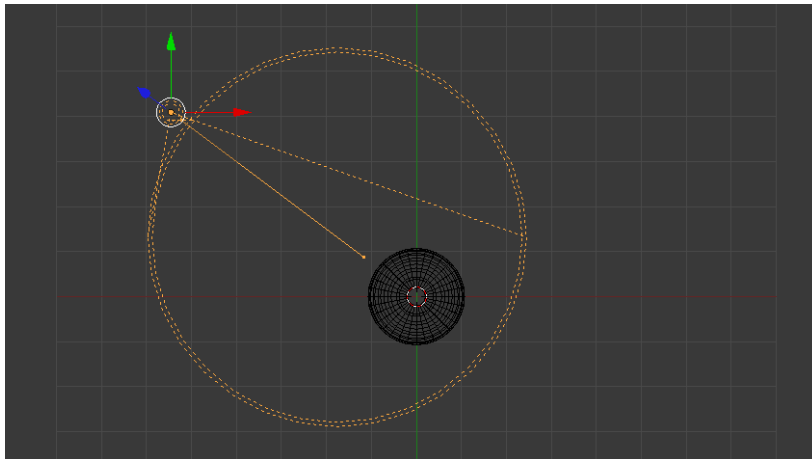


figure 12

A spot has a conic shape; this cone shows where the light bundle appears.

- ➔ Press <N>.
- ➔ Fill in the following Rotation values X: 0, Y: -25, Z: -35.
- ➔ Press <N> to close the Transform Properties.
- ➔ Press <F12> to render the scene.

The ground shows the shape of the spot (figure 13).

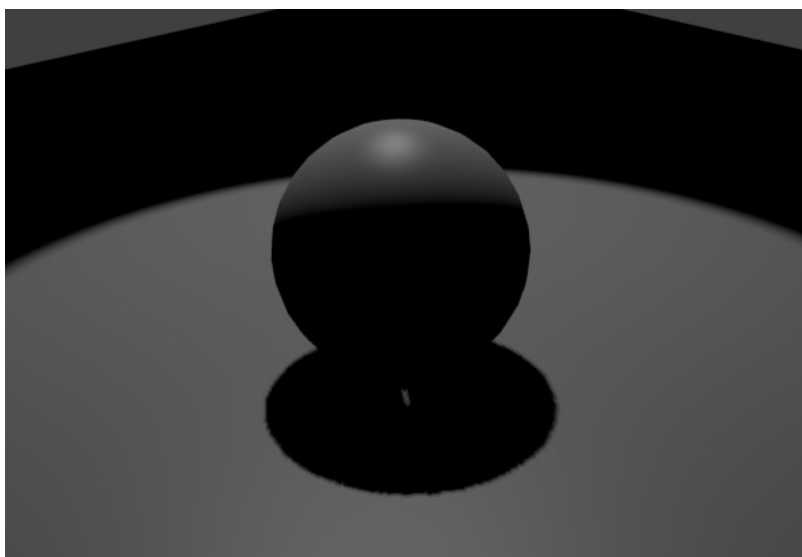


figure 13

The shadow does not appear to be smooth.

- ➔ Open the Object Data Panel
- ➔ Select [Ray Shadow] (marked red in figure 14).

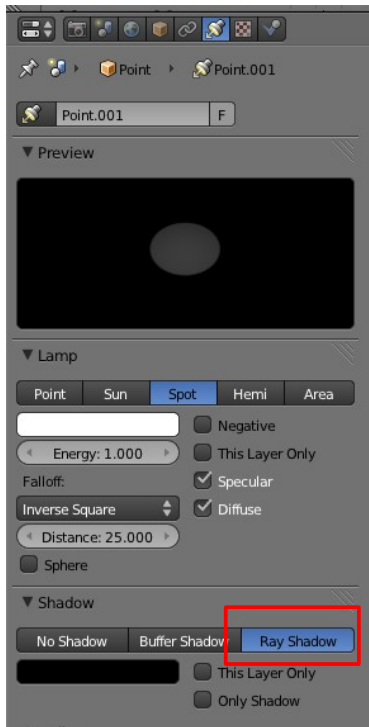


figure 14

Lamp Panel

The lamp panel (figure 15) is almost the same for all light types. With Distance you can adjust the range of your light. Energy adjusts the intensity of the light and the white area is the light's colour.

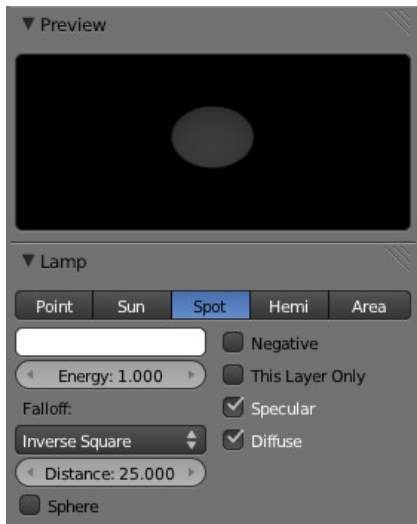


figure 15

- ➔ Set the lamp colour to R: 1.000, G: 0.000 and B: 0.000.
- ➔ Press <F12> to render your scene.

The lamp colour now changed into red.

- ➔ Click [Halo] in the Spot Shape Panel (figure 16).

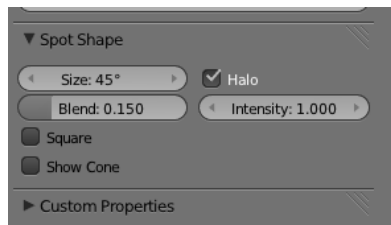


figure 16

- ➔ Press <F12> to render your scene.

When halo is enabled, the beam of light becomes visible.

- ➔ Set the Intensity to 2.5
- ➔ Press <F12> to render the scene.

The beam of light has become more dense now (figure 17). In the Spot Shape Panel, Size defines the angle of the beam.

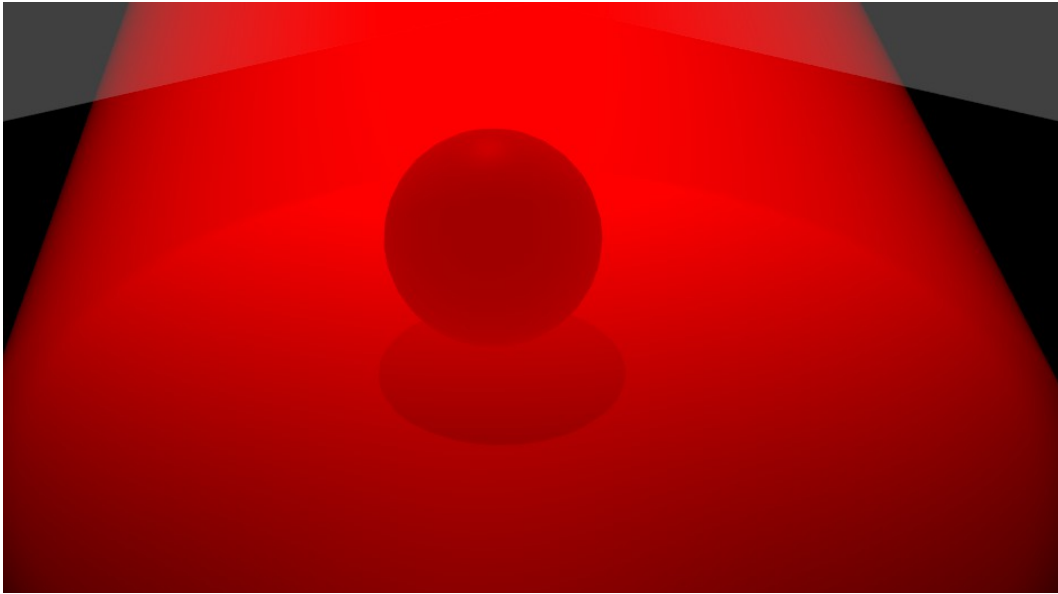


figure 17

➔ Save your work (<Ctrl> + <W>) as bc07.02.blend

The challenge

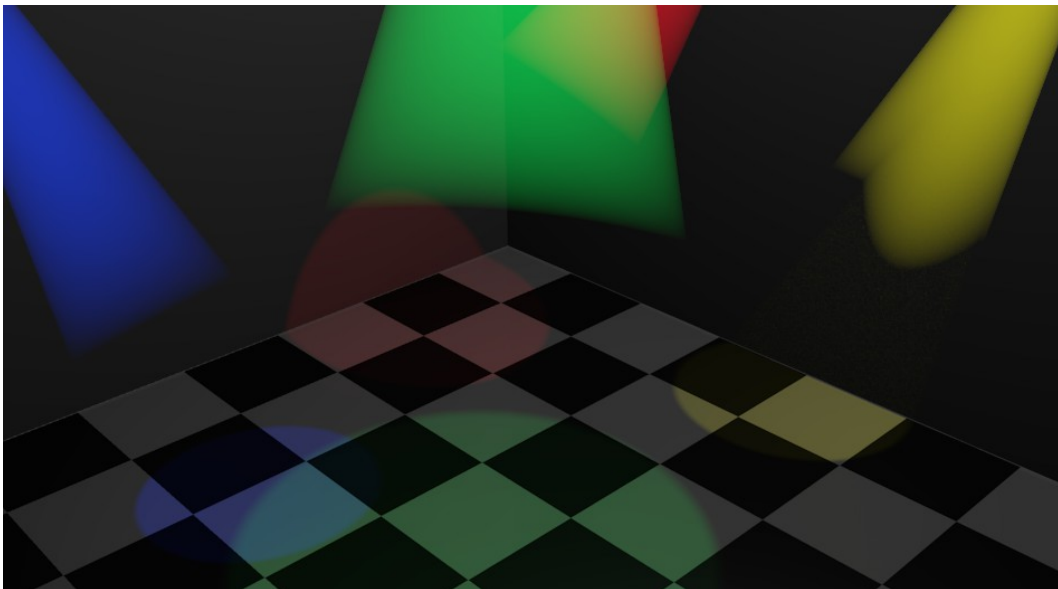


figure 18 – classic style discofloor – bc07.03.blend

Skills from this course

- Using Transform Properties (<N>)
- Setting shadows for lights
- Adjusting light colours
- Using spots and lamps
- Applying halo to spots
- Adjusting the halo colour

Course 8 – Animation

Frames, keyframes and framerate

In the previous chapters we have only created static images. Blender offers another output format as well: animations. An animation is a sequence of static images. These static images are called **frames**.

An animation shows a number of images per second. This number is called the **framerate** which has the abbreviation: **fps** (frames per second). Common used framerates are 25 or 30.

Blender uses **keyframes**. These keyframes are reference points in the animation. Imagine an animation which takes for about 90 frames. During these 90 frames a cube moves from left to right. The advantage of keyframes is you do not have to define the position of the cube for each frame. You only need to define two keyframes: the position of the cube for frame 1 and another for frame 90. Blender can do the math for you and calculate all the positions in between.

Computing the duration of an animation is very straightforward. If you have an animation with a framerate of 30 and you want the length of the animation to be 3 seconds, the total amount of frames is then $3 \times 30 = 90$ frames.

➔ Start a new scene (<Ctrl> + <N>).

The sections marked red in figure 1 show the current frame number.

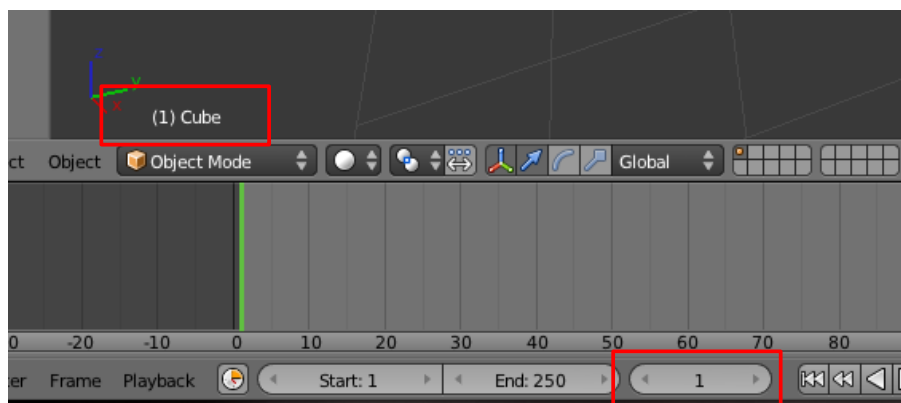


figure 1

Frame navigation

The arrow keys help you in navigating through the frames: <←> and <→> moves one frame forward or backward. <Shift> + <↑> or <Shift> + <↓> moves 10 frames forward or backward.

➔ Press <I> in order to make a new keyframe in frame 1.

A menu appears (figure 2). In this menu you can choose between different kinds of keyframes. The choice defines which object properties are stored inside the keyframe.

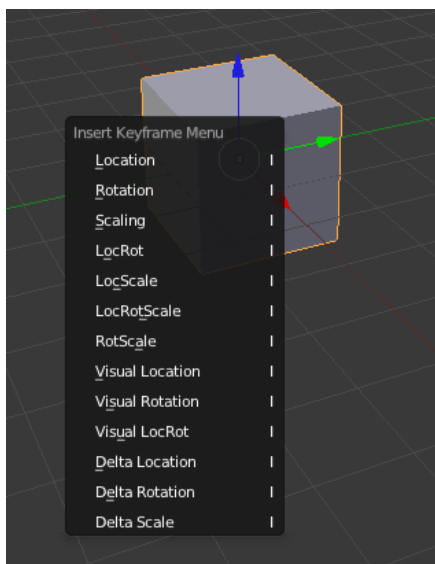


figure 2

➔ Choose [Location] in order to make a keyframe for the location of the cube.

➔ Press 5 times <Shift> + <↑> till you reach frame 51.

➔ Press <G> for moving.

➔ Press <X> to lock the X-axis.

➔ Type <5> and press <Enter>.

➔ Press <I> again in order to create a location keyframe for frame 51.

- Choose for [Location].
- Keep pressing <←> until you reach frame 1; you will notice that the cube is moving back to its original position.
- Press <F10> for the Scene Panel.

The Dimensions Panel shows from and to which frame the animation runs (here 1 to 250) (marked red in figure 3).

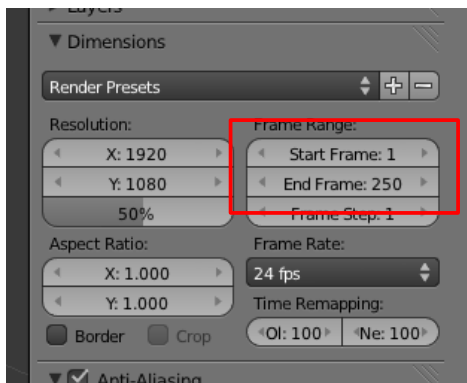


figure 3

- Change 250 into 75.
- Press <↓> to jump to frame 1.
- Press <Alt> + <A> to run the animation.

You now see the animation running. The green line on the Timeline Panel shows the current frame (figure 4).

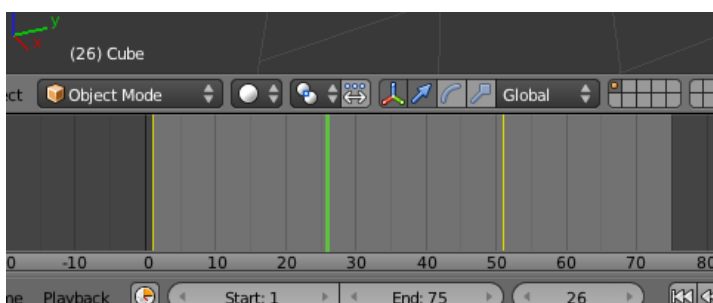


figure 4

- Press <Esc> to cancel the animation.

Video codec

JPEG and PNG are designed for stills. For animations there are other formats like AVI, MPEG en MOV. A raw stored animation can take a huge amount of disk space.

In order to shrink these files, Video Codecs were invented. These codecs “encode” the animation in a very smart way which makes the file smaller.

➔ Click in the Format Panel at [Jpeg] and choose [AVI JPEG] (figure 5).

AVI JPEG is and a codec which just places all the frames in an AVI file without compressing the frames. This codec takes a lot of disk space. Instead you can choose to render using MPEG or H.264 which save a lot of disk space. You might want to use VLC player to play your video files. VLC player is freely available at <http://www.videolan.org/vlc/>

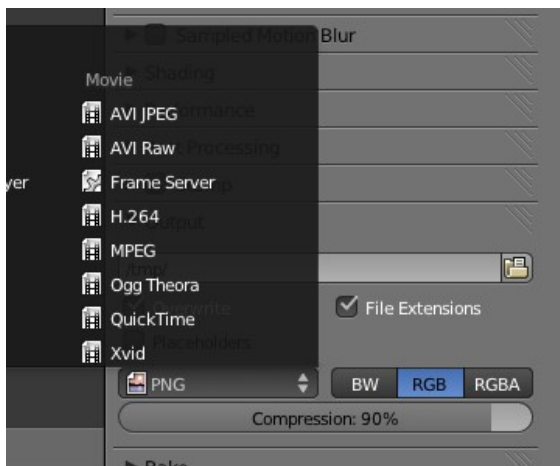


figure 5

➔ The default output folder is /tmp you can change this to any arbitrary directory.



figure 7

- ➔ Press [Animation] (marked red in figure 8) in order to start the animation rendering process.

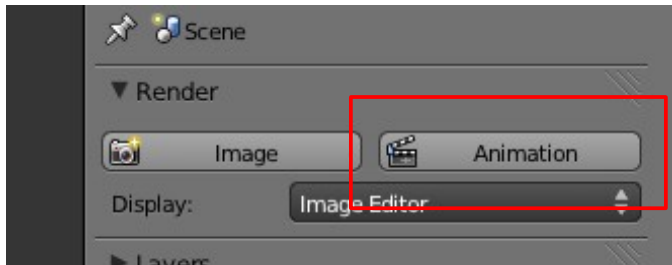


figure 8

During the animation rendering, you will see Fra: 1, Fra: 2 etc. This number is the current rendered framenummer.

When the render process has been finished, the render window shows "Fra: 75" in the top left corner.

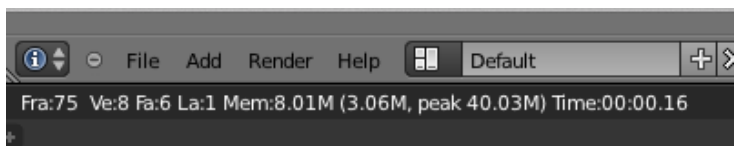


figure 9

The animation will be stored as c:\tmp\0001_0075.avi or /tmp/0001_0075.avi for Mac OSX users. You can open this folder in either Windows Explorer or Finder for the Mac OSX users.

- ➔ Save your work (<F2>) as bc08.01.blend
- ➔ Start a new scene (<Ctrl> + <N>).
- ➔ Press <7> for Top View.
- ➔ Select the Camera.
- ➔ Press <I> to create a new keyframe.
- ➔ Choose [LocRot] (Location and Rotation)

- ➔ Navigate to frame 51 (5× <Shift> + <↑>).
- ➔ Move and rotate the camera like figure 10.

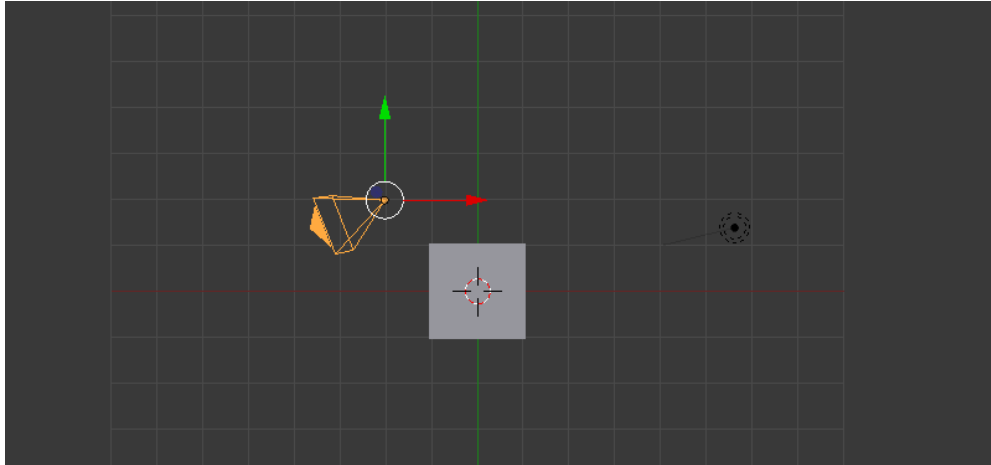


figure 10

- ➔ Press <I> in order to add a keyframe for frame 51.
- ➔ Choose [LocRot].
- ➔ Press <↓> in order to go to the previous keyframe.
- ➔ Press <F10> for the Scene Panel.
- ➔ Change the endframe from 250 into 60.
- ➔ Press <0> for the Camera View.
- ➔ Press <Alt> + <A> to view the animation.

Now you can see the change of location and rotation from the camera.

- ➔ Save your work (<Shift> + <Ctrl> + <S>) as bc08.02.blend.

The challenge

Animate the lights of the discofloor we have created in the previous chapter. You might also want to animate the camera and move it around the discofloor.

Skills from this course

- Animating by using keyframes
- Defining Video Codecs for your animation
- Playing animations
- Defining the animation duration

Course 9 – Tips and Tricks

Parent/Child

Sometimes you have an object which needs to have a fixed position with respect to another object. In this case you want to have the child moving along with the parent.

- ➔ Start a new scene.
- ➔ Select the cube.
- ➔ Duplicate (<Shift> + <D>) the cube.
- ➔ Press <Z> to lock the Z-axis.
- ➔ Type <3> and press <Enter>.
- ➔ Select the lower cube.
- ➔ Hold <Shift> and select the upper cube.
- ➔ Press <Ctrl> + <P>.

A menu appears (figure 1).

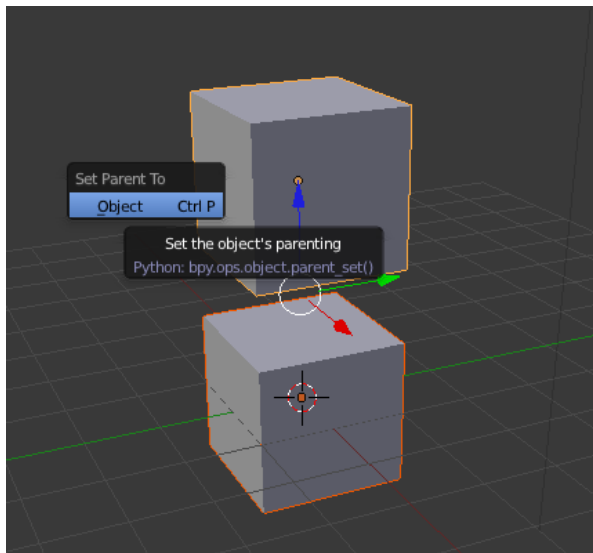


figure 1

➔ Choose [Object]

A dotted line shows the relationship between the objects. The upper cube has become "parent", the lower "child".

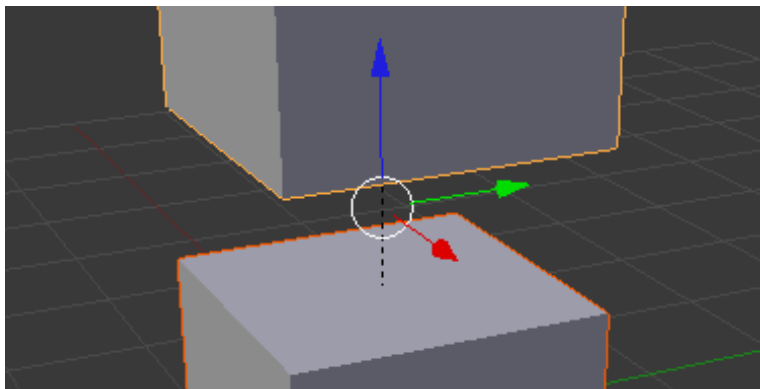


figure 2

- ➔ Select the upper cube.
- ➔ Press <G> for move.
- ➔ Move the cube randomly.

You now can see the lower cube moving along with the upper cube.

➔ Select the lower cube.

- ➔ Press <G> and move randomly.

The upper cube does not move along.

- ➔ Select the lower cube.

- ➔ Press <Alt> + <P>.

A menu appears (figure 3).

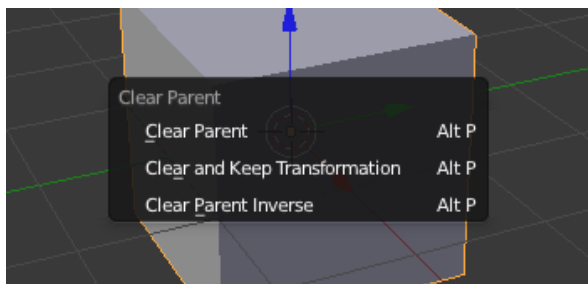


figure 3

- ➔ Choose [Clear Parent].

The child-parent relation has been removed.

- ➔ Select the upper cube.

- ➔ Press <G> to move.

- ➔ Move the cube randomly.

You now can see the bottom cube not moving along. The parent-child relationship can be very useful when modelling an animation character. The eyes are child of the head, the head is child of the body, the hair is also a child of the head etc.

Change origin of an object

An object always rotates around its centre, or so called origin (marked red in figure 4). Sometimes you want to move this centre.

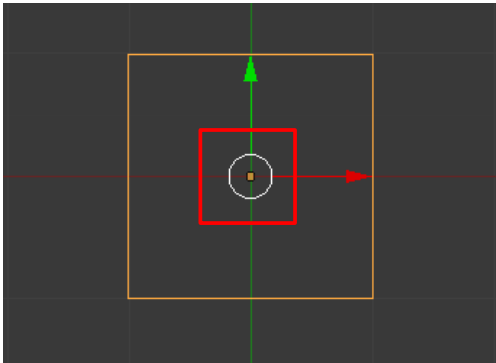


figure 4

- ➔ Start a new scene.
- ➔ Click in the Top View (<7>) with your left mousebutton on the top right corner of the cube.
- ➔ Do the same in the Front View (<1>).
- ➔ Switch to the Camera View with <0>

The 3D-cursor has moved as shown in figure 5.

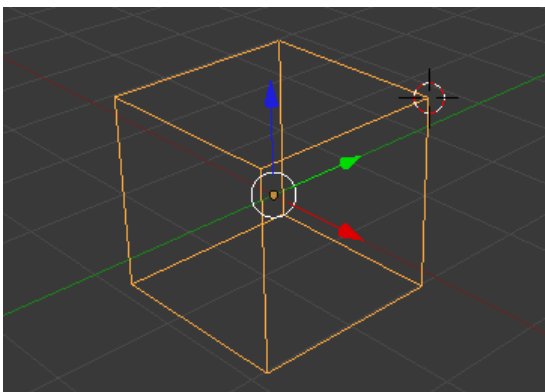


figure 5

- ➔ Select the cube with your right mousebutton.

- ➔ Click on [Origin] in the Object Tools Panel (figure 6).

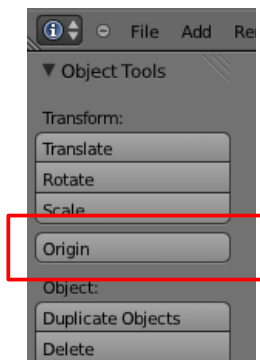


figure 6

A menu appears.

- ➔ Choose [Origin to 3D Cursor]

The origin of the cube has been moved to the location of the 3D-cursor.

- ➔ Press <R> for rotate.
- ➔ Rotate the cube randomly; you will see the cube rotating around its new origin.

Spin

Sometimes you would like to create multiple instances of an object, rotated over a certain angle. An example can be the hour dashes on an analogue clock, which is copied 11 times over 360 degrees. Another example can be when drawing a gear.

- ➔ Start a new scene.
- ➔ Press <1> for Front View
- ➔ Press <5> for Orthographic View

- ➔ Click with the left mousebutton, four grid squares below the cube in order to move the 3D-cursor (marked red in figure 7).

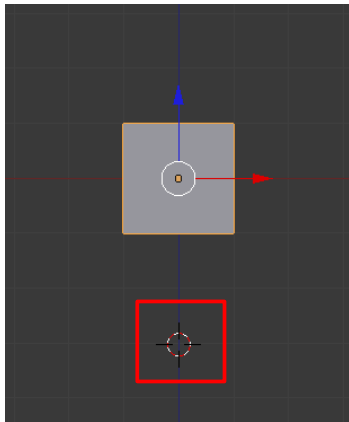


figure 7

- ➔ Press <Tab> for Edit Mode.
- ➔ Click [Spin] on the Mesh Tools Panel (marked red in figure 8).

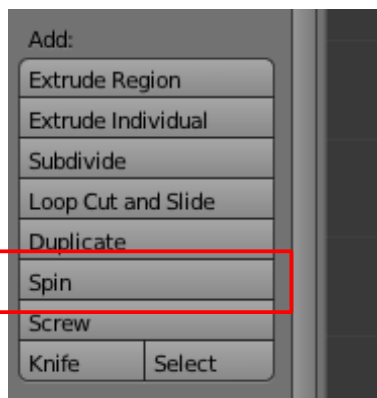


figure 8

You now see multiple cubes duplicated around the Y-axis (figure 9).

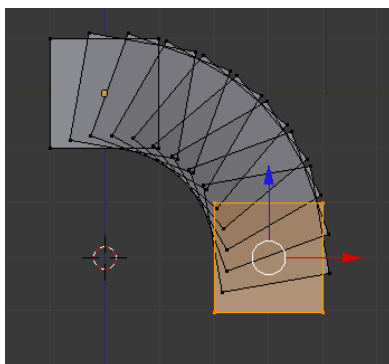


figure 9

With the Spin Panel you are able to modify the Spin Modifier parameters.

- ➔ Change the Degrees to 360 (figure 10).

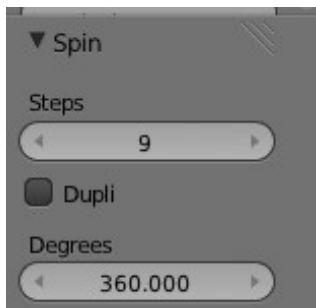


figure 10

Your cube has been multiplied nine times around 360 degrees (figure 11).

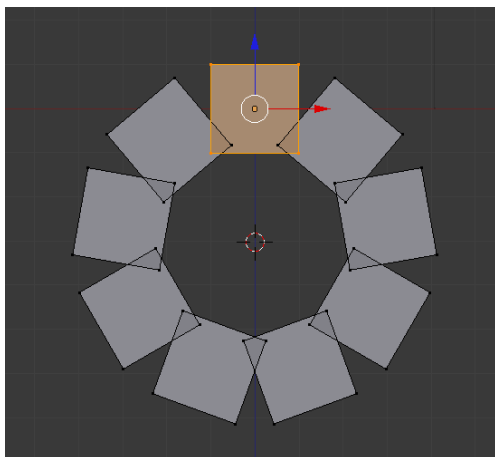


figure 11

- ➔ Press [Tab] for object mode to finish the operation.

Alignment

Placing objects on the grid can be quite difficult. Therefore Blender is equipped with an alignment function.

- ➔ Start a new scene.
- ➔ Press <G> to move the cube.

➔ Move the cube at random.

➔ Press <Shift> + <S>.

A menu appears (figure 12).

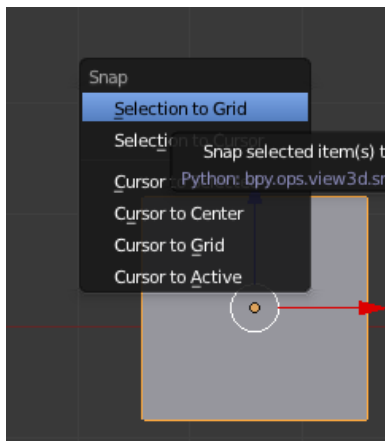


figure 12

➔ Choose [Selection to Grid].

The cube is now aligned to the grid.

Moving around the view

Sometimes you want to move a certain object to the centre of your view or you want to have the 3D-Cursor centred in your viewport.

➔ Start a new scene.

➔ Press <1> for Front View.

➔ Press <5> for Orthographic View.

➔ Duplicate (<Shift> + <D>) the cube and place it at an arbitrary position.

➔ Press <.> on your numeric keypad to centre the object in the view.

➔

- ➔ Click with your left mousebutton on an arbitrary position to move the 3D Cursor.
- ➔ Press <Ctrl> + <. > on the numeric keypad to centre the view around the 3D Cursor.

Extending meshes

- ➔ Start a new scene.
- ➔ Press <1> for Front View.
- ➔ Press <5> for Orthographic View.
- ➔ Select the cube.
- ➔ Press <Tab> for Edit Mode.
- ➔ Press <A> to deselect all vertices.
- ➔ Make sure "Limit selection to visible" is disabled (marked red in figure 14).

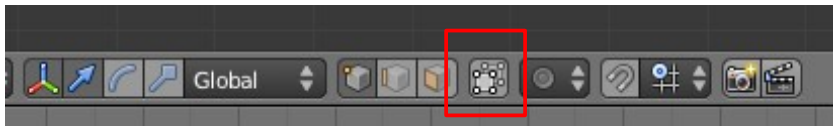


figure 14

- ➔ Press for Block Selection and drag a rectangle as shown in figure 15.

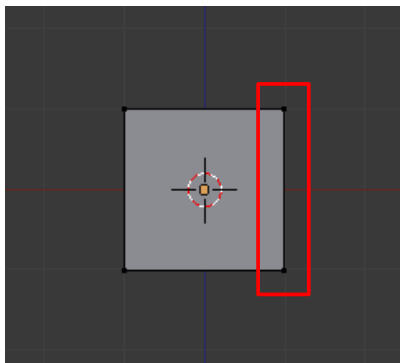


figure 15

- ➔ Press <E> for Extrude Region.

- ➔ Hold down <Ctrl> while moving one grid to the right.
- ➔ Press <0> for Camera View.

You have now extruded your mesh as shown in figure 16.

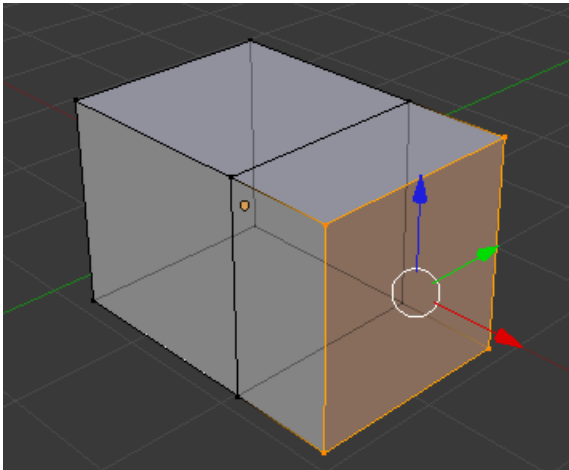


figure 16

- ➔ Press <1> for Front View.
- ➔ Press <A> to deselect all vertices.
- ➔ Press for Block Selection and drag a rectangle as shown in figure 17.

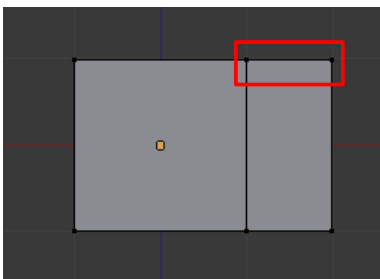


figure 17

- ➔ Press <E> for Extrude Region.
- ➔ Hold down <Ctrl> while moving two grid to the top.

You have now extruded your mesh as shown in figure 18.

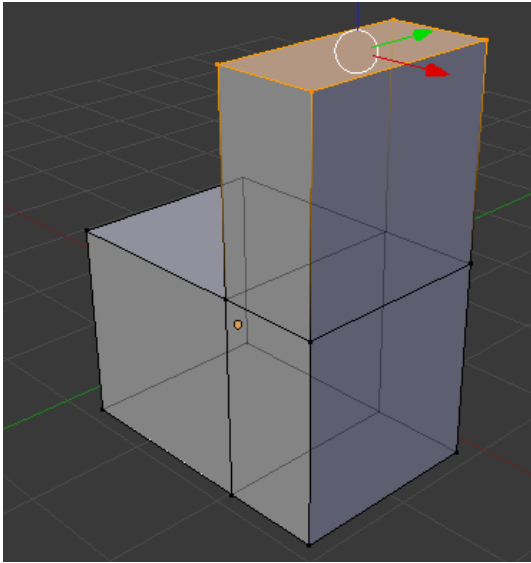


figure 18

Cutting meshes

- ➔ Start a new scene.
- ➔ Press <1> for Front View.
- ➔ Press <5> for Orthographic View.
- ➔ Select the cube.
- ➔ Press <Tab> for Edit Mode.

With "Loop cut and slide" we are able to split meshes.

- ➔ Press <Ctrl> + <R> for "Loop cut and slide".
- ➔ Move the mouse to the top edge of the cube, a purple cut line will appear (figure 19).

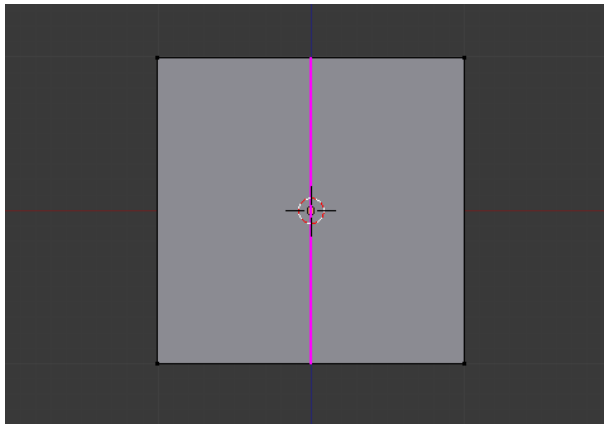


figure 19

With the moving the scrollwheel up and down of press <Page Up> or <Page Down> we can adjust the number of cuts.

➔ Set the number of cuts to 3

We have now cut our mesh in four parts as shown in figure 20.

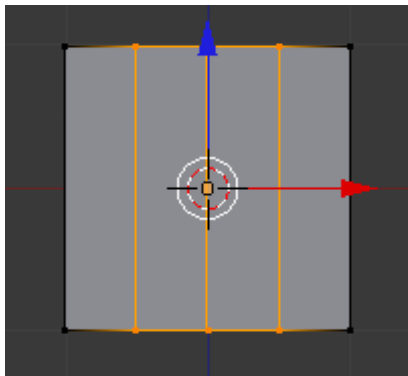


figure 20

Appendix 1: The installation of Blender

This appendix provides a step by step guide about the Blender installation progress.

- ➔ Browse to <http://www.blender.org/download/get-blender/>.

Windows

- ➔ Click under heading "2.63" on a mirror near you (marked red in figure 1).



figure 1

- ➔ Open the installer and follow the instructions on the screen.
- ➔ You are now able to run Blender

Mac OSX

- ➔ Click under heading "2.63" on a mirror near you (marked red in figure 2).



figure 2

- ➔ Extract the downloaded zip file
- ➔ Open the extracted folder "blender-2.63a-release-OSX_10.5_i386" in Finder
- ➔ Drag Blender to your application folder

➔ You are now able to run Blender

When you are starting Blender for the first time you will see something like figure 3.

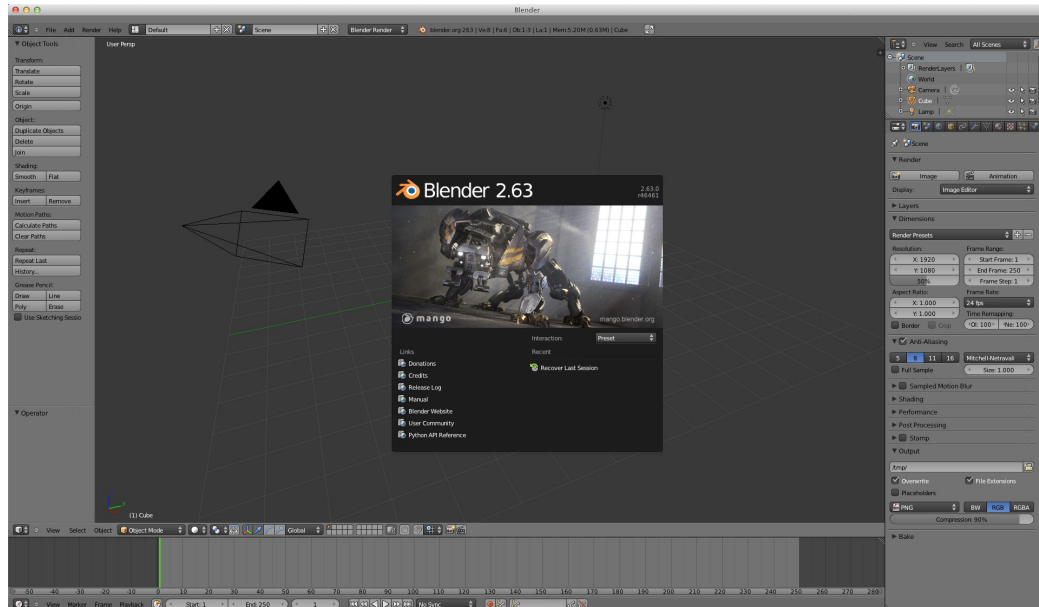


figure 3

Blender is now ready to use.

Appendix 2: Keyboard shortcut overview

Object Mode

<G> → <X>	Move over X-axis
<G> → <Y>	Move over Y-axis
<G> → <Z>	Move over Z-axis

<S> → <X>	Scale on X-axis
<S> → <Y>	Scale on Y-axis
<S> → <Z>	Scale on Z-axis

<R> → <X>	Rotate over X-axis
<R> → <Y>	Rotate over Y-axis
<R> → <Z>	Rotate over Z-axis

<Ctrl> + <↑>	Maximise view
<Ctrl> + <↓>	Back to previous size

<Alt> + <C>	Convert object type
<Alt> + <A>	Playback Animation

Using numeric keys:

<1>	Front Perspective View	<4>	Rotate View Left
<3>	Right Perspective View	<6>	Rotate View Right
<7>	Top Perspective View	<8>	Rotate View Top
<0>	Camera Perspective View	<2>	Rotate View Bottom
<.>	User Perspective View	<+>	Zoom View In
		<->	Zoom View Out

<Ctrl> + <S>	Save
<Ctrl> + <O>	Open last used file
<F1>	Open
<F2>	Save as
<F3>	Save render
<F5>	Shading Panel
<F6>	Texture Panel
<F9>	Editing Panel
<F11>	Show latest render
<F12>	Render scene

<Scrl>	Zoom view in and out
<Ctrl> + <Scrl>	Move view horizontal
<Shift> + <Scrl>	Move view vertical

<Q>	Quit Blender
<X>	Delete
<N>	Transform Properties
<I>	Insert Keyframe

Edit Mode

<A>	Select or deselect all vertices
	Block selection
<E>	Extrude
<O>	Proportional Editing
<Shift> + <F>	Face Fill

Appendix 3: Console rendering

Introduction

Sometimes rendering using the console is much easier than from the Blender program. This might be the case when a large amount of scenes needed to be rendered.

Parameters

Before we start rendering we will take a look at the parameters of the Blender executable.

- b render in background; renders without starting Blender
- f the frame you want to render
- S scene name
- s starting frame number
- e end frame number
- a render animation
- h help

Rendering a single frame using Blender internal render system

Linux:

```
$ blender -b untitled.blend -f 1
```

Windows:

```
c:\program files\blender\blender.exe -b untitled.blend -f 1
```

When executing the command you see something like:

```
C:\Program Files\Blender>blender -b untitled.blend -f 1
Compiled with Python version 2.5.2.
'import site' failed; use -v for traceback
Warning: could not determine argv[0] path
Checking for installed Python... No installed Python found.
Only built-in modules are available. Some scripts may not run.
Continuing happily.
Fra:1 Mem:0.20M | Preparing Scene data
Fra:1 Mem:0.20M | Preparing Scene data
Fra:1 Mem:0.20M | Creating Shadowbuffers
Fra:1 Mem:8.22M Sce: Scene Ve:8 Fa:6 La:1
Fra:1 Mem:8.22M | Creating Environment maps
Fra:1 Mem:8.22M | SSS preprocessing
Fra:1 Mem:8.22M Sce: Scene Ve:8 Fa:6 La:1
Fra:1 Mem:17.97M | Part 1-16
Fra:1 Mem:17.97M | Part 2-16
Fra:1 Mem:17.97M | Part 3-16
Fra:1 Mem:17.97M | Part 4-16
Fra:1 Mem:17.97M | Part 5-16
Fra:1 Mem:17.97M | Part 6-16
Fra:1 Mem:17.97M | Part 7-16
Fra:1 Mem:17.97M | Part 8-16
Fra:1 Mem:17.97M | Part 9-16
Fra:1 Mem:17.97M | Part 10-16
Fra:1 Mem:17.97M | Part 11-16
Fra:1 Mem:17.97M | Part 12-16
Fra:1 Mem:17.97M | Part 13-16
Fra:1 Mem:17.97M | Part 14-16
Fra:1 Mem:17.97M | Part 15-16
Fra:1 Mem:17.97M | Part 16-16
Fra:1 Mem:9.27M Sce: Scene Ve:8 Fa:6 La:1
Saved: C:\tmp\0001.jpg Time: 00:01.59
```

Rendering an animation using Blender internal render system

The commands below show how to render an animation using the Blender internal renderer.

Linux:

```
$ blender -b untitled.blend -s 1 -e 5 -a
```

Windows:

```
c:\program files\blender\blender.exe -b untitled.blend -s 1 -e 5 -a
```

This means Blender we render an animation from frame one till frame five. In this example we have used a scene which renders to a jpg-avi file. The console output should look like:

```
Created avi: /tmp/0001_0010.avi

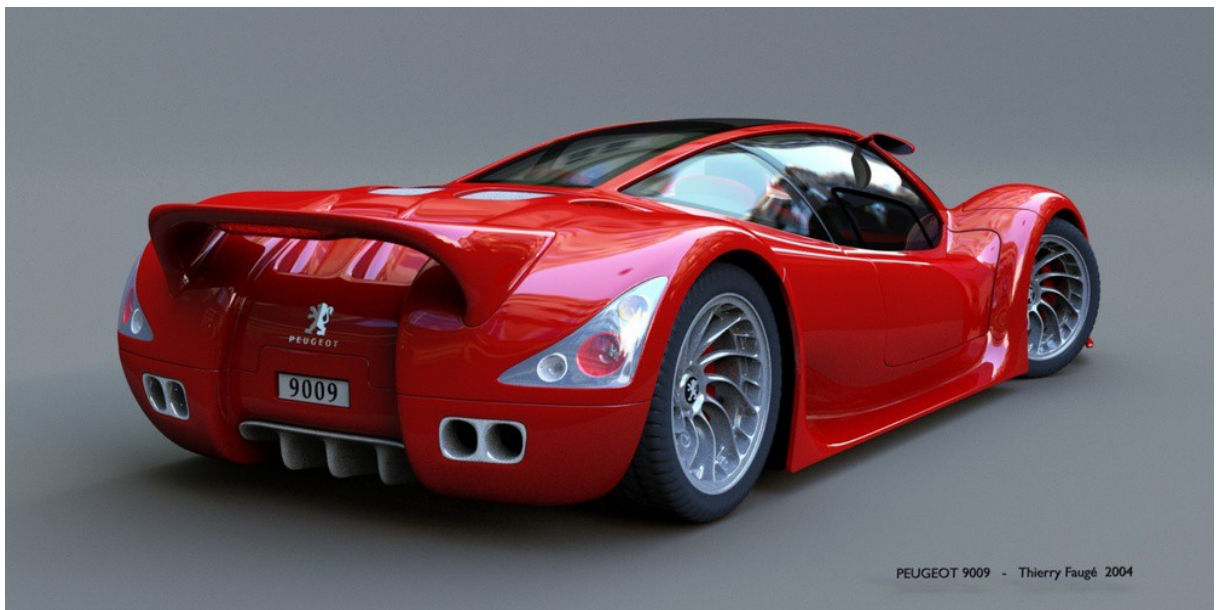
C:\Program Files\Blender>blender -b untitled.blend -s 1 -e 5 -a
Compiled with Python version 2.5.2.
'import site' failed; use -v for traceback
Warning: could not determine argv[0] path
Checking for installed Python... No installed Python found.
Only built-in modules are available. Some scripts may not run.
Continuing happily.
Created avi: C:\tmp\\0001_0005.avi
Fra:1 Mem:0.20M | Preparing Scene data
Fra:1 Mem:0.20M | Preparing Scene data
Fra:1 Mem:0.20M | Creating Shadowbuffers
Fra:1 Mem:8.22M Sce: Scene Ve:8 Fa:6 La:1
Fra:1 Mem:8.22M | Creating Environment maps
Fra:1 Mem:8.22M | SSS preprocessing
Fra:1 Mem:8.22M Sce: Scene Ve:8 Fa:6 La:1
Fra:1 Mem:17.98M | Part 1-16
[...]
Fra:5 Mem:17.98M | Part 16-16
Fra:5 Mem:9.28M Sce: Scene Ve:8 Fa:6 La:1
Append frame 5 Time: 00:01.68

Blender quit
```

Appendix 4: Blender gallery



Richie



SpeedTiti



SpeedTiti



Malefico Andauer



Zoltan Miklosi



Bas van Dijk

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