Blender Visualization Tutorial WS2014-15 I

CELLmicrocosmos Cell Modeling Project WS2014-15,
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Forum:
http://www.cellvisualization.org

Direct link to this forum entry:
http://www.cellmicrocosmos.org/Cmforum/viewtopic.php?f=21&t=760

Actual Version of Blender:
http://www.blender.org

Here, Blender 2.7X is used.

Target

This tutorial describes the basic functionality of Blender. It is important to go through the whole tutorial, because these basic knowledge will be required in the following tutorials and most of it will not be repeated!

What is Blender?

Wikipedia

Blender was developed as an in-house application by the Dutch animation studio Neo Geo and *Not a Number Technologies (NaN)*. It was primarily authored by *Ton Roosendaal*, who had previously written a ray tracer called Traces for Amiga in 1989. The name "Blender" was inspired by a song by Yello, from the album Baby.

Roosendaal founded *NaN* in June 1998 to further develop and distribute the program. The program was initially distributed as shareware until NaN went bankrupt in 2002.

The creditors agreed to release Blender under the terms of the *GNU General Public License*, for a one-time payment of €100,000 (US$100,670 at the time). On July 18, 2002, a Blender funding campaign was started by Roosendaal in order to collect donations and on September 7, 2002 it was announced that enough funds had been collected and that the Blender source code would be released. Today, Blender is free, open-source software and is, apart from the two half-time employees and the two full-time employees of the Blender Institute, developed by the community.

The *Blender Foundation* initially reserved the right to use dual licensing, so that, in addition to GNU GPL, Blender would have been available also under the "Blender License", which did not require disclosing source code but required payments to the Blender Foundation. However, this option was never exercised and was suspended indefinitely in 2005.[5] Currently, Blender is solely available under GNU GPL

Watch the Show Reel

http://www.youtube.com/watch?v=QbzE8jOO7_0&hd=1

And be sure to do not miss this part:

http://www.youtube.com/watch?v=QbzE8jOO7_0&hd=1&t=180

Installation

We will be working with Blender version 2.67b, because it is quite stable. Go to the Blender website, locate the older versions, and download the version for your OS.
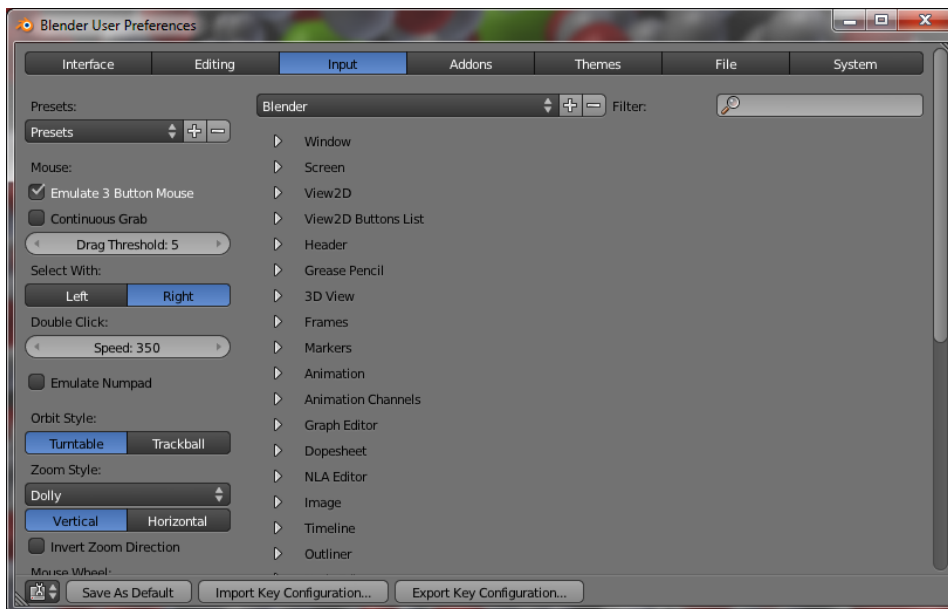
Preparations

Menu → File → User Preferences

→ Addons:

activate:
Import-Export: Import Images as Planes

→ Input

activate "Emulate 3 Button Mouse" for using Blender with a Mobile PC

Press: "Save As Default/Save User Settings" to make sure, next time you start Blender, you do not have to redo these settings again.

Shortcurt keys

Now, a number of shortcuts will follow. Of course it is a good idea to remember most of the shortcuts in the future on your own, because working with Blender is much faster with shortcuts instead of using the menus. However, to support you during your work, KatsBits provides a very nice keyboard chart which you can download here for free:

http://www.katsbits.com/tutorials/blender/useful-keyboard-shortcuts.php

Object Mode

First, create a Cube:
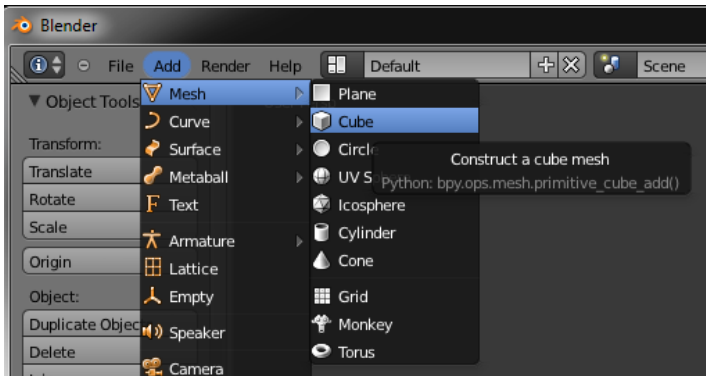
Selections

Left Click: Select

Alt+Left-Click (Center Mouse Button): Emulate Center Mouse Button & Rotate
Center-Click+Shift: move horizontally/vertically
Center-Click+Ctrl: zoom in/out

Ctrl+Left-Click: Draw Shape and Select

Ctrl+Alt+Left-Click: Zoom

ESC → Back to 3D View if e.g. in Render Mode

Perspectives

Num-Pad
1   : Front
3   : Side
7   : Top
CTRL+#   : Opposite (e.g. CTRL+1: Rear)
5   : Orthographic/Perspective View
4,2,6,8   : Rotate in 45° steps
0   : Switch Camera View/Perspective View
Shift+F   : Free Floating Mode for Camera/Perspective View,
                 Use WASD to navigate, finish with left click
+/–   : Zoom in/out
Pos1   : Show all objects
Shift-C   : The view is shifted to show all objects

Manipulation Modes

G   : Grap
R   : Rotate
S   : Scale

G/R/S+Axis   : Translation/Rotation/Scale along the chosen *Global* Axis (X, Y, Z)
G/R/S+2xAxis: Translation/Rotation/Scale along the chosen *Local* Axis (X, Y, Z)
+Shift   : Translation/Rotation/Scale along the chosen Plane (X/Y, Y/Z, Z/X)
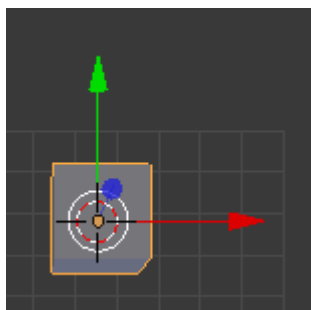   (e.g., press Y (as the normal) → X/Z plane is used)

Combined with Alt: UnDo ("Object Mode"; not in "Edit Mode")

Ctrl+Space: Show/Hide Manipulators

Select here the manipulator needed (in this case the arrow):

Transformation orientation, e.g. "Local" or "Global" are used, to define the base coordination system for the manipulators

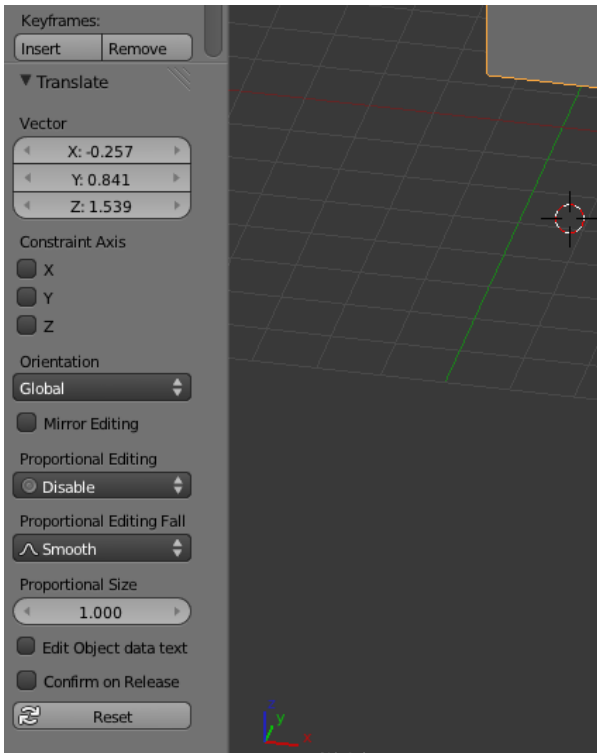Left-Click on Arrows of Object → Movement along the chosen axis
Ctrl+Movement: in full Blender steps
Ctrl+Shift: Movement in 1/10 Blender steps

Undo Options

Ctrl-Z: Undo (32 Undos, can be changed File → Preferences → „Editing" → Change Size of UnDo History)

Ctrl-Shift-Z: Redo

The Last Action/Transformation is shown here and can be manipulated

Origin → change the Gizmo of an object

Edit Mode

Tab: Edit Mode (toggle between Object and Edit Mode)

select with Right Mouse Button single vertices

Shift: Multiple Selection, keep pressed by selecting 4 nodes

S + 0 + Enter → Place all selected nodes in one place
(S for scale, 0 Scales the distances between all selected nodes to 0;
 pressing S + 10 would scale the distances between all selected nodes to the 10th of their length;
 this method can again be combined with X, Y and Z restraints, e.g. by selecting S + X + 0;
 watch the actual scale on the left bottom corner shown below)
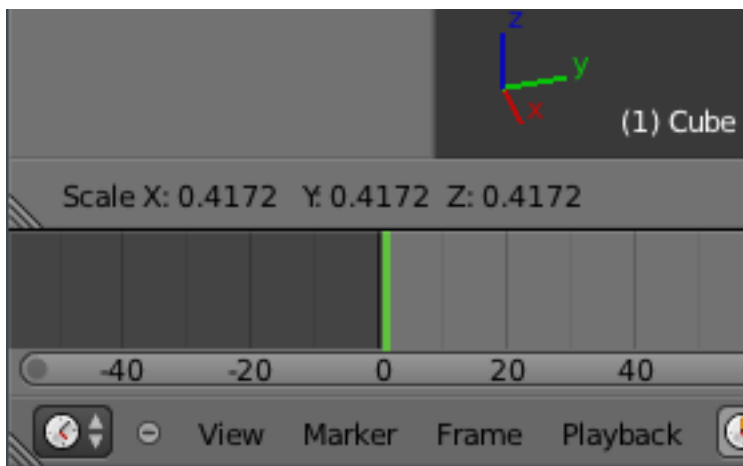
W   : "Specials" Pup-Up for Edit Mode appears, select:
                          Remove Doubles: Removes all overlapping vertices in one position,
                          e.g. after using S+0
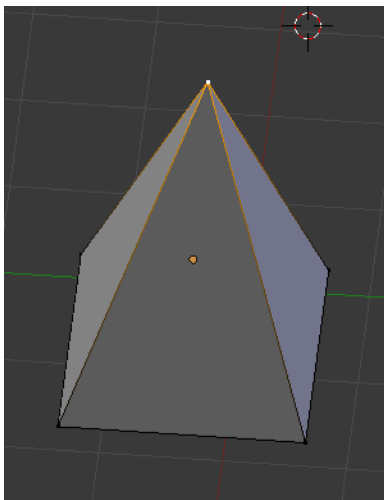
Further ShortCuts:

X *or* DEL   : Delete Objects

Shift+A: Add Objects to actual object (remember, we are in Edit Mode, these objects will be not a single object, but they will be added to the actually edited object) or

Add

Selection Modes

Ctrl+Left Click   : Selection in Pencil Mode

C   : Brush Mode (ESC to exit)

Ctrl + Tab   : Change Sub-Edit Mode: Vertex, Edge, or Face

A   : (De-)Select All

Manipulation Modes

Vertex select   : Select vertices
Edge select   : Select edges
Face select   : Select faces
+Shift   : Select multiple vertices/edges/faces
+Ctrl   : Select all vertices/edges/faces between previous and actual selection

E   : Extrude vertices/edges/faces

first select two unconnected vertices and
W → Merge ...   : Combine and merge two vertices
or
F   : A direct edge between both vertices is added

first select three or more vertices connected by edges (but without a face in between)
F   : create face between vertices
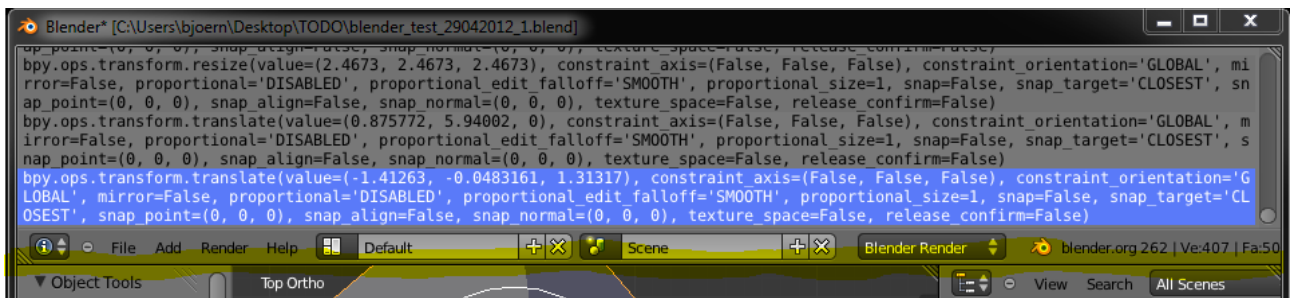
first select two connected vertices and
W → Subdivide ...   : A new node is added between the preselected two vertices

first select a single node as starting vertex
CTRL + LM   : A new vertex plus edge between the preselected vertex is added

API-Navigator
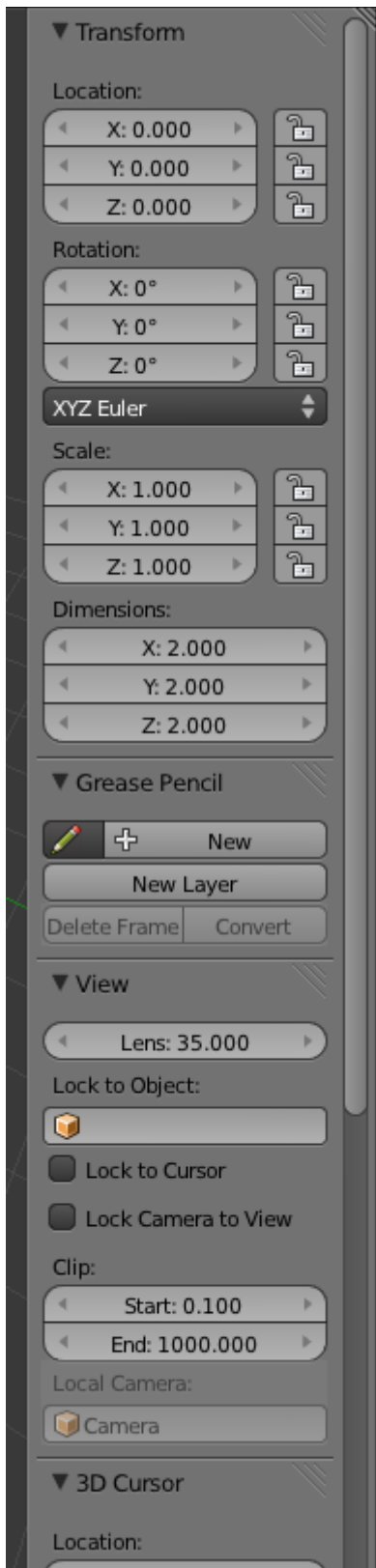
Help → Python API Reference

The Python-Scripts executed by Blender are always shown in the top section which is normally hidden. To open this section, the yellow marked line (see screen shot) has to be dragged down with the Mouse+LeftPress.
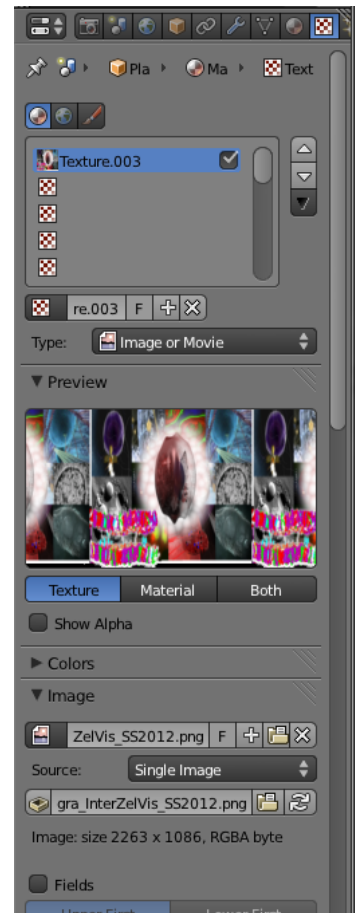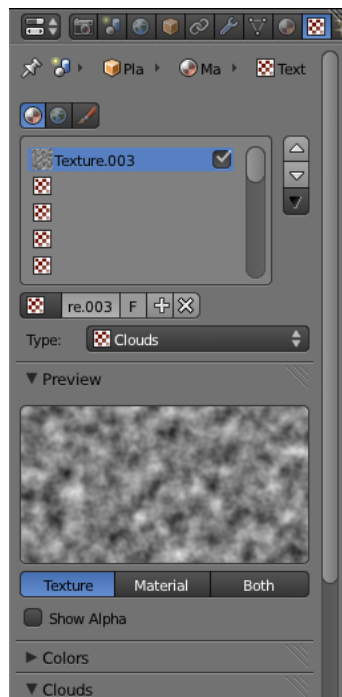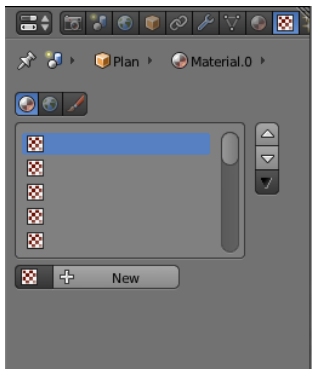
Properties Window

N → Properties of the selected object

▼ Transform

Location:
- ◀ X: 0.000 ▶
- ◀ Y: 0.000 ▶
- ◀ Z: 0.000 ▶

Rotation:
- ◀ X: 0° ▶
- ◀ Y: 0° ▶
- ◀ Z: 0° ▶

XYZ Euler

Scale:
- ◀ X: 1.000 ▶
- ◀ Y: 1.000 ▶
- ◀ Z: 1.000 ▶

Dimensions:
- ◀ X: 2.000 ▶
- ◀ Y: 2.000 ▶
- ◀ Z: 2.000 ▶

▼ Grease Pencil

[✏] [➕] New

New Layer

Delete Frame | Convert

▼ View

◀ Lens: 35.000 ▶

Lock to Object:

[📦]

☐ Lock to Cursor

☐ Lock Camera to View

Clip:
- ◀ Start: 0.100 ▶
- ◀ End: 1000.000 ▶

Local Camera:

[📦] Camera

▼ 3D Cursor

Location:

Background Image

This image is only shown in view ports, e.g. in the camera perspectives:
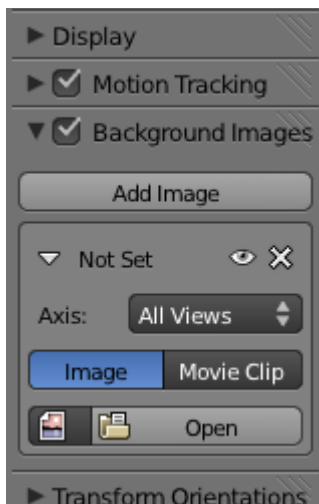
(this is still the properties dialog)

This maybe useful if an image should be used as a base for a three-dimensional object, e.g. image segmentation. Important: If "All Views" is chosen, the images are only shown in orthographic perspective, which is toggled by "5" on the NumPad
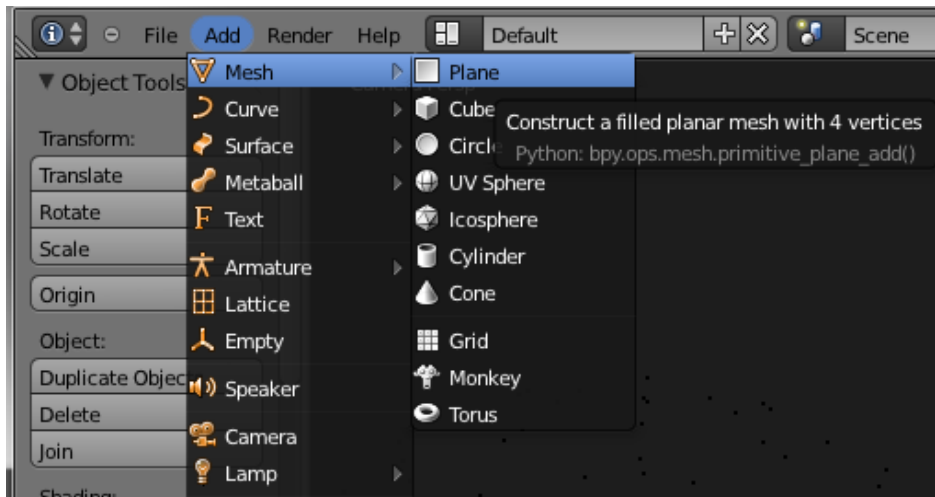
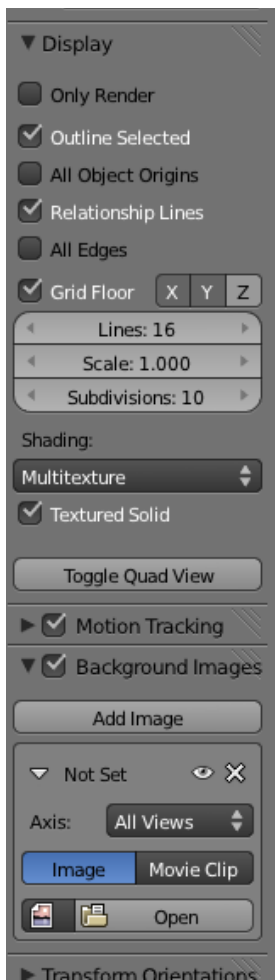→ Therefore, usually it will be needed to correlate an image with a plane:

A Plane with an Image

The complex way

(Attention only for those who plaid around with the render settings: use the standard renderer: the Blender Renderer)

Create the Plane:

Make sure, that "Textured Solid" is checked in the properties (Press N to toggle properties):

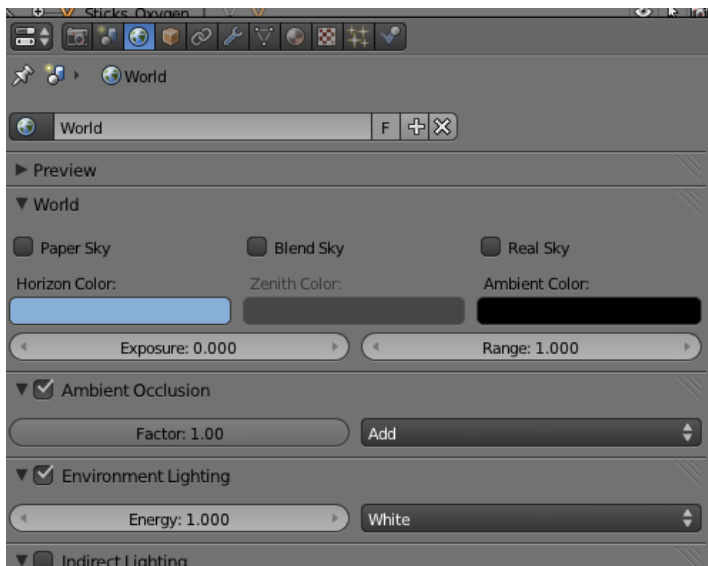Create a new Material (the plane has to be selected):

Create a new Texture: →   →

The easy way

World Background Settings

Change the Light/Background Settings in the World Options:

Some new Options and a few Repetitions

B	→ Border Select
H	→ Hide all selected
Shift+H	→ Hide all unselected
Alt+H	→ Unhide all
A	→ De-Select All
W	→ Specials: Subdivide line between selected vertices
Shift+D	→ Duplicate
Alt+M	→ Merge selected nodes (Edit Mode only)
E	→ Extrude selected nodes or shapes
F	→ create face between selected vertexes

Modifiers

Modifiers can be used to change the appearance of an object without changing the original shape. Modifiers can be temporarily deactivated. If you want to unite the object with its modifier, just press "Apply".
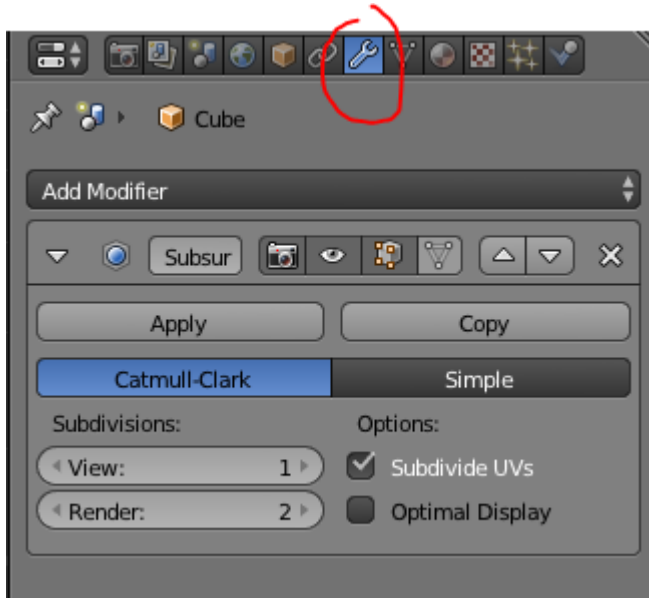
Generate/Subdivision Surface

Generates a smoother surface.
View: Subdivision surface factor for the actual 3D view.
Render: Subdivision surface factor for the next rendering.

Generate/Mirror Modifier

Mirror the next manipulations along one or more predefined axes