3D Wed Gallery for Game

Title: 3D Web Gallery for Game
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Chapter 2 INTRODUCTION TO THREE-DIMENSIONAL MODELLING

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Learning Outcome

Objectives of this chapter are: -

- ➢ Introduction to 3D Modelling
- ➢ How and where is 3D used
- ➢ Modelling Software
- ➢ Blender Interface

</div>

INTRODUCTION

Three-dimensional (3D) modelling and animation is starts with understanding basics of 3D, 3D space, 3D coordinate system, and 3D objects. Followed by understanding 3D tools and choosing right tools based on our requirements.

The 3D modelling process is different based on methods we use to create model but the finished products are the same.

3D process is starts with idea and documentations. Next stage is 3D creation which we start creating 3D model using 3D tools based on storyboard, blue prints and requirements.

The simple steps for creating 3D model are: -

- ➢ The 3D modelling is start with primitive shapes, polygonal, curve, or digital sculpting.
- ➢ After completion of basic 3D model, we will start applying effects such as painting, colouring, texturing, camera, lights, and shadows.
- ➢ With the completion of model, it's time to animate the object in 3D space. Animation process starts with armature and bone.
- ➢ The final process is rendering the model and output will be the final product.

In term of 3D computer graphics, **3D modelling** is the process of developing a mathematical representation of an object in three dimensions. The product is called **3D model**. Someone who works with 3D models may be referred to as a **3D artist**. It can be displayed as a two-dimensional image through a process called 3D rendering.

The three-dimensional model represented by collection of points in 3D space, connected by various geometric entities such as triangles, lines, curved surfaces, etc.

HOW AND WHERE IS 3D USED?

It is computer 3D graphic software enable us to create such a powerful and realistic 3D Model. It is empowering us to make functional prototypes saving money and reducing risk.

Nowadays 3D used in everywhere such as Gaming, Entertainment, Aerospace, Architecture, Arts, Automotive, Engineering, Education, Universities, manufacturing, medicine, product design, etc.

How Is It Used?

It is a computer graphics technique that allows us to develop a digital representation of any object, living or inanimate. This representation is called a 3D model, we may choose to create a physical representation of the model by using a 3D printer.

We need specialized software to create 3D models. These 3D models can be used for various purposes like illustration, architecture, movies, engineering, video games, commercial advertising, and so on. We use a 3D rendering process to view a 2D image of a 3D model.

Where Is 3d Used?

3D models are used for a variety of mediums including video games, movies, architecture, illustration, engineering, and commercial advertising. The 3D modelling process produces a digital object capable of being fully animated, making it an essential process for character animation and special effects.

Industries that 3D Modelling uses are as follows: -

- ➢ Medicine
- ➢ Entertainment
- ➢ Gaming
- ➢ Architecture
- ➢ Engineering
- ➢ Aerospace
- ➢ Arts
- ➢ Automotive
- ➢ Schools
- ➢ Universities
- ➢ Manufacturing
- ➢ Publishing
- ➢ Advertising and Marketing
- ➢ Geology and Science
- ➢ HealthCare
- ➢ And many more.

3D examples of Medical Industry

Today, 3D models are used in a wide variety of fields. The medical industry uses detailed models of organs; these may be created with multiple 2-D image slices from an MRI or CT scan.

Medicine in a field where breakthroughs save lives, 3D printers are helping doctors, researchers and medical equipment manufacturers to iterate faster, test more thoroughly and personalize healthcare like never before.
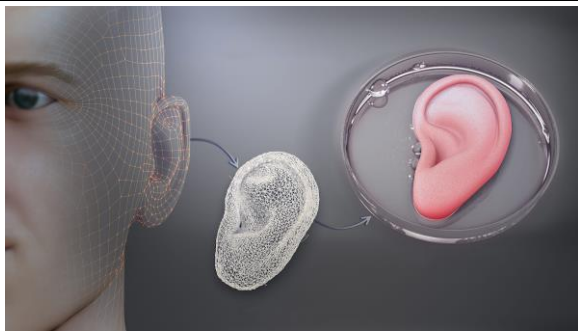
Figure 1 3D to create organ sample

Figure 2 3D for organ creation

Figure 3 3D Printing

Figure 4 3D in dentistry

A. Model of Spine   B. Traditional titanium impant   C. 3D Printed Implant

Figure 5 3D Printing

Using 3D in Animation and movie

The **movie industry** uses them as characters and objects for animated and real-life motion pictures.

The fact is that there's hardly a big film (or any of the popular television shows) that comes out of Hollywood without extensive use of 3D modelling. Even in shows that aren't full of special effects, it's relatively common to have 3D images added to shots to improve the texture and design of the scene.

Figure 6 3D in Animation movies

Figure 7 Alita Battle Angel

Figure 8 3D in Movie Alta battle angle

Figure 9 Alita Battle Angle

Using 3D in gaming industry

The **video game industry** uses them as assets for computer and video games. One of the best-known uses of 3D models is in the area of gaming. As video games have become more and more realistic, the need for 3D software and 3D assets has become nearly insatiable. We've come a long way since the original Mario. Today, no matter if you're destroying aliens or driving animated automobiles, the scenes, the props, and even the people look real enough to pop out of the game and sit down to play beside you. Even universities and colleges now offer courses in 3D modelling for video gaming.

Figure 10 3D in Video Games

Figure 11 3D in Video Games

Figure 12 3D Character for game

Figure 13 3D in Game

Figure 14 3D of spaceship

Using 3D in Architecture industry

The **architecture industry** uses them to demonstrate proposed buildings and landscapes in lieu of traditional, physical architectural models.

With an 3D Tools on your side everything becomes far more efficient. Within hours you'll have a concept model in your hands – and at a fraction of the cost too. But why stop at one model? With 3D printing, you can let the creativity flow crafting many iterations until you're satisfied.

Figure 15 3D In Architecture

Figure 16 3D In Architecture

Figure 17 3D architecture

Using 3D in Engineering

The **engineering community** uses them as designs of new devices, vehicles, and structures as well as a host of other uses.
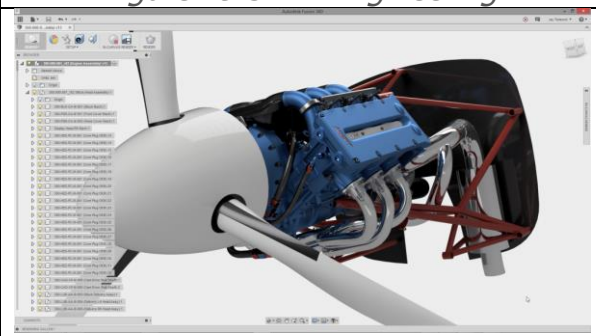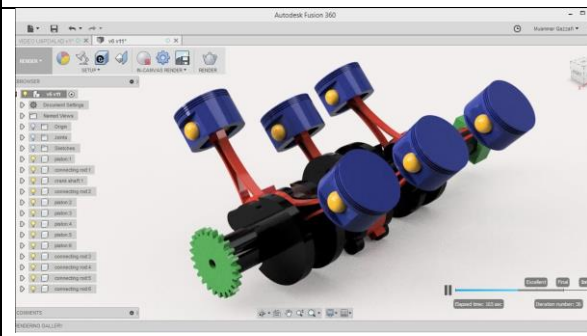
When engineering bold new designs, 3D printing lets you try new prototypes, addressing problems and finding solutions as you go, all in just a matter of hours. Even those with complex internal structures and geometries, something traditional methods just can't offer.

Figure 18 3D in Engineering
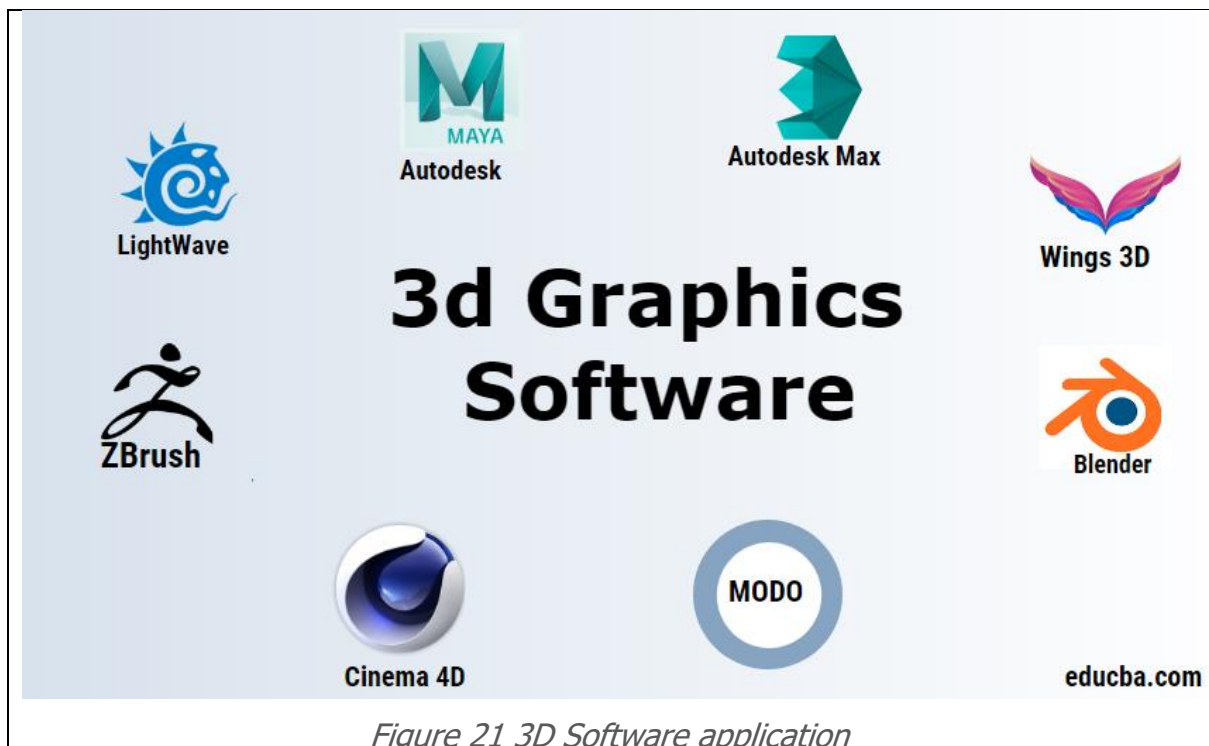

Figure 19 3D in Engineering
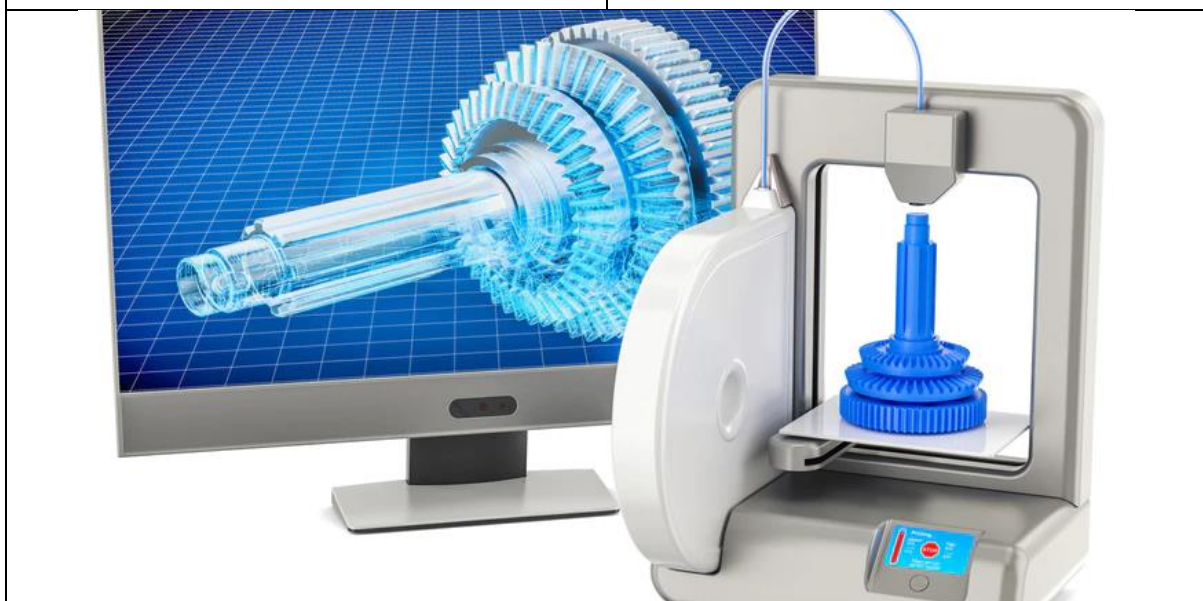
Figure 20 3D in Engineering

3D MODELLING SOFTWARE

3D modelling software is a 3D computer graphics software used to produce 3D models.

Figure 21 3D Software application

These quality programs won't automatically make you a better artist – you'll still need to learn those 3D skills. But when it comes to creating incredible artwork and animation, having the right 3D modelling software for your style, skill level and budget certainly helps.

List of some of 3D Modelling Software

- ➤ Autodesk Maya
- ➤ Houdini
- ➤ Cinema 4D
- ➤ Modo
- ➤ Autodesk 3Ds Max
- ➤ ZBrush
- ➤ Rhinoceros
- ➤ Substance Designer
- ➤ Blender
- ➤ Daz Studio
- ➤ Skethup
- ➤ Sculptris
- ➤ Wings 3D
- ➤ Lightwave

## How to choose the best 3D modelling software

So how do you choose the right 3D modelling software for you? Well, there are some key considerations to bear in mind. Firstly, as a general rule, any kind of 3D work will require around 16GB RAM or more. Most of the 3D software applications here need roughly 5GB of disc space to install, but you need to take rendering into account too.

Also, if you're taking your digital art seriously, then investing in one of the best graphics cards , with a fast processor and a lot of memory is highly recommended. That way, you're much less likely to experience a lag when displaying complex 3D scenes.

We've got the best paid-for options, as well as the best free 3D software for those on a budget.

Maya

Ask any 3D artist to name the best 3D modelling software, and most will choose Autodesk Maya. Largely seen as the industry standard for CG, Autodesk Maya boasts an unrivalled range of tools and features. This hugely extensible app isn't for the faint-hearted: its toolset is hugely complex and takes time to learn. However, if you're aiming to get a job in the animation or VFX industries, you'd be wise to use the same software that the likes of ILM, Pixar, DNEG and Frame store use.
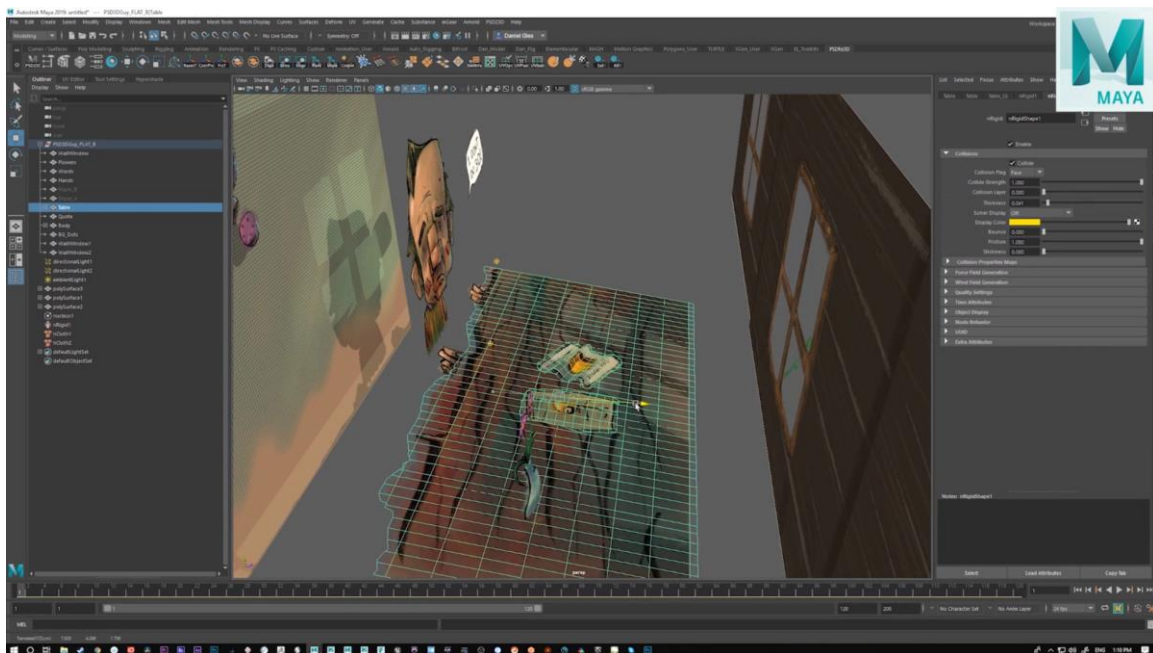
Figure 22 Maya Autodesk

Maya is great at modelling, texturing, lighting and rendering – its vast feature set includes particles, hair, solid body physics, cloth, fluid simulations and character animation. There's a chance you may never touch some of its functionality, so you need to decide if it's actually overkill for your specific needs.

Houdini 18

Coming in second place in our guide to the best 3D modelling software is Houdini by SideFX. Widely used in the VFX industry for creating a range of amazing 3D imagery, Houdini's node-based procedural approach provides digital artists with an unprecedented level of power, flexibility and control. This nodal workflow isn't to everyone's liking, but Houdini also has more traditional tools for directly interacting with polygons on screen.

Like Maya, this level of power and non-standard workflow can be tricky to get to grips with. Fortunately, SideFX offers Houdini Apprentice, a free version of Houdini FX, which can be used by students, artists and hobbyists for personal non-commercial projects. The free version gives you access to virtually all of the features of the award-winning Houdini FX to develop your skills and for working on personal projects. The full-featured Houdini Indie also provides an affordable commercial option for small studios.

Figure 23 Houdini 18

Cinema 4D R20

Maxon's Cinema 4D has been around for many years and is highly regarded in the worlds of motion graphics, visualization and illustration. It's a professional, complex piece of software, known for its overall stability and for being the CG app with the easiest learning curve.

Cinema 4D enjoys a thriving community with a huge online library of tutorials and how-tos – not to mention training site Cineversity, to which you get free membership when you buy the app or pay for the annual Maxon service agreement (MSA).

Figure 24 Cinema 4D

Autodesk 3ds Max

3ds Max is Autodesk's PC-only 3D computer graphics program, used for TV and feature film production and for architectural and product visualisation. Like its sister software Maya, 3ds Max boasts a very robust toolset for 3D modelling, not to mention fluid simulations, hair and fur, plus character rigging and animation.

Figure 25 Autodesk 3Ds Max

It uses both direct manipulation and procedural modelling techniques, and a huge library of different modifiers makes the modelling process easier for new or intermediate 3D artists.

3ds Max offers a professional toolset and, unsurprisingly, comes with a professional price tag. However, students can get the software for free and a trial version is also available for 30 days.

Modo

Borne out of the development team behind LightWave 3D, Modo has grown from a basic subdivision surface modeller to the fully-featured digital content creation app we know today. Its tools have been well thought through and implemented, making it very user-friendly, and when you throw in a really solid rendering system, it's easy to see why Modo has grown in popularity.

With modelling at its core, Modo is one of the best apps out there for the creation of polygonal forms, using both direct tools and procedural techniques. The addition of the best-in-breed MeshFusion Boolean system simply extends its modelling repertoire.
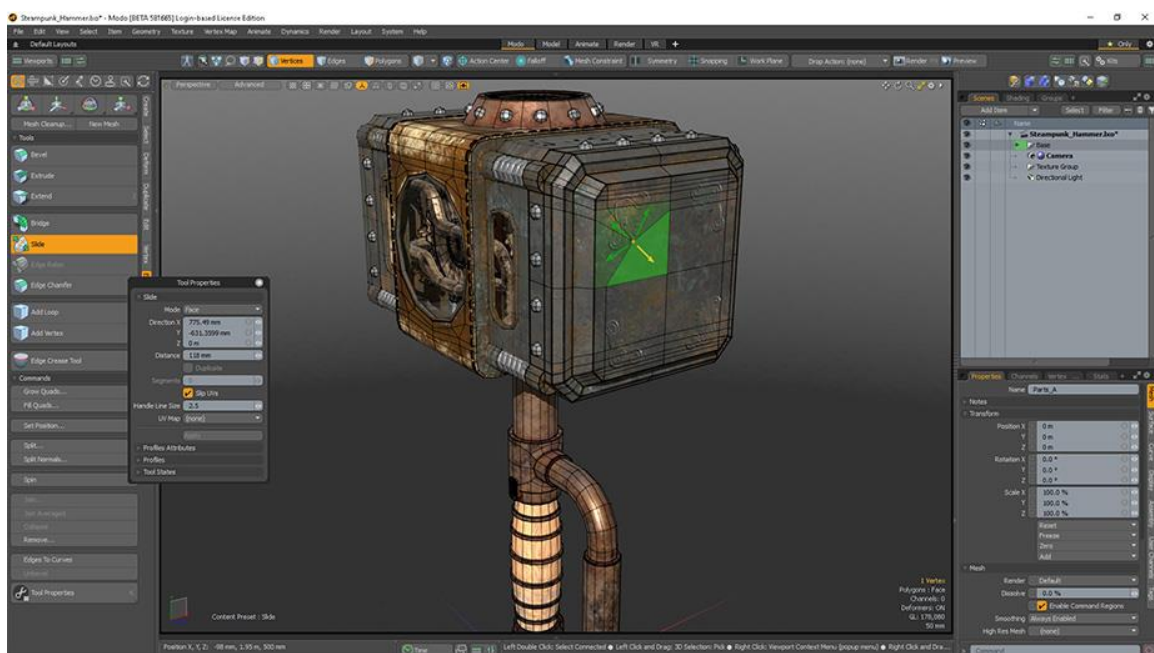
Figure 26 Modo

Modo might lack the high-end dynamics and simulation tools you might find in a program like Maya, but it holds its own when it comes to creating stunning artwork, producing as good a 3D render as any other package currently available.

ZBrush 2020

ZBrush is a standalone sculpting and modelling app that is best suited to the creation of organic forms – although recent updates have gradually improved its hard-surface abilities. It works in a non-standard fashion, with a workflow and user interface that's initially very hard to learn, so you really need to get ZBrush and use it every day to become proficient.

However, ZBrush isn't only for sculpting and modelling: it can also be used to create UV maps and paint textures, enabling seasoned artists to craft entire figures, with clothing and props, ready for rendering. ZBrush is a popular choice among artists

wanting to 3D print toys and action figures, too, with tools specifically aimed at 3D printing.
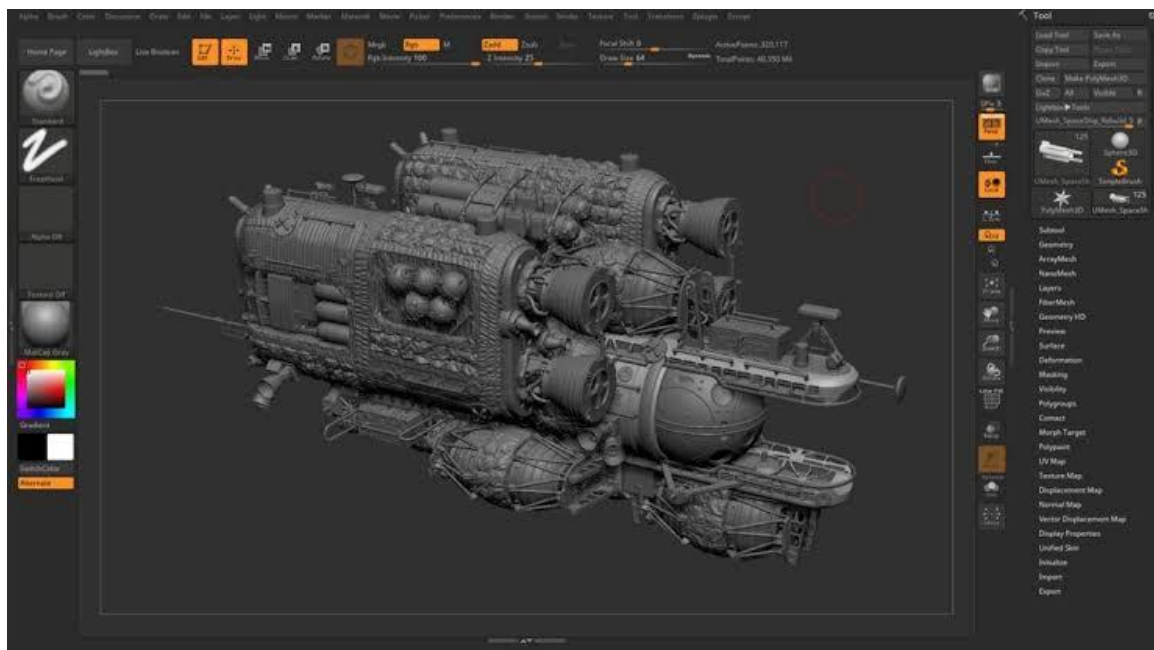

Figure 27 ZBrush

Blender

For CG artists on a budget, it doesn't get any better than Blender, the free modelling, texturing, animation and rendering app. Version 2.93.0 provides a modern, more consistent interface, plus high-quality viewport, real-time interactive rendering, and tons of fixes and features.
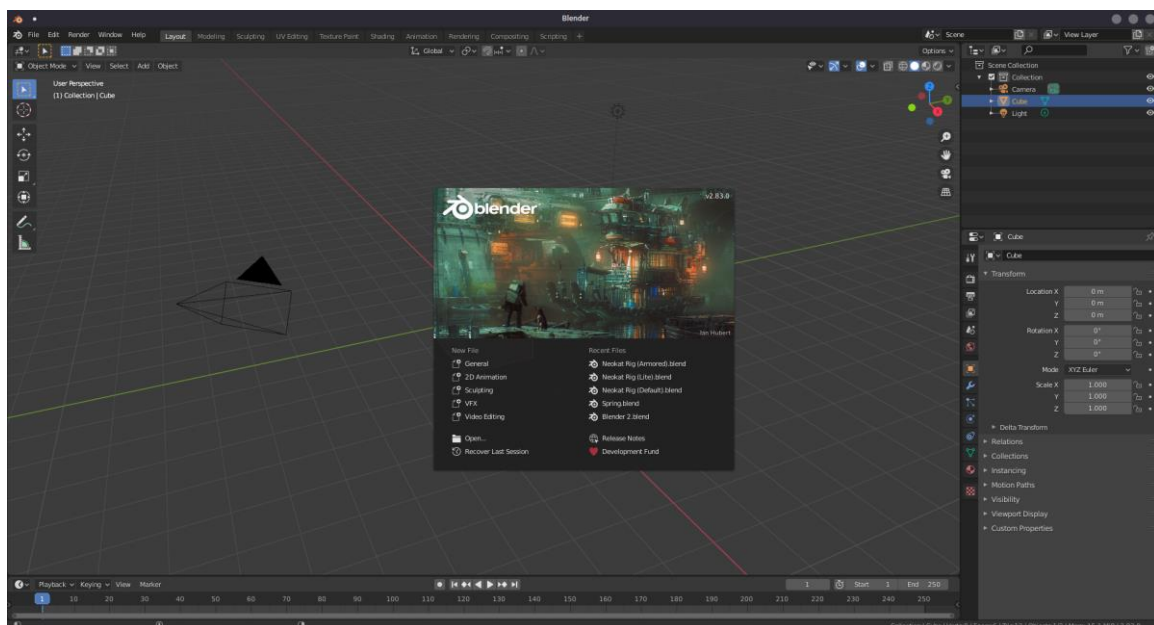

Figure 28 Blender

The open-source program has been around for a long time now, and subsequently has an army of artists, teachers and enthusiasts behind its continued development. It boasts a highly impressive 3D modelling and sculpting toolset, and is considered a

completely viable alternative to paid modelling programs. Blender was notorious for its non-standard way of working, but 2.82a solves a lot of these issues, and so it will feel more familiar if you're moving from an existing app.

Blender is a brilliant starting point to see if 3D graphics are for you – and we have a host of fantastic Blender tutorials to get started with elsewhere on the site. Despite the non-existent price tag, it's capable of producing images and animation that on a par with just about any other 3D modelling software on the market.

BLENDER INTERFACE

After starting Blender and closing the Splash Screen the Blender window should look something similar to the image below; as Blender's user interface is consistent across all platforms.
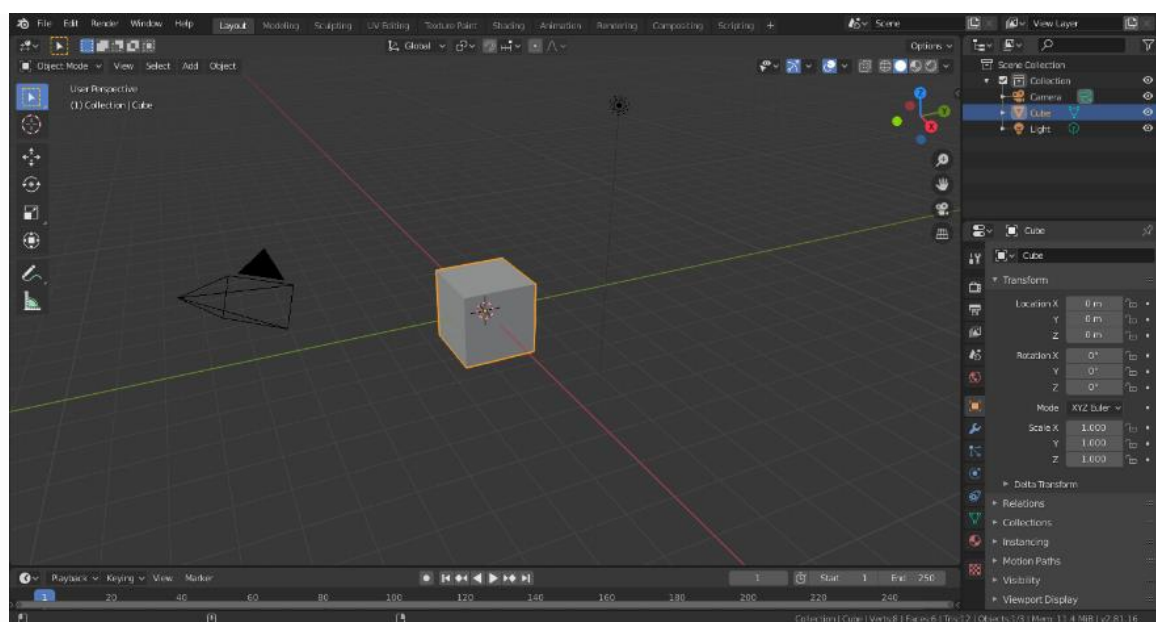
Figure 29 The default startup Blender window

Theme colors

Blender allows for most of its interface color settings to be changed to suit the needs of the user. If you find that the colors you see on screen do not match those mentioned in the Manual then it could be that your default theme has been altered. Creating a new theme or selecting/altering a pre-existing one can be done by selecting the Preferences editor and clicking on the Themes tab.
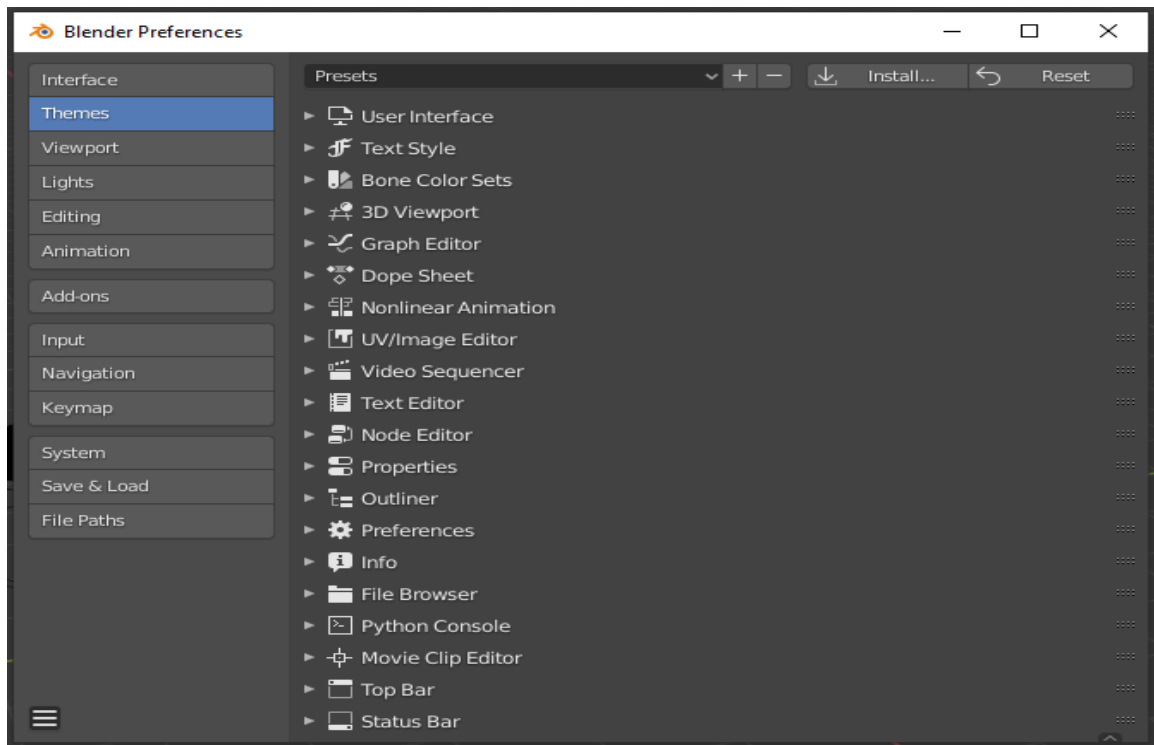
Figure 30 Blender Theme colors

Blender's interface is separated into three main parts: -

➢ Topbar at the very top.
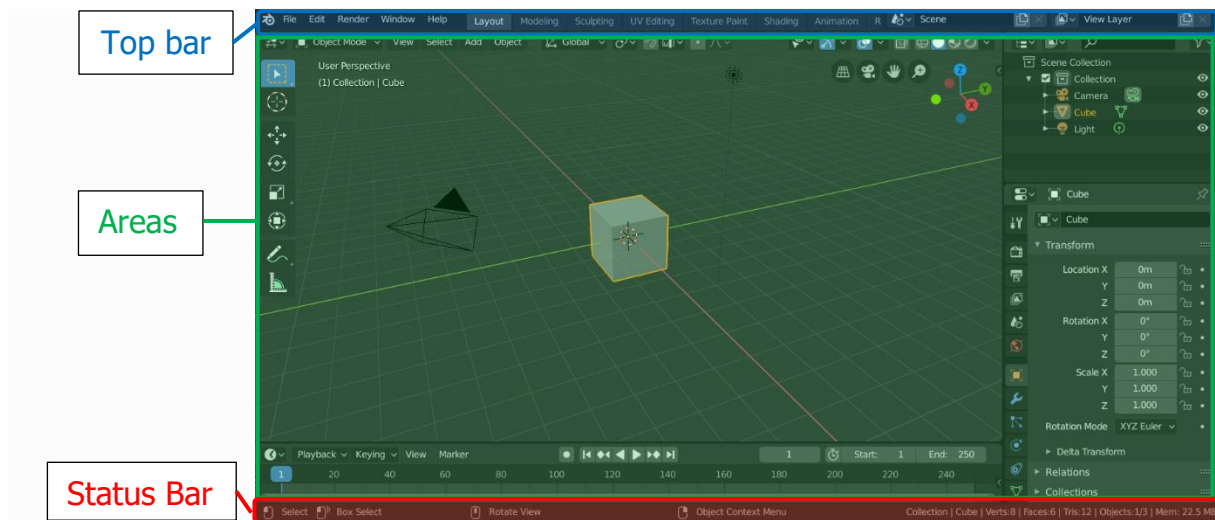➢ Areas in the middle.
➢ Status Bar at the bottom.

Figure 31 Blender's default Screen Layout. Top bar (blue), Areas (green) and Status Bar (red).

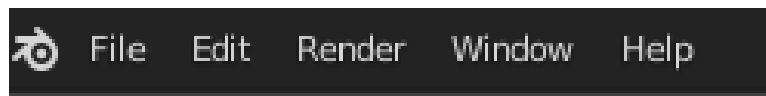## Top bar

Menus

➢ File
➢ Edit
➢ Render
➢ Windows

➢ Help

Figure 32 Menu Bar

For more detail about the menu item refer to Blender Manual at: -
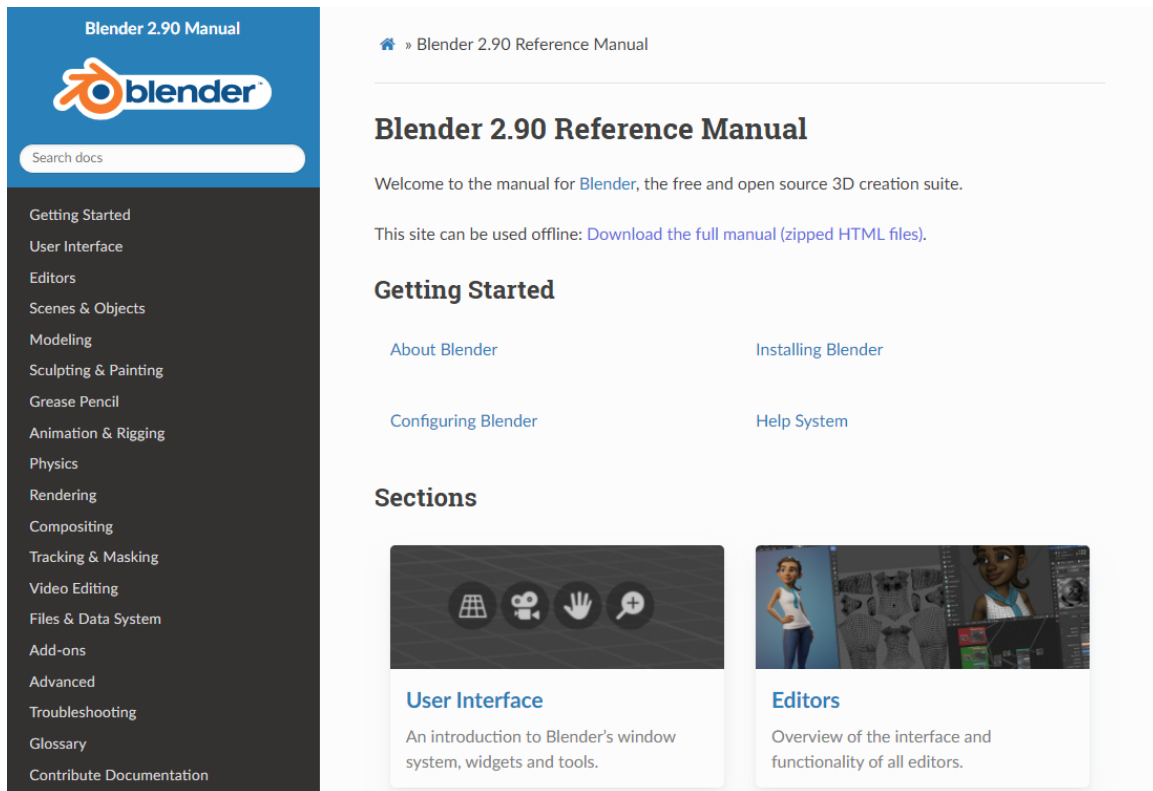

Figure 33 https://docs.blender.org/manual/en/dev/

Workspaces

Workspaces are essentially predefined window layouts. Blender's flexibility with Areas lets you create customized workspaces for different tasks such as modelling, animating, and scripting. It is often useful to quickly switch between different workspaces within the same file.
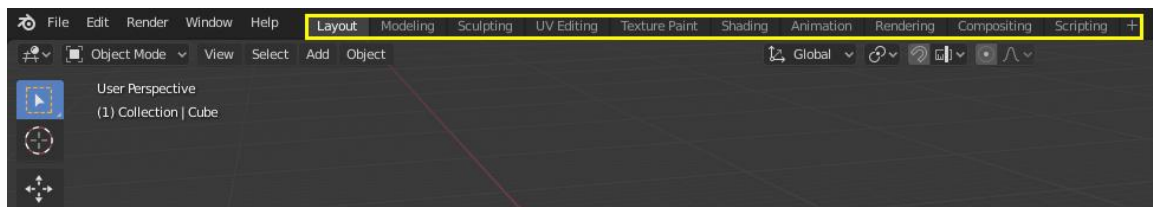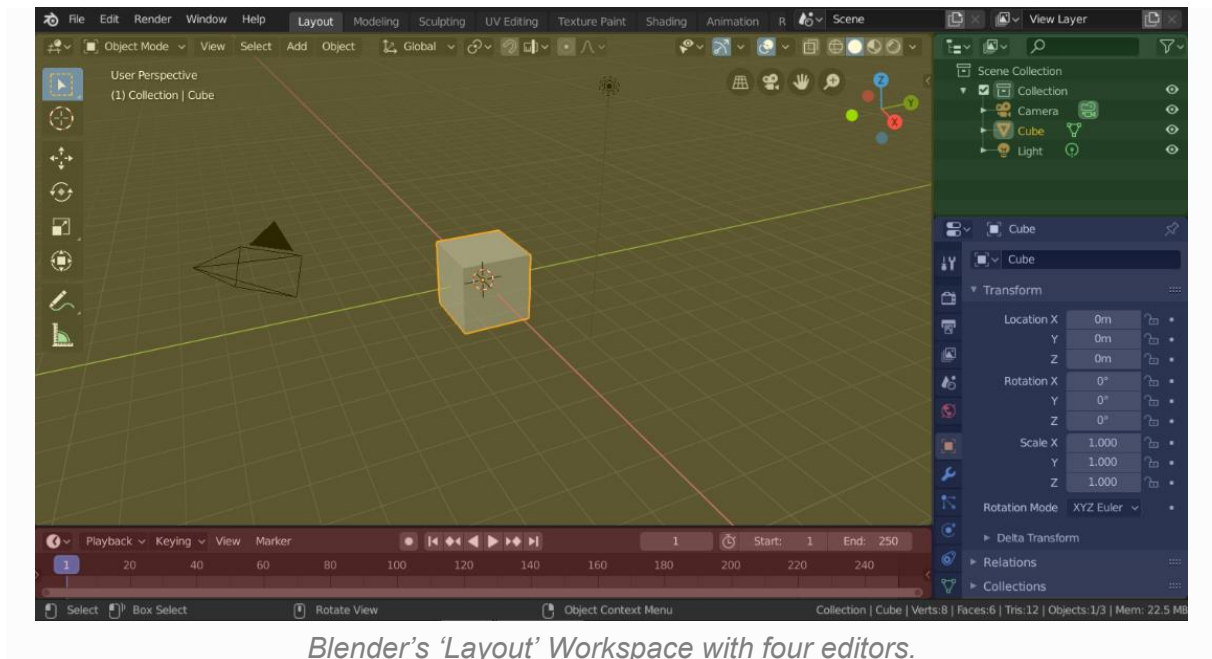

Figure 34 Workspaces are located at the Topbar

Default Workspaces

Blender's default start-up shows the "Layout" workspace in the main area. This workspace is a general workspace to preview your scene and objects and contains the following Editors: -

➢ 3D Viewport on top left.
➢ Outliner on top right.
➢ Properties editor on bottom right.
➢ Timeline on bottom left.

Blender's 'Layout' Workspace with four editors.

3D Viewport (yellow), Outliner (green), Properties editor (blue) and Timeline (red).

Blender also has several other workspaces added by default: -

Modeling

For modification of geometry by modeling tools.

Sculpting

For modification of meshes by sculpting tools.

UV Editing

Mapping of image texture coordinates to 3D surfaces.

Texture Paint

Tools for coloring image textures in the 3D Viewport.

Shading

Tools for specifying material properties for rendering.

Animation

Tools for making properties of objects dependent on time.

Rendering

For viewing and analyzing rendering results.

Compositing

Combining and post-processing of images and rendering information.

Scripting

Programming workspace for writing scripts.

Additional Workspaces

Blender has a couple additional Workspaces to choose from when adding a new Workspace: -

2D Animation

General workspace to work with Grease Pencil.

2D Full Canvas

Similar to "2D Animation" but contains a larger canvas.

VFX

➢ Masking

Tools to create 2D masks for compositing.

➢ Motion Tracking

Tools to motion track and stabilize footage.

➢ Video Editing

Sequence together media into one video.

Save and Override

The workspaces are saved in the blend-file. When you open a file, enabling the Load UI in the File Browser indicates that Blender should use the file's screen layouts and overriding the current layout. See Load UI.

A custom set of workspaces can be saved as a part of the Defaults.

Status Bar

The Status Bar is located at the bottom of the Blender window and displays contextual information such as keyboard shortcuts, result or warning message and statistical information. The Status Bar can be hidden by disabling Show Status Bar in Window menu or by dragging from the top edge down.

Figure 35 Status Bar.

Keymap Information

The left side of the Status Bar displays mouse button shortcuts and the keymap of the active tool. In editors with a Toolbar, pressing Alt shows the hotkeys to change to a desired tool.
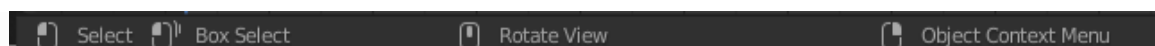
Figure 36 Keymap Information

Status Messages

The middle of the Status Bar displays information about in progress operations.


Figure 37 Status Messages

Running Task

The progress of the currently running task is show when a computation is being performed for example rendering, baking or playback. Hovering the mouse pointer over the progress bar will display a time estimate. The task can be aborted by clicking the cancel button (X icon).

Report Message

Blender operation results or warnings, such as after saving a file. They disappear after a short time. Click this label to show the full message in the Info Editor.

Resource Information

The right side of the Status Bar displays information about the Blender instance.
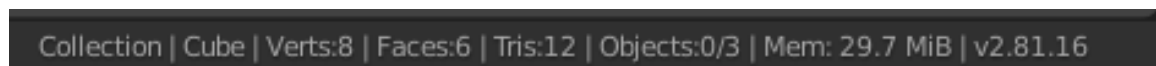
Figure 38 Resource Information

Collection
Name of the active Collection.
Active Object
Name of the active selected object.
Geometry
Displays information about the current scene depending on the mode and object type. This can be the number of vertices, faces, triangles (Tris) or bones.
Objects
Number of the selected objects and the total count.
Memory
The "Mem" label shows an estimate of Blender's RAM consumption. In a single-instance single-machine scenario, this estimate provides a measurement against the hardware limit of the machine.
Blender version
The version of Blender that is currently run.

MENUS

Blender uses a variety of different menus for accessing options and tools. Selecting menus can be interacted with in the following ways: -

Mouse selection

➢ Left Mouse Button (LMB) on the desired item.

Numerical selection

➢ You can use the number keys or numpad to input an item in the list to select. For example, Numpad1 will select the first item and so on.

Shortcuts

➢ Use Wheel while hovering with the mouse.
➢ Arrow keys can be used to navigate.
➢ Each menu item has an underlined character which can be pressed to activate it.
➢ Number keys or numpad can be used to access menu items. (Where 1 is the first menu item, 2 the second, etc. For larger menus Alt-1 the 11th… up to Alt-0 the 20th.)
➢ Press Return to activate the selected menu item.
➢ Press Esc to cancel the menu, or move the mouse cursor far from the pop-up, or by LMB clicking anywhere out of it.
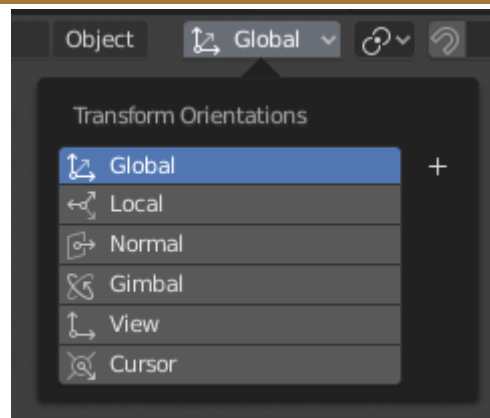
Select Menus
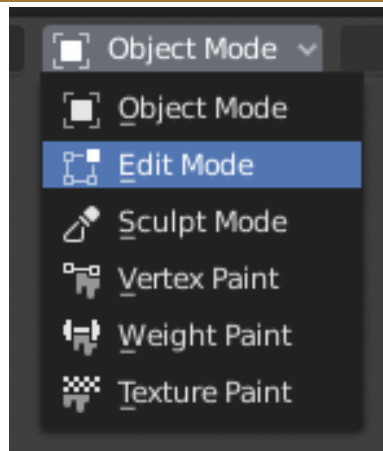
Figure 39 The 3D Viewport Mode Select menu.

The Select menu (short selector) lets you choose between a set of options. Select menu appears as an icon and/or text with down arrow on the right side of the button. The menu options are shown with LMB click on the button. The selected option is then shown as active on the menu button.

Popover Menus

The Transform Orientations pop-up menu.

Popover menus are overlays. Like Select Menus, pop-up menus also include down arrow on the right side of menu button. However, pop-up menus allow more content

to be shown, such as title, list options, buttons, sliders, etc. Popover menus group controls into a menu, which is automatically hidden when mouse pointer leaves menu boundaries (including a margin).

Context Menu

Context menus are pop-ups opened with the Menu key for editors and RMB for properties. Context menu contents depend on the location of the mouse pointer.

Pie Menus

A pie menu is a menu whose items are spread radially around the mouse.
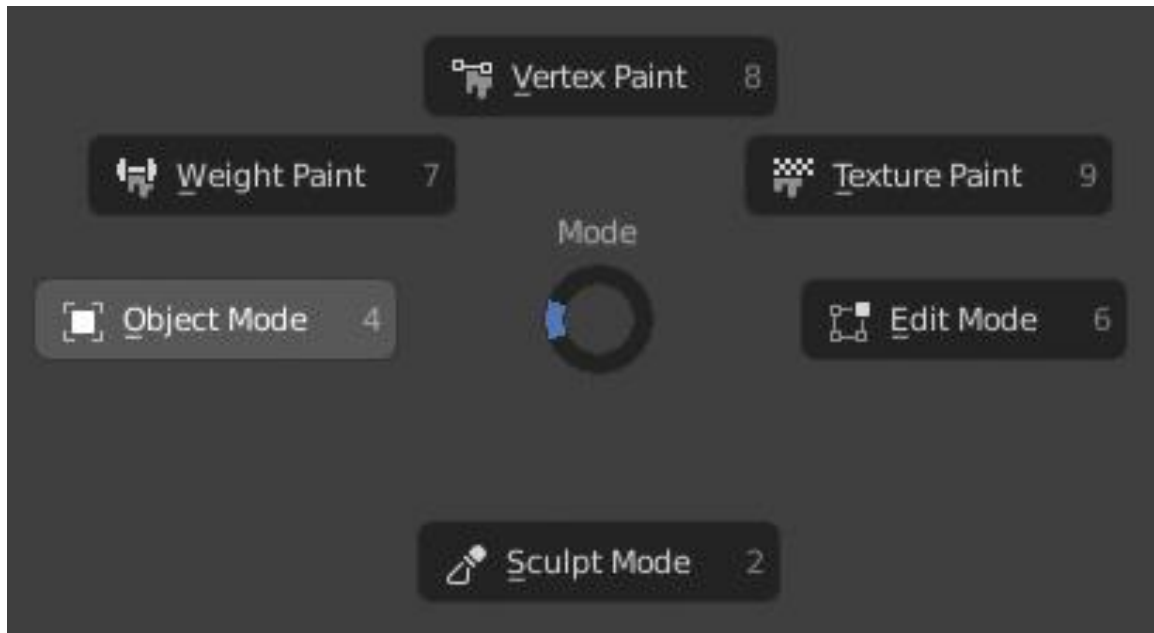
Figure 40 The 3D Viewport Mode Pie menu.

Interaction

The pie menu is spawned by a key press, which are listed in the add-on's documentation.

Tip

Fastest way to operate a Pie menu is to press down key(s) that invoke the menu, then move mouse slightly towards a selection, and release key(s) to activate the selection.

Releasing the key without moving the mouse will keep the menu open and the user can then move the mouse pointer towards the direction of a pie menu item and select it by clicking. Releasing the key, after moving the mouse towards a pie menu item, will cause the menu to close and the selected menu item to activate.

An open disc widget at the center of the pie menu shows the current direction of the pie menu. The selected item is also highlighted. A pie menu will only have a valid direction for item selection, if the mouse is touching or extending beyond the disc widget at the center of the menu.

Pie menu items support key accelerators, which are the letters underlined on each menu item. Also, number keys can be used to select the items.

SELECTING

By default, Blender uses the LMB to select items in the Blender window. Alternatively, the RMB can be used instead by changing the Preferences. Blender has several selecting tools that can be used across the different editors.
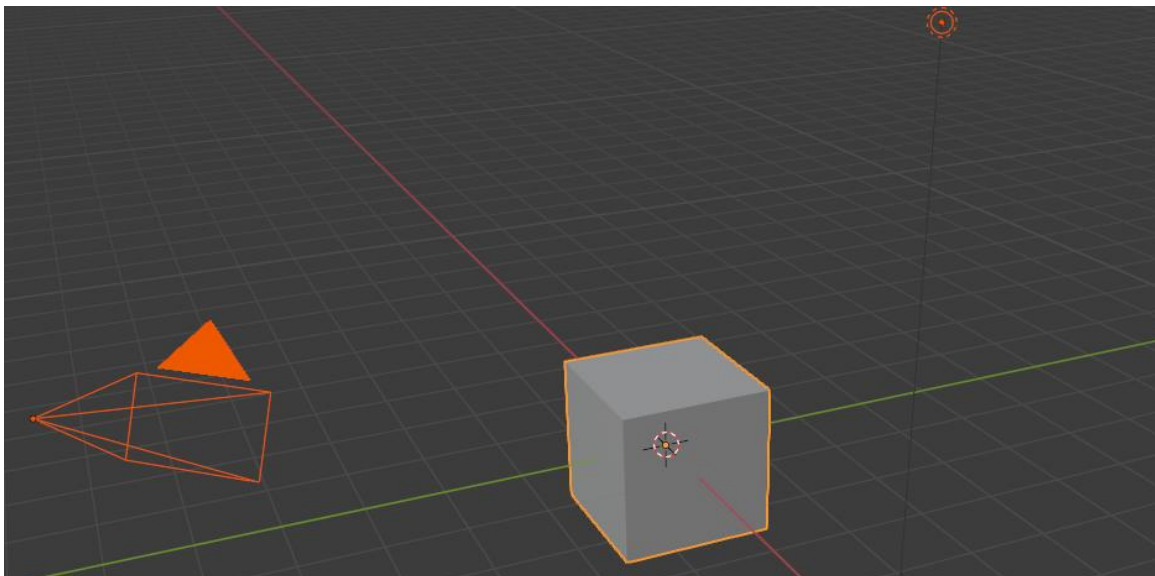
Selection Tools

Select All

Hotkey – A

By pressing A, it will select all items in the scene.

Note

 In Edit mode, it will select only the object which editing.


Figure 41 "A" Select all in Object mode

Select Box

Hotkey - B

To activate the tool, press B or click and drag LMB. With Select Box you draw a rectangle while holding down LMB. Any item that lies even partially within this rectangle becomes selected. If any item that was last active appears in the selection it will become active.

*Figure 42 Start* | *Figure 43 Selecting* | *Figure 44 Complete*
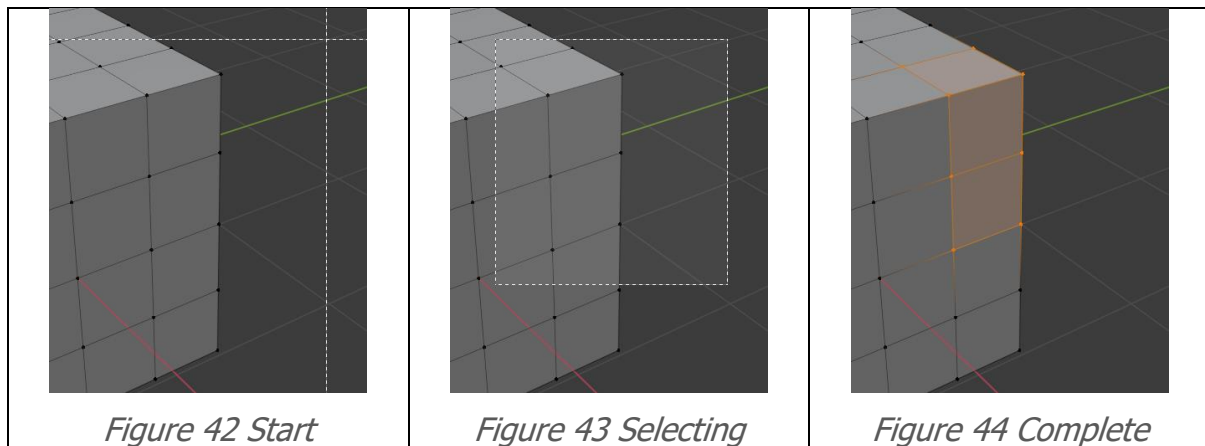
Select Circle

Hotkey - C

Circle Select C allows you to select multiple items within a circular area. Move your mouse over any items within the circular area (shown with a dotted circle) while holding LMB to select those items. Alternatively, use MMB to deselect them. When you're done selecting, press RMB or Esc. To change the diameter of the circle, scroll with the Wheel or use the NumpadPlus and NumpadMinus keys.

*Figure 45 Start* | *Figure 46 Selecting* | *Figure 47 Complete*
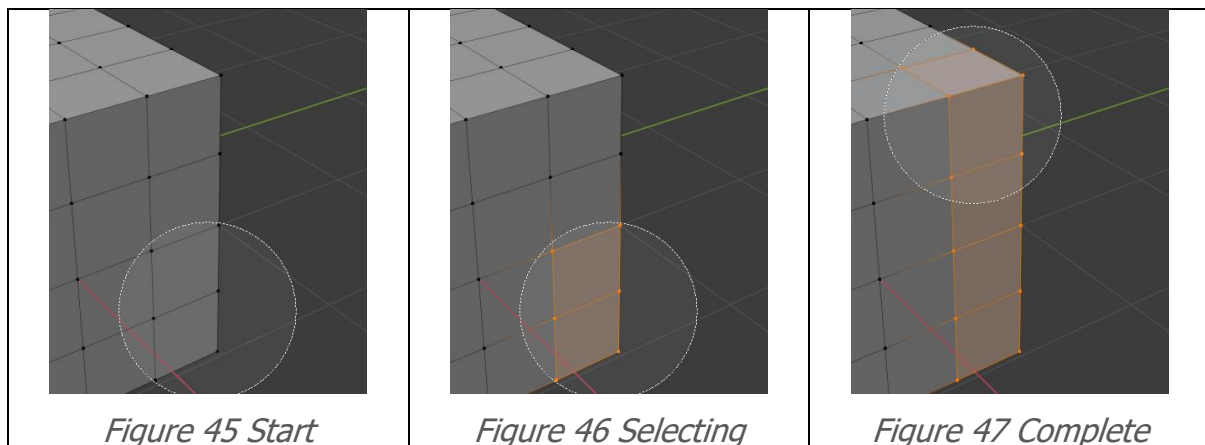
Select Lasso

Hotkey - Ctrl-RMB

Lasso Select is used to create a free-form selection. Simply hold Ctrl-RMB while drawing a dotted line around the items you want to select. The shape you draw will be automatically closed by connecting a line from the current position back to the starting point.
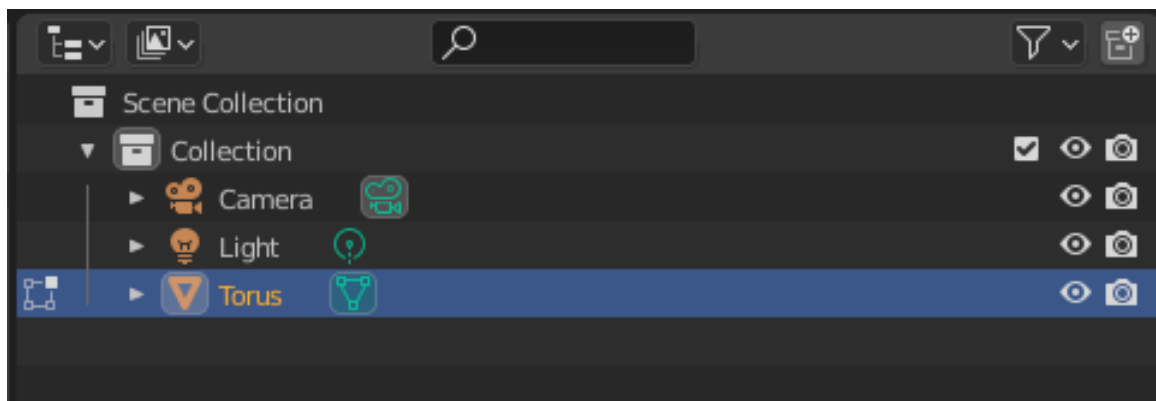
Note

Lasso Select adds to the previous selection. For deselection, use Shift-Ctrl-RMB.

Figure 48 Start	*Figure 49 Selecting*	*Figure 50 Complete*
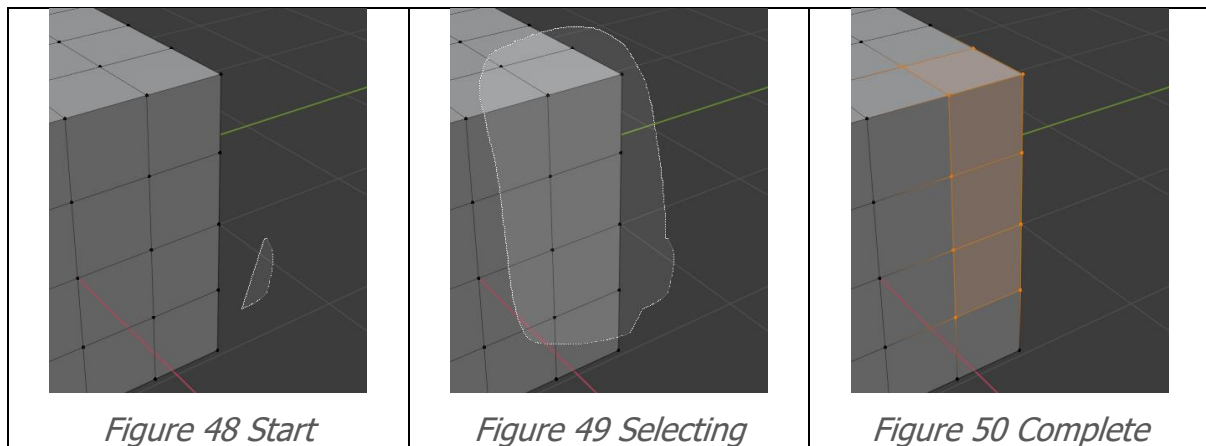
Outliner

The Outliner is a list that organizes data in the blend-file, i.e., the scene data, Video Sequencer data, or anything that gets stored in a blend-file.

Figure 51 Outliner Panel

The Outliner can be used to: -

➢ View the data in the scene.
➢ Select and deselect objects in the scene.
➢ Hide or show an object in the scene.
➢ Enable or disable selection (to make an object "unselectable" in the 3D Viewport).
➢ Enable or disable the rendering of an object.
➢ Delete objects from the scene.
➢ Unlink data (equivalent to pressing the X button next to the name of a data-block).
➢ Manage collections in the scene.

Each row in the Outliner shows a data-block. You can LMB click the disclosure triangle to the left of a name to expand the current data-block and see what other data-blocks it contains. Holding Shift when clicking on the disclosure triangle will expand child data-blocks recursively. LMB Clicking and dragging along disclosure triangles will expand or collapse multiple data-blocks.

Selecting and Activating

Selection is done with LMB (and/or the context menu, see below) on the row of a data-block. Single selections will also activate the data-block. The rows of selected data-blocks are highlighted blue, with the active data-block highlighted in a lighter blue.
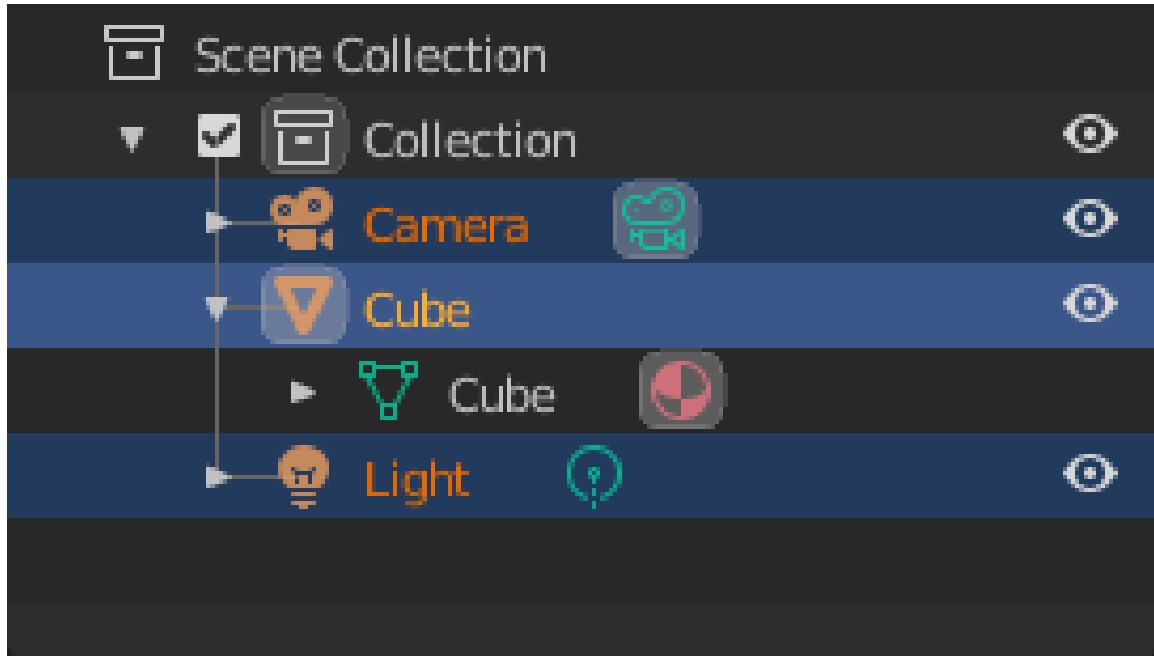

Figure 52 Selected data-blocks with the Cube active.

Clicking in empty space below the list of data-blocks will deselect all.

By default, selecting data-blocks in the Outliner will select the respective objects, bones, and sequences in the 3D Viewport and Sequencer. Selections in the 3D Viewport and Sequencer will be synced to each Outliner. To disable selection syncing, turn off the toggle in the filter popover.

Children of a data-block can also be selected by clicking the icon that is displayed to the right of the parent data-block's name.

Relations Management

Data-blocks can be dragged and dropped to manage data relations in the Outliner. To begin a drag and drop, LMB click and drag from the name or icon of a data-block.

Objects can be moved to collections by dropping on the name or contents of a collection. To link an object to a collection, hold Ctrl while dropping.

To set parent-child relations between objects, drop an object onto another object while holding Shift.
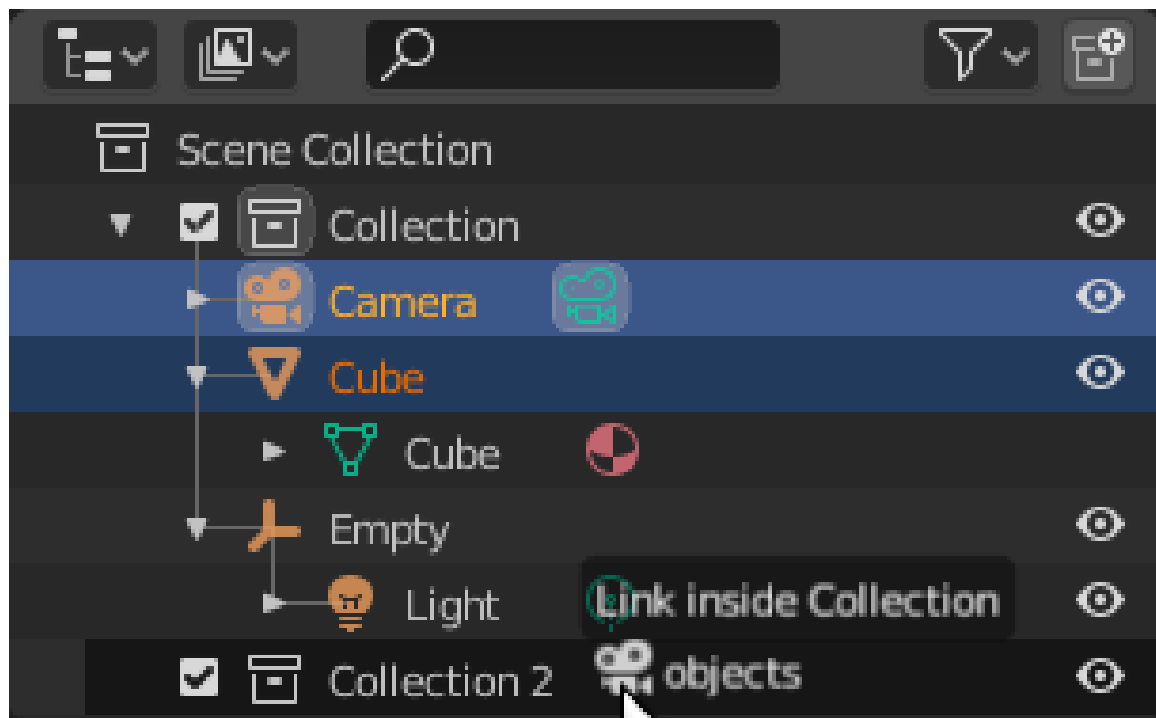
Figure 53 Linking objects to a collection.

Note

Drag and drop will attempt to operate on the entire selection. Selected data-blocks that are incompatible with the operation will remain unmodified.