

Week 1 Module 1: Edit Mode, General

Edit Mode

Now that you know the fundamentals, you may wonder how one can create complex, and often curved, shapes using these tools. Simply using duplicates of the default primitives seems far too tedious to create more complicated forms, and you'd be right.

For the creation of scenes with higher complexity, one of the most renowned and powerful (class of) features available in Blender, is the Edit Mode.

Now you may wonder what the edit mode is, after all, it sounds like it involves some sort of editing, and what even constitutes a mode in this context?

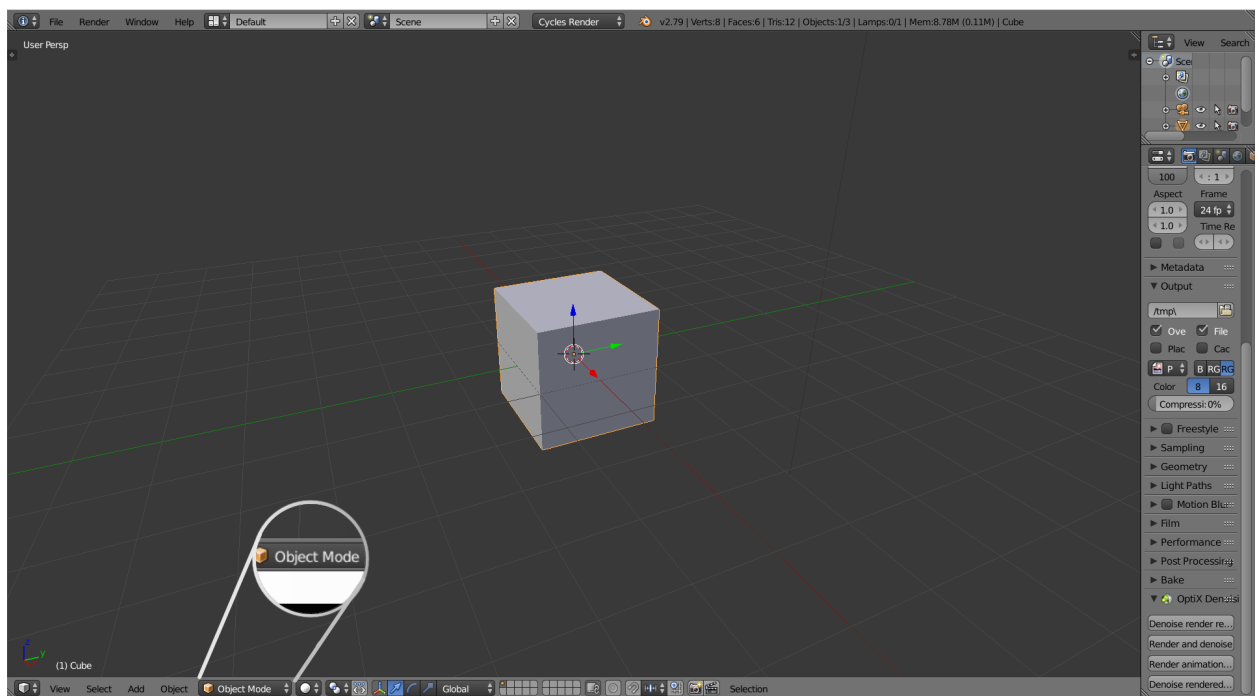


Fig 1: Object Mode

Well, in the viewport (the portion of the window used to interact with objects in the scene), you can notice in the bottom-left there's a tab with a drop-up menu. This is the object interaction mode, and can be set to Object Mode(default), edit mode, sculpt mode, and a couple other modes namely

vertex and texture paint, however apart from the former 3, the rest are rarely touched, and even the sculpt mode is used sparingly for a majority of models.

Go ahead and click on the tab, and select *Edit Mode* (or alternatively press **TAB** to switch between object and edit modes). You may now notice how some of the buttons have changed, but the interface overall remains similar. One notable difference now however, is the visibility of individual vertices.

Selection

Although **CTRL+TAB** allows you to switch between mesh select modes, vertex select, edge select, and face select, by default it is set to vertex select. As the name implies, you can select a single vertex, or many by holding down the **SHIFT** key while selecting vertices, and perform the same operations as performed on the primitive objects.

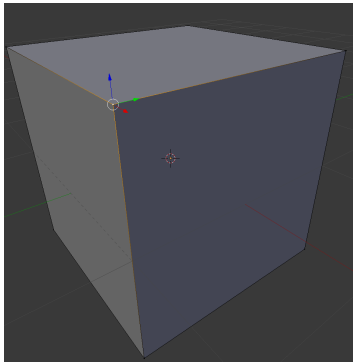


Fig 2: Vertex Select

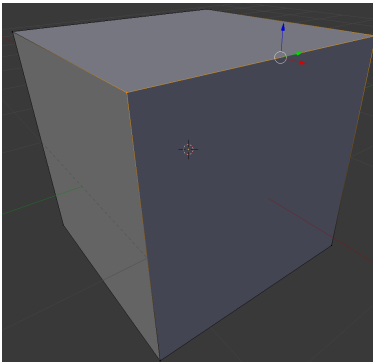


Fig 3: Edge Selected

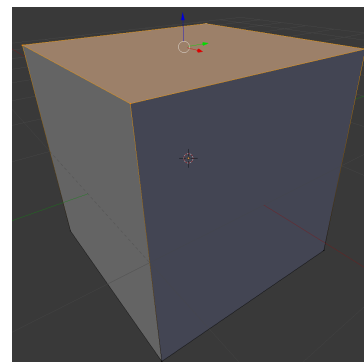


Fig 4: Face selected

The selected vertex/edge/face is highlighted in the viewport. Selecting 2 vertices is the same as selecting an edge(Fig 3), and if a few vertices/edges form a face, you can select them to select the face(Fig 4).

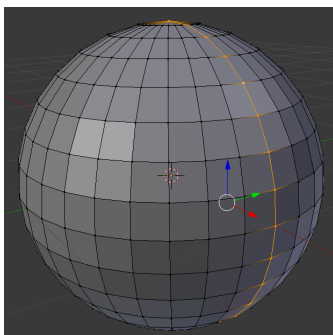


Fig 3.2: Edge Ring Select(Vertical)

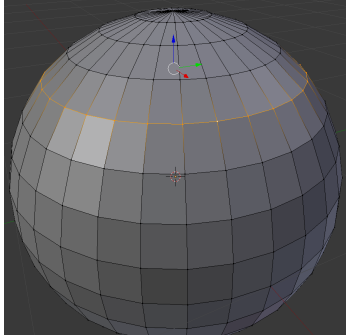


Fig 3.1: Edge Ring Select

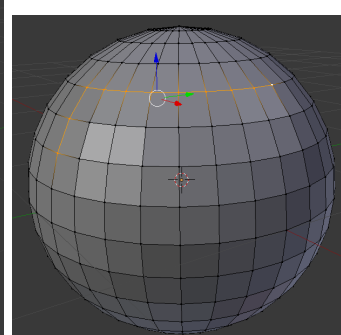


Fig 2.1: Shortest Path Between Vertices

Holding down **ALT** while selecting any edge will also select the entire edge loop of which it is a part (same applies for vertices and faces), towards the direction the edge loop is facing. Also, if you select a vertex (or edge or face) and then

select another while holding down **CTRL**, the shortest path of vertices is selected.

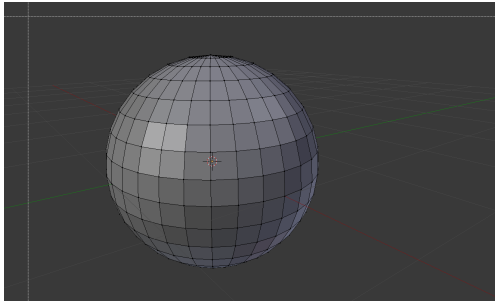


Fig 2.2: Start of Box Select

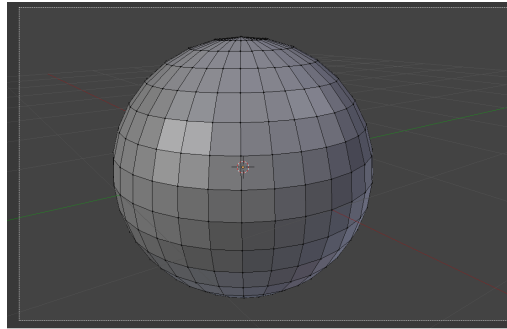


Fig 2.3: Box Area Selection Complete

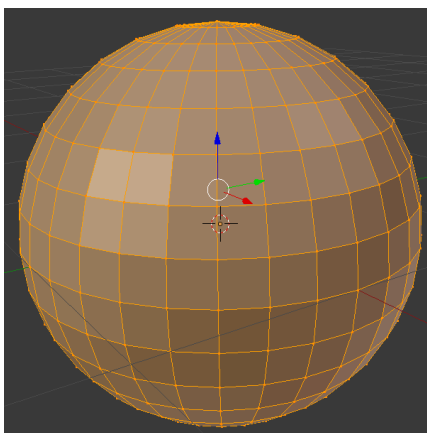


Fig 2.4 Vertex selection, Box select

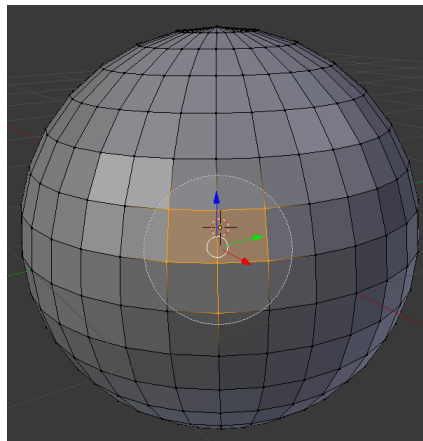


Fig 2.5: Circular Selection

Selecting **B**, you start by clicking with the **LMB**(left-mouse button) at a start position, and dragging onwards, you will notice a rectangle figure with dotted edges forming, and once you let go, all the visible vertices in the quadrilateral are selected, and the figure disappears. This is known as box select. You can also deselect vertices in a similar manner, by dragging and releasing the **MMB**(middle-mouse button).

Selecting **C**, your cursor is surrounded by a circle, whose size you can alter with the scroll wheel of your mouse. If you click the **LMB**, the vertices visible inside the circle around your cursor are selected, while if you click the **MMB**, the vertices will be deselected.

Shortcuts

LMB: Left Mouse Button

RMB: Right Mouse Button

MMB: Middle Mouse Button

Extrusion

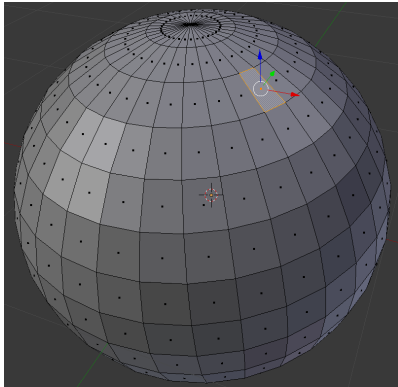


Fig 5: Selected Face

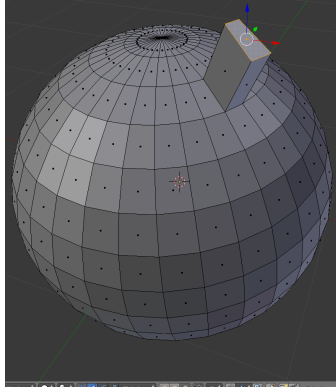


Fig 6: Extruded Face

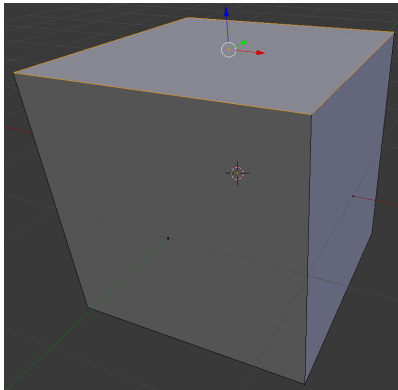


Fig 5.2 Selected Face

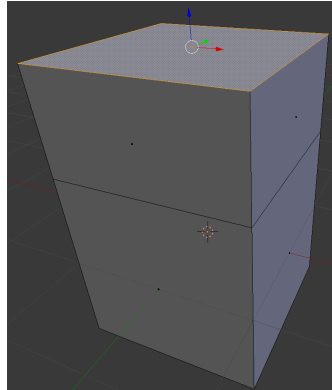


Fig 6.2 Extruded Face

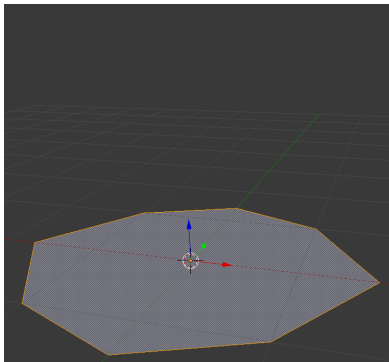
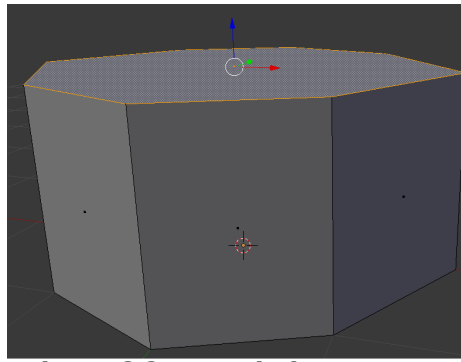


Fig 5.3 Selected Face



Phase 6.3 Extruded Face

An extrusion is an extension of a face, with the same cross section. It can be stretched placed in any location and rotation, but is an extension of the original face. It is probably more intuitive to try it out, the shortcut is **E**, followed by entering the axis along which to extrude, and length in numerical terms. Don't let the simple description fool you though, it is one of the tools you will use most often.

Bevel

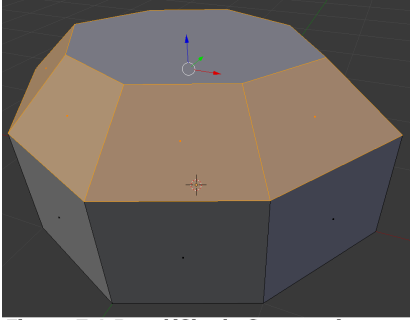


Figure 7.1 Bevel(Single Segment)

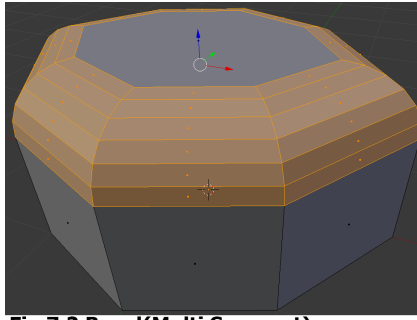


Fig 7.2 Bevel(Multi Segment)

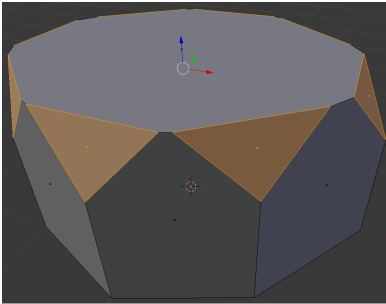


Fig 7.3 Vertex Bevel

A bevelled edge or beveled edge refers to an edge of a structure that is not perpendicular to the faces of the piece. **CTRL+B** is used to bevel an edge, dragging the mouse away from the pivot point to increase bevel, and scrolling to increase segments, and so, smoothness. Pressing **V** after pressing the shortcut enables bevelling on vertices.

Make Edge/Face

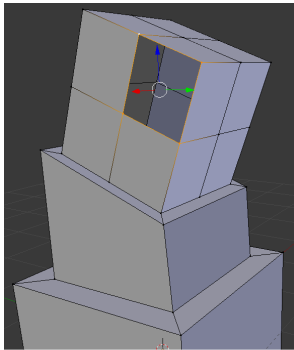


Fig 8.1: Selected vertices

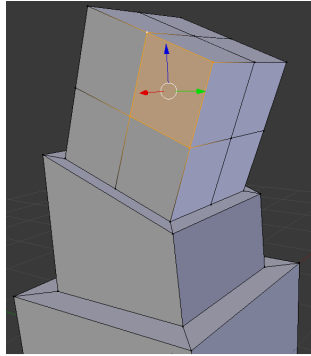


Fig 8.2 Face formed

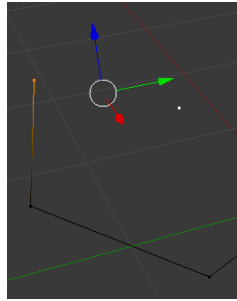


Fig 8.3 Selected 2

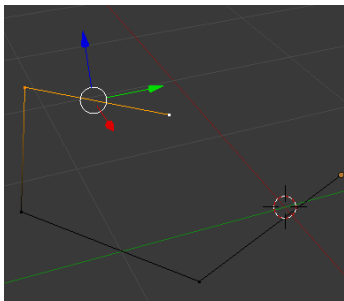


Fig 8.4 Formed an edge of 2 vertices

To form an edge, **E** is pressed with 2 vertices selected, whereas if more than 2 vertices are selected, a face is formed using the selected vertices by pressing **F**.

General Background Information

Before the main lesson begins, there are some essential concepts to master first.

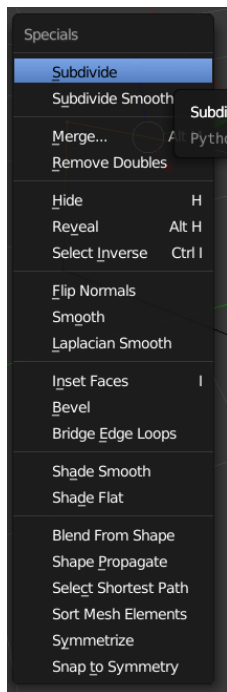
Shortcuts

LMB: Left Mouse Button

RMB: Right Mouse Button

MMB: Middle Mouse Button

Context Menus



Context menus are the popup menus which appear when you right click on an item (or **CTRL+LMB** [left-mouse click] for MacOS users), giving you many options. However, since both the left and right mouse buttons have their own function in Blender, they aren't directly available.

However, Blender provides an alternate and more powerful method, albeit non-standard, method of accessing various kinds of context menus through the use of keyboard shortcuts, such as **CTRL+A** (Applies certain properties to default), or **U** (UV Unwrapping menu), which appear at the location of your (regular, non 3D) cursor.

Pivot Point

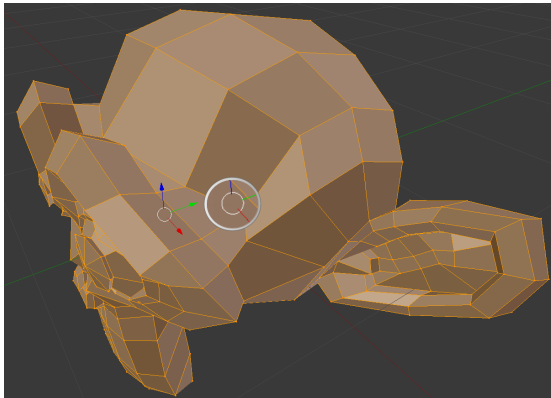


Fig A.1: Pivot Point Zoom

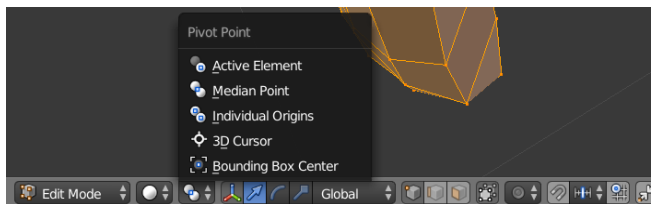


Fig A.2: Pivot Point Menu

While going through the lessons, and practicing later, you may or may not have noticed this white circle, to which the three translational(i.e movement) arrows are attached. What is this circle, and why is it relevant?

Well as a starter, this point, wherever it is, acts as the center around which operations take place, such as rotation, translation (movement) and scaling. When you select multiple objects or vertices, or deselect them, you may notice the location of this pivot point changing. Clicking on the icon showing the intersection of 2 circles, brings out the Pivot Point pop-up menu. It has the following options, in the order they're shown:

1. **Active Element:** If multiple vertices/objects are selected, it sets the active vertex/object, the most recently selected, as the pivot point for the entire selection to act around.
2. **Median Point(default):** If multiple vertices are selected, it sets the average position of all the vertices as the pivot point, however keep in account that this center shifts depending on the distribution of vertices, so don't use it to find the Centre of Volume. Similarly, if multiple objects are selected, the average of their origins (explained below) is taken as the pivot point.

3. **Individual Origins:** This allows every vertex/object selected to operate on their own individual axes, instead of depending on a single, central pivot point.
4. **3D Cursor:** As you can place this anywhere, you can essentially set any point in the viewport as the pivot point.
5. **Bounding Box Center:** The bounding box is an imaginary cuboid in Blender, which takes the maximum extents on the 3 axes of the model, and constructs a box accordingly, hence is a 'bounding box'. The center of this box is set as the pivot point in this option.

Axes and Transformations: Global, Local & Normal

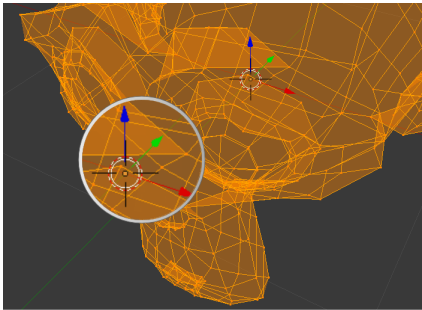


Fig B.2: Transformation(Translation)

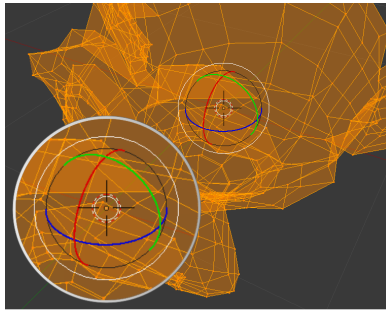


Fig B.3: Transformation(Rotation)

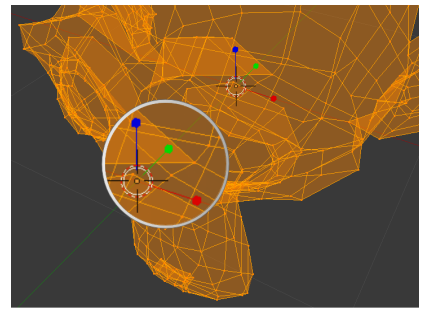


Fig B.4: Transformation(Scaling)

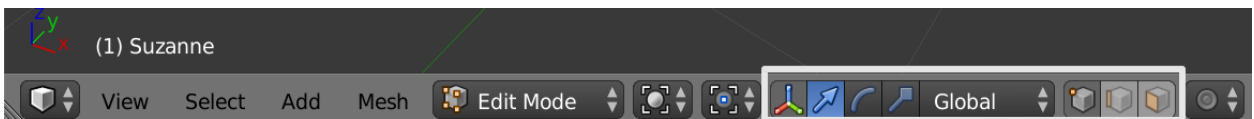


Fig B.1: Transformation Manipulator Display

You may have noticed the 3 arrows around the pivot point. Well, go ahead, click and drag any one arrow (with **LMB**), and you'll notice the object moves along that axis, through the pivot point. You can notice down in the toolbar, an arrow is selected under the transformation manipulators, which signifies movement.

You can either select multiple by **SHIFT+LMB** and keeping **SHIFT** pressed or separately with **LMB**. The manipulators are:

Rotation manipulator (arc)	Scaling manipulator (square connected to diagonal line)	Movement manipulator (cursor icon)[default]
A 3D wireframe model of a Suzanne object with a rotation manipulator. The manipulator consists of a central pivot point and three colored arcs (red, green, blue) representing the X, Y, and Z axes respectively.	A 3D wireframe model of a Suzanne object with a scaling manipulator. The manipulator consists of a central pivot point and three colored squares (red, green, blue) representing the X, Y, and Z axes respectively.	A 3D wireframe model of a Suzanne object with a movement manipulator. The manipulator consists of a central pivot point and three colored arrows (red, green, blue) representing the X, Y, and Z axes respectively.

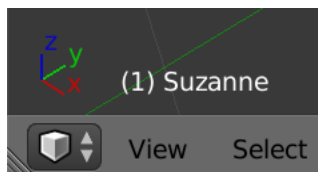
These manipulators let you transform the selection around the pivot around, on an axis.

Speaking of axes though, you may not have noticed, but while extruding (without specifying an additional axis), the axis along which you extruded is navy blue, same as the Z-axis, and it seems to not lie on the Z-axis at all. This is because it is the *normal* Z, not the *global* Z.

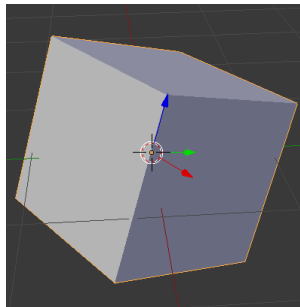
You must be wondering, what exactly are the global and normal? The 5th button in the white rectangle selected in the toolbar, is a drop-up menu, having options to set the transform orientation, which the global and normal are configurations of.

There are 5 configurations for transform orientation, although usually only the first 3 are used:

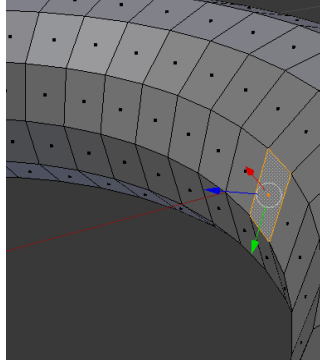
- **Global (default):** The manipulator (widget around pivot point) matches the world/global space in the viewport. Ever notice the 3 axes in the bottom-left corner? That's the current orientation of the global axes depending on the view. This remains constant throughout the scene.



- **Local:** The manipulator matches the object axes, i.e. the global axes with the rotation on the object synced.

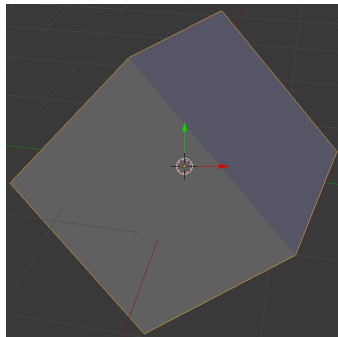


- **Normal:** When an element is selected in the edit mode, the **normal** (line perpendicular to the tangential line of the surface/curve/etc), lines up with the Z-axis of the manipulator, orienting the other axes similarly. When multiple elements are selected, it is oriented towards the average of their normals.



When used in object mode, it has the same effect as the local orientation.

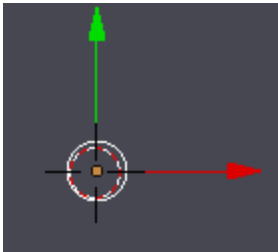
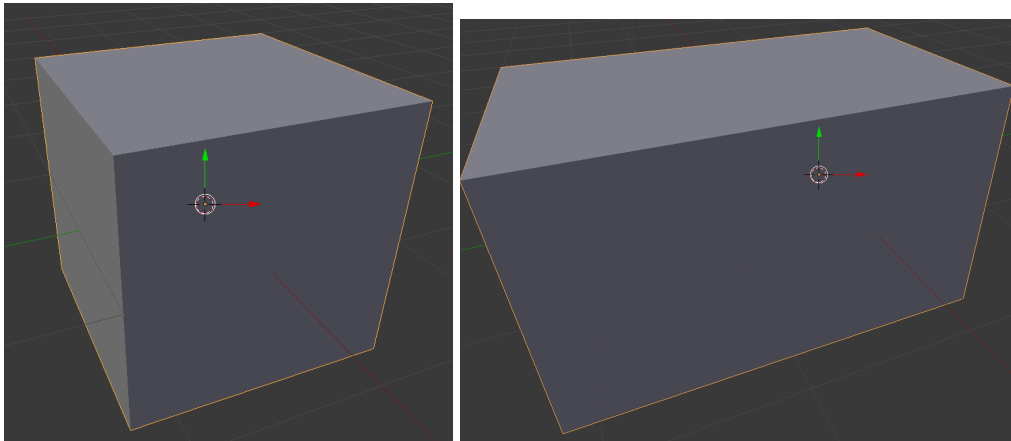
- **View:** The manipulator matches your current view in the viewport. Up-down is the Y-axis, towards right-left is the X-axis, and closer-away from view is the Z-axis.



- **Gimbal:** This isn't very useful at the moment. You can look it up online, but it can be safely ignored for now.

By default, all operations, activated by means other than the manipulators, are performed on the global axis, however you can change this by changing the transform orientation tab to desired orientation, and entering the required axis twice every time you use a command, as when it is entered only once, it defaults to global.

Object Origin



Well, for a selection of elements in the edit mode, the median point depends on the average location of the vertices, and the active element is the last selected element. However, this doesn't seem to be followed in the object mode, where even a cube with vastly different extents, has the same 'object median point'. This is called the origin, and is denoted by an orange circle.

The origin doesn't automatically set to the average of the vertices of the object, although it can be changed. This is done by **SHIFT+CTRL+ALT+C**, and then selecting an option. That shortcuts quite long, isn't it? It's probably the longest one in Blender. Anyway, the context menu to set the object's origin has the following options:

1. Geometry to Origin: Adjusts the location of the object's **bounding box**, such that the origin is the center.
2. Origin to Geometry: Adjusts the origin, such that it is the center of the bounding box of the object.
3. Origin to 3D Cursor: Adjusts the origin to the current position of the 3D cursor, can be used to position the origin anywhere.
4. Origin to Center of Mass (Surface)/(Volume): May vary slightly depending on topology, but overall, the origin is calculated through the average of the points in the mesh.