3D Manipulators

Introduction

Polygon modeling is essentially based on the manipulation of 3D entities such as points, edges and faces, whether it is for the creation or editing of surfaces or volumes.

Hexagon is based a 3D Manipulator which lets you make 90% free-form models (organic forms without precision, for example) without ever leaving the manipulator to change tools, views, etc.

These 3D Manipulators offer incorporated accessories, which can be either be called up at any time by keyboard shortcuts, or by selecting corresponding icons.

The 3D Manipulator

Translation

The translation manipulator moves the selected elements. The manipulator is symbolized by arrow points (2D and 3D).

- If you click on an axis, the movement of the selected item is restricted to that axis.
- If you click on a triangle on the same plane as the two axis, the movement is restricted to that plane.

Keyboard shortcut: T
Rotation

The rotation manipulator \( \text{\textcircled{\textdegree}} \) rotates the selected elements. The manipulator is symbolized by circles.

- If you click on a circle corresponding to an axis, the rotation of the selected element is limited to that axis.

Scale

The scale manipulator \( \text{\textcircled{\textcdot}} \) scales the selected elements. The manipulator is symbolized by cubes.

- If you click on a cube on the end of an axis, the scaling of the selected element is limited to that axis.
- If you click on one of the grey cubes on the same plane as the two axes, the scaling is restricted to that plane.

This manipulator also shows a global interactive box which surrounds the object.

- Click on a face of this box to scale the object as if you were pulling on the face.
- Click on an edge of this box to pull on both faces that touch that edge.
- Click on a corner of the box to scale the box proportionally away from the opposite corner.
The scale manipulator.

**Keyboard shortcut:** $S$

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**Universal**

The universal manipulator is a combination of the three fundamental manipulators. It lets you perform moves, rotations and scalings without changing the tool.

Using this manipulator is practical to move the objects globally. However, for precise manipulations of 3D entities like vertices or edges, the number of clickable modifiers on each axis may become a problem.
The universal manipulator.

**Remark:** The size of the manipulator is modifiable in the preferences.

**Keyboard shortcut:** U

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**3D Manipulator Accessories**

**Selection**

The 3D manipulators and their accessories work according to the current selection. For example, if you are in select point mode, and you use the translation manipulator to move an edge, it will affect only the selected edges and not the other entities.

**Working Planes and 3D Manipulators**

The working plane can be defined for the manipulators in the context menu located on the current manipulator:

- World: According to the working planes defined globally in the program, e.g.: the three absolute
planes XYZ, the camera plane or the specific plane.

- **Selection**: The working axis snaps to the internal orientation of the selected element (the geometric normal of the face or edge selected).
- **Bbox**: The working axis of the manipulator follows the orientation of the object's bounding box. If the object is rotated, the axis lets you scale or move it using its own axis.

**Hide/Show**

This function lets you hide the manipulator when necessary, like when making complex selections around the clickable areas of the manipulator.

- Click the icon in the manipulators palette to hide or show the manipulators.

**Keyboard shortcut: Space bar**

**Delete**

Lets you delete the selected 3D entity. This function is available only by the Edit menu or by pressing the Delete key.

**Keyboard shortcut: Delete**

**Dissolve**

Lets you delete a selected entity, but reconstruct the geometry around it. This function works on select points, select edges and select faces mode. This function is available only by the Edit menu or by pressing the Backspace key.

**Keyboard shortcut: Backspace**
Copy From the Manipulator

In object selection mode, when holding the Ctrl key (Command on MacOS) while moving, rotating or scaling, the transformation is applied to a copy of the original object. This allows you to speed up simple copy operations.

Remark:

- This operation does not work on curves because Ctrl key (Command on MacOS) with the manipulators is a shortcut of the fast extrude tool, and as such it will generate an edge extrusion.

Displaying the Universal Manipulator Components

The universal manipulator has numerous components, displayed in a small screen area. According to the point of view, it will sometimes be that case that these components can hinder visibility, especially when a manipulator axis is oriented toward the camera. In this case, these components will be grayed and could not be selected.

When the camera will move around, the grayed components will be reactivated as previously.
On the left, the grayed components and on the right, after a camera modification, the components are back.

**Advanced Options for the Manipulators**

**Set the Pivot**

The pivot is the center reference point of the selected object. Rotation and scale manipulators use this point as the center of rotation or the point of reference for scaling.

This accessory lets you temporarily redefine the pivot as a position other than the default, or define the position by modes of semi-automatic placement such as selection, world and bounding box.

**Usage:**

- Click on the set pivot function in the context menu over the manipulator.
- Define the new pivot position by clicking in the scene on a point already existing on any object in the scene.
- The pivot of the selected object is placed at the chosen point.

**Notes:**

- The new position of the pivot isn't visible if there is no selection active on the objects are not affected.
- The position is only applied to the currently selected object. The pivots of the other object.

**Reset the Pivot**

This accessory lets you reset the pivot of an object if it had its pivot modified.

**Usage:**

- Select the object to have its pivot reset.
- Click the reset the pivot function in the context menu over the manipulator.
- Hexagon replaces the pivot to its original place