Working in 3D Space: Navigation, Working Planes and Guides

Introduction

You will be working in a three dimensional space (XYZ). Your mouse is a two dimensional pointing system and your computer screen can only show a flat image, so Hexagon proposes different ways of working within these limits.

Navigation

Navigation is the movements of the virtual point of view, or camera, around the scene. When you want to inspect your model from all angles or zoom in, you will need to navigate in your 3D space.

Hexagon offers three ways to navigate: by the icons in the control panel, by the mouse and by the keyboard.

Navigation by the Control Panel

In the control panel at the bottom of your workspace, you will find two groups of icons which deal with navigation:

- Use the icon to turn your camera around the target point.
- Use the icon to pan around the scene, or displace laterally (such as camera traveling in film terminology).
- Use the icon to zoom in and out.

Holding down the mouse button on an icon navigates directly on the icon, or click on an icon, turning your mouse cursor into that icon, and navigate directly in the 3D Workspace by click-dragging and return to 3D manipulation by clicking on the icon.

- Use the icon (View all) to reposition your camera, without changing its orientation, so that all the elements in the scene are visible
- Use the icon (View selection) to reposition your camera so that the selection is visible
- Use the icon (View detail) to let you draw with a red rectangle selector to specify the area to include in the new placement of the camera.
- Use the icon (Custom view) to point the camera at an element by clicking in the 3D Workspace, or by inputting coordinates in the tool properties palette. You can also use the tool option place eye in the same palette, to specify interactively or by precise input, where you want to place your camera. Once you have placed your target point, or the virtual
eye, Validate the tool to continue working.

### Mouse Navigation

- While holding down the Alt key, click-drag with the left mouse button in the 3D Workspace to rotate the camera around the scene (like the 🎥 icon).
- While holding down the Alt key, click-drag with the middle mouse button in the 3D Workspace to zoom the camera in and out (like the 📸 icon).
- While holding down the Alt key, click-drag with the right mouse button in the 3D Workspace to pan around the scene (like the 🎥 icon).

Additional mouse navigation commands:

- Use the mouse wheel to zoom in and out step-by-step (like the 📸 icon).
- Click and hold the mouse wheel button to pan around the scene (like the 🎥 icon).

**Remarks:**

- The mouse wheel zoom target is defined by the on-screen mouse cursor, while Alt key and middle mouse button will zoom in and out toward the center of the 3D Workspace.
- Combine the shortcuts Alt + Ctrl and the left mouse button to rotate the camera around the current selection (object, vertices, edges or faces). You can choose the mode as default by changing the preference “Dolly around selection center”, in the “User Interface” tab, under section “Misc”.

### Keyboard Navigation

- The arrow keys turn the camera in the direction of the keys.
- The arrow keys with the Alt key pressed will pan the camera in the direction of the keys.
- On the number keypad, use the '3' key to zoom in and the '.' key (Period key) to zoom out.
- Finally use the '2', '4', '6', '8' keys to directly view the scene from the front, left, right and back respectively. The keys '5' and '9' are the bottom and top views, respectively.
Space Mouse Support

3Dconnexion motion controllers allow you to navigate more efficiently in the 3D scene while modeling.

These devices have a single controller that transforms your movements into camera movements.

There are several types of motion controllers from 3Dconnexion: SpaceMouse, SpaceBall, SpaceTraveler, Cadman, SpacePilot, and more. They are all based on the same architecture and use the same device driver, which is supported by Hexagon.

Installation

- Install the software provided with the 3Dconnexion motion controller and test it with the provided tools. If needed, you can download the drivers at http://www.3dconnexion.com.
- Once you have installed the 3Dconnexion software, you will be able to use the device with Hexagon.
- You must first enable the device in the preference panel, located in the User Interface/Misc tab.

Camera Movements

The possible camera movements are:

- Pan left and right: move controller left and right.
- Pan up and down: pull controller up and down.
- Zoom in and out: push controller forward or pull backward.
- Rotate left and right: twist controller clockwise or counterclockwise.
- Rotate up and down: tilt controller forward and backward.

The Three Working Planes

To work in 3D space (to draw a profile, move an object) the proposed method used by most 3D programs is to work always on one plane in 3D space.
The Absolute Working Planes

The three reference grid guides.

By default, Hexagon lets you work in the so-called absolute planes, symbolized in the 3D Workspace by three reference grid guides. The horizontal plane (XZ), the vertical plane (XY) and the transversal plane (YZ).

The axis indicator on the lower left of the 3D Workspace is the 3D trihedron. When you move around the 3D space, you can see that the active working plane is symbolized by a white square touching two of the axes. By default, Hexagon automatically chooses the best working plane for your view, or the one that is the most perpendicular to the camera position.

The 3D trihedron.

You can force Hexagon to make another working plane active that is not automatically proposed, by clicking on the faces of the 3D trihedron to work in that plane. Click again on that same face to return to automatic mode.

The Camera Working Plane
You also might not want to work with the default XYZ planes, but with what is called the camera plane. This can be compared to having a piece of paper that is always held out in front of you, turning as you change your view, always staying perpendicular to your field of view.

The default and camera planes switch button.

Activate this plane by clicking on the camera button on the manipulators palette. Come back to the three absolute working planes by clicking on the XYZ button.

**Specific Working Planes**

In some cases you may want to work on a plane defined by the face of an object (the side of a pyramid for example) in order to manipulate an element on this plane or perpendicular to it.

**Usage:**

- Click on the *Custom plane enabled* button on the manipulators sub-palette.
- Click on a face of the object corresponding to the plane you want to work in. Hexagon changes the working plane to match it.
- Click on the *Reset the working planes* button to come back to the default planes.

**This functions:**

- Either by “flipping” the grid guide representing the working plane,
- or by giving the impression of “flipping” the scene, with the grid guide staying the same.

These two actions have the same result, and you can choose whichever you are most comfortable with.

When you have no further use for the custom working planes, reset the planes to the default, so that further created objects will not be created in an unwanted orientation.

The working planes are taken into account when lines and forms are created, or certain tools are used. The 3D manipulators is an exception. If the manipulators are on Selection or Bbox mode, these planes are ignored. See the chapter on the 3D Manipulators for more details.

The three modes of the 3D Manipulators in the sub palette.

**3D Guides**
Hexagon uses in some cases 3D guides (two perpendicular axes), that can also show incremental measurements. They permit you to work precisely with distance measurements within certain tools. They also let you restrict your work to one axis only.

These 3D guides are in the active working plane automatically when using certain tools. If your camera is facing your object, Hexagon shows you only the X axis (horizontal, in red) and the Y axis (vertical, in green) and you can apply constraints to one axis by using the Space bar.

The incremental measurement snap to the 3D guides can be activated by clicking on the icon in the control panel. When the snap is active, the lines snap to each unit or tenth of a unit, depending on the measurement unit chosen.

To increase or decrease the units, use the +/- keys.

The last used axis constraint of the 3D guides will continue to apply to current and future tools. Using the Space bar, you can flip the constraint again to the other plane, or again to have no constraints on your cursor (the default mode).

It is important to keep in mind the fact that the Space Bar will allow you to apply vertical or horizontal constraints while using a tool which uses 3D Rulers, such as drawing tools or snap/align or the symmetry tool.
Precise Input, Relative Mode, Absolute Mode, Origins

Hexagon is a program which can work without constraints in a freehand style, but can as well use precise number input, or parameters, for the majority of the tools.

By default, Hexagon works in relative mode: all new values are defined by the previously entered values. For certain uses, it is necessary to define an origin to your 3D universe, which is by default in the center of the horizontal grid guide, and inputting a value in reference to this point is referred to as absolute mode.

Changing from relative mode to absolute mode:

- In the scene properties palette, a relative/absolute icon lets you choose the mode of measurements feedback and input values.

Remark:

- The center of the universe can be changed from the preference panel in the Interface tab, Rulers parameters.

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