CPQ 3D Feature: Mirror

When designing a 3D scene, you may need to create a duplicate of a mesh. While the pattern features can help, they don't provide a mirror image of the mesh.

In this course, you will learn about the mirror feature.

.Objectives

- Creating the mirror feature and understanding its properties
- Automating the mirror feature with Snap rules

The Mirror Feature

Use the Mirror feature to create a mirror duplicate of a source mesh.

To introduce the concept, we've created a simple box mesh, with dimensions 2 by 4 by 9.

We've also positioned the mesh away from the origin, at location [2,4,9].

To use this feature, first select the mesh you'd like to transform.

In the properties column on the right, open the features expander, and add a new Mirror feature.

Notice the mesh changes, and a new yellow square appears. This is the mirror plane. It is usually invisible, and appears only when editing this feature to help you understand the geometry.

To help us better understand the mirror plane, check the "clone geometry" checkbox.

You'll now see both the original mesh (at it's original position and rotation), and it's mirror copy (controlled by the mirror plane).

When the mirror feature is created, the default settings change the mesh in a way that's easy to notice , but it can be hard to understand at first. Let's go through each of those settings in turn.

You control the mirror feature by setting the rotation and position of the mirror plane.

First, rotation. The mirror plane is turned by adjusting the Mirror Plane Normal. The normal is a vector that stretches out from the mirror plane like a handle. It's perpendicular to the plane itself.

For example, a normal of [1,0,0] is aimed along the X axis, so the plane spans across the other two axes, like a wall.

A normal of [0,1,0] points directly up to the Y axis. So the plane rests flat on the ground, like a rug.

To aim your mirror plane at other angles, create a more complex vector. For example, to aim the mirror at a 45 degree angle around the Z axis, enter [1,1,0] as your normal vector.

Or try a different 45 degree angle, around the X axis, by entering a mirror plane normal of [0,1,1].

The mirror plane can be adjusted to any angle by entering different numbers into the three slots of the vector.

That’s the rotation of the mirror plane. Let’s adjust the position.

The position is controlled by the mirror plane intersect, which is a point in space. By default, the intersect is located at the center of the mesh, represented by the vector [0,0,0].

All the work we’ve done thus far is with the mirror plane at the center of the mesh. Things get interesting when the mirror is farther away from the mesh. Let’s move the mirror plane intersect to [0,0,2].

By moving the position of the mirror plane, we make the mirrored geometry move as well.

When mirroring geometry, notice that you can slice (or remove) any geometry that crosses the mirror plane.

With Slice turned on, any faces of both the original mesh and the mirrored mesh that cross the mirror plane are cropped away.

The “Slice” checkbox has no effect when the original mesh does not cross the mirror plane.

For example, increase the mirror plane intersect to [0,0,6] so it does not touch the original mesh. You’ll see the “slice” checkbox has no effect, because there’s nothing to slice.

Automating a real-world example of the mirror feature with Snap rules

Like any other feature, the mirror feature can be adjusted during run-time with Snap rules.

Usually, the fields of data controlling this feature would come from a configurator, or some other source. For demonstration purposes, we will use fields within this stand-alone scene.

In this example, we want to design the truss system above a rock concert stage.

If we want to make a simple arch over the stage, we will first create the upright, then mirror the upright to make a crossbeam.

Then we will mirror this structure a second time to complete the arch.

Let’s get started. We’ve imported a mesh representing a basic truss structure.

First, apply a linear pattern to repeat the truss to a longer length. This will be our upright.

Edit the original truss mesh properties so our upright is positioned on one side of the origin.

Then, create a mirror feature to create a reflection at an angle.

We will turn on the “slice geometry” to remove the un-needed length.

This original upright and reflected crossbeam makes up one side of our arch.

We can complete the arch by adding a second mirror feature to the feature stack.

Move the mirror plane Intersect away from the mesh. Here, we move it down the Z axis until it’s aligned with the origin of the scene.

As before, we'll use Slice to remove the geometry we don't need.

We have our arch. Other features can be applied as well, such as a linear pattern to create a long structure.

Since we named the different features, we can automate them using Snap rules.

For example, we can adjust the mirror plane normal on our first Mirror feature to adjust the height of the arch.

In the editor, iIt seems the values ranging from 1 to 2 are best.

Create a new field to allow the user to adjust this parameter.

Then create a scene rule to set the mirror feature's… mirror plane normal… Y… to whatever the user specified.

Run your scene: you'll see the entire truss structure update.

Notice that adjusting the mirror plane intersect's Y parameter from 6 to 10 changes the height of the structure.

Create a new field to allow your user to select from this range of numbers.

Then create a second scene rule to set the mirror feature's… mirror plane intersect… Y… to whatever the user wants.

Recap

In this course, you reviewed the concept of how a Mirror feature can duplicate existing geometry.

You've reviewed how positioning and rotating the mirror plane changes the result.

And you learned how to automate the Mirror feature using Snap rules.

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