Joining Geometry in CPQ 3D Scenes

In this course, you will learn the *theory* of geometry join by watching a real-world example of how to *use* this feature to solve a design problem.

Objectives

- Learn the theory of geometry join,
- determine which of 3 join types suits your needs,
- watch a real-world example of how to use a geometry join to solve a design problem.

Geometry Join Theory & Example

Use the Geometry Join feature to create a complex mesh from the geometry of two other meshes.

This feature allows you to create the new geometry through one of three joining operations; called cut, union, and intersect. We'll take a look at each.

For these examples, we've created two primitive sphere meshes. One is slightly above and to the left of the other.

We've also applied materials to the two spheres.

And to help us understand the geometry, we're viewing the scene render in wireframe mode. This wireframe is built of lines that connect the points, or facets, of a mesh. These lines also outline all the two-dimensional faces of the mesh.

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 Geometry Join feature.

As with all features, you can change the name of the feature to make future Snap programming easier.

Select the target mesh you want to use by clicking the "target mesh" field. You enter selection mode: you must either click a mesh to select it, or click cancel.

After a moment, two things happen. First, the two meshes are joined with the join type selected. Here, the default of "cut" is used, so the selected mesh is cut out of our featured mesh.

Second, the other mesh we selected is hidden automatically so we can easily see our results.

That geometry on the other mesh is untouched by the feature. That mesh is used as a template to modify the featured mesh, so don't delete it. Just leave it hidden, or move it into a group for safekeeping.

Cut is not the only geometry join. You can also perform a union join type, which merges the two meshes into one. Here, we see two spheres unioned into a peanut shape.

Or you can perform an intersect join type, which shows only the volume where the two meshes overlap in space. Here, the intersect created an almond-shape from the two spheres.

Returning to the "shaded" render mode will hide the geometry and show materials again.

Geometry Join Manipulations with Snap

Like any other feature, Geometry Joins 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 create custom molds to help turn waste plastic into sturdy, stackable bricks.

To create the brick mold configurator, Let's let our user design the brick shape they want.

Create a primitive mesh box. Rename it to "brick".

Create a primitive cylinder. Size it much smaller: a radius of 0.2, and position of y as 0.5. Call it "top connector". This will be the top connector.

But the bottom of the brick needs a matching spot.

Clone the top connector to make a bottom connector with the same properties, but with a Y position of -0.5

Now that the shapes are present, use them to modify the brick's shape.

Select the brick, and create a new "geometry join" feature. Join it to the bottom connector with a "cut" join.

You'll see the volume disappear from the bottom of the brick.

Create a second geometry join to the "top connector", with a type of "union". You now have a completed brick, with an extension on the top and a matching void on the bottom.

What if our customers need special connector bricks? Maybe a brick with two voids, or a brick with two extensions?

Create a new text field for the user to specify the type of brick. We're using a number select field called "studs"with the choices of 0, 1, and 2.

Create a new scene rule, called "Build Brick".

Use the set feature block to set the Brick's

join geometry-top

joinType.

What are the types available? Let the Snap language guide you. Instead of trying to type in these values ourselves, use the enum block.

The Enum block helps enumerate (or give a list of) different settings choices. It's easier to use than trying to type out these choices.

Once in position, the enum block gives you the same list of choices you saw when creating the feature.

1. If the user wants no studs, set both top and bottom to the cut type of join.
2. Just one stud? Place it on the top with a union join type.
3. Two studs required? Set both top and bottom to a union join.

When we run the scene, we see the Geometry Join is now driven by the fields.

Recap

You reviewed the theory of how a Geometry Join can build a more complex shape from simpler ones.

You've reviewed the three types of joins: union, intersect, and cut.

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

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