Creating and Automating Features of 3D Meshes Transcript

Features are simple transformations that can be applied to a mesh to create complex visual effects. Features make both permanent changes to a mesh, as well as temporary ones you can skip or even adjust.
In this course, we will introduce the concept of features, demonstrate a common feature, called Transform Geometry, and create Snap rules to make the feature dynamic.

Objectives

- What are features?
- The Transform Geometry Feature
- Make Features Dynamic with Snap

What are Features?

Why do meshes have features?

The meshes in your 3D scene help your customer visualize your product. As the product's configuration changes, those meshes often need to change as well.
A window may become taller, or wider.
Maybe a gear has 20 cogs around it… or 30.
Your configurator handles the logic, but how can you show these dynamic elements?
Your scene represents these products as 3D meshes. You can make changes like these to a mesh with Features.
Features are changes you can make to a mesh. They can be permanent adjustments or temporary, dynamic changes to the mesh. Through Snap logic, features can be updated or skipped entirely depending on your needs.
By expressing your complex transformations as a series of simpler features, you can make these permanent or temporary changes easy to manage.

The Transform Geometry Feature

One of the fundamental features to apply to a mesh is Transform Geometry, which can change the size of any mesh along the 3 dimensions.
In your 3D Scene, first select the mesh you want to change.
Here, we'll create a mesh to work with. If you don't have a box mesh already, in the explorer select meshes.. create primitive… box.
The mesh is selected, and it appears with a highlight around it in the viewer.
In the selected mesh's accordion of properties, collapse other expanders to bring the Features expander on-screen.
Click new feature… Transform Geometry. The feature is added to the list of features.
All features have a name. You can change the name of the feature, so when other features are added in the future, this transformation is easy to identify in your Snap code. We'll call this one resize entire mesh.
Each feature has various settings which you can adjust. Adjustments can be made both now, during design time, as well as later, during run time.
Design-time adjustments made now are entered directly into the feature settings. For the Transform Geometry feature, we can adjust the dimensions mathematically by entering a scale factor into one of the properties…
…or adjust the dimensions visually by clicking the resize button to show the resize gizmo for the mesh.
Centered around the origin of the mesh, this gizmo provides handles to adjust the three dimensions visually.
Drag the three handles in the gizmo to change the size along three dimensions.

You can Combine the visual and mathematical techniques. Visually drag a gizmo handle to quickly find the dimension you want, then mathematically refine the effect by entering a precise value.
Remember, the feature is a set of instructions applied to the mesh.
So you can choose to apply the feature or not. Click the eye icon next to the feature name to see it ignored… or applied… to the mesh.
Click the context menu next to the feature name to manage this feature. You could remove the feature, as well as perform other tasks useful when multiple features are applied.
When one or more features are applied to a mesh, the New Feature button gets a companion: the Collapse button. What is the collapse button?
Collapsing a feature applies the feature's adjustments permanently. Those adjustments can't be changed dynamically during run-time, or turned on and off. The mesh itself is replaced with a new adjusted version, and the feature you entered disappears from the mesh's list.
Collapse a feature only when you're confident the adjustments of the feature won't change in the future, and they should be committed to the mesh.
What is the benefit of collapsed features? The 3D scene may run faster if there are many complex features.

In most cases, features are not collapsed, because the flexibility they give is most important.

Make Features Dynamic with Snap

Once a feature is added to a mesh, and the default values of the feature are defined during design-time, you can change those features during run-time, using Snap.
Here, we'll change the dimensions of a Transform Geometry feature, based on fields from a configurator.
First, be sure your scene is linked to a configurator. By linking a configurator, the Snap toolbox can give you more choices based on that configurator's design.
Click the rules tab to open the Rules Editor, and create a new Scene Rule.
Double-click the rule to give it a useful name like set box dimensions.
In this rule, we want to set a feature on our Box mesh. So open the toolbox, and explore the scene… features category.
Drag the set feature block into your rule.
Fill in the blanks. We want to set a feature on the box. We named the feature "resize entire mesh", and we want to change the scale of that feature.

The first scale is along the x dimension. Fill that slot with the Width field from our configurator, using the get field block.

You can duplicate this line of code three times, connecting each of the three dimensions with the Width, Depth, and Height fields.
Run your scene. You should see the connected configurator launch, and this scene appear in the configurator's viewer.

Adjustments to the width, depth, and height fields in the configurator are applied to the box mesh. This happens as part of the rule cycle after every edit the customer makes.
This is a great start, and works well. But it can be optimized.

Click the Next button to find out more.

Return to your Snap rule. You'll notice the parser has to find the box model and drill down into a feature inside it three times. Making three trips to the same place is inefficient, especially if your scene is complex.
Replace these three lines of code with just one line, by using a vector. A vector is a combination of three numbers, and is a common way to express data in 3D scenes.

Open the toolbox, and open the scene… vectors category. Drag out the first block, showing three numbers. This vector block can bundle up three dimensions into one neat package, which can be faster to process.

Drag the width, height, and depth fields into the x, y, and z slots in the vector.
Then drag the vector into the set feature block.

Notice the error: the set feature block is expecting just one number for the scale x parameter. We're giving it three.

Change the set feature block to accept a vector by clearing the final property. Change the X to null.

Now, instead of setting one dimension with a number, we're setting all three dimensions with a vector.

The error disappears.

Your code runs the same as before, but reads easier and performs faster.

Recap

Features are simple, modular adjustments to meshes in your 3D scene. In this course, we introduced features, demonstrated the transform geometry feature, and used the rules editor to create rules. We also learned how you can use vectors to optimize your code.

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