Linear Patterns in CPQ 3D Scenes Transcript

In this course, learn the theory of linear patterns by watching a real-world example using this feature to solve a design problem. Use Snap to manipulate the linear pattern feature. Then go beyond the basics with tips, tricks, and suggestions.

Objectives

- Linear Pattern Theory & Example
- Linear Pattern manipulations with Snap
- Linear Pattern: Beyond the basics

Linear Pattern Theory & Example

Use the linear pattern feature to repeat a mesh along a straight line.

First, adjust your view of the scene to make your work easier. Hide other meshes that may get in the way. Change your camera orientation so you can clearly view your work.

Select the mesh you'd like to repeat.

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

1. As with all features, you can change the **name** of the feature to make future Snap programming easier.
2. Set the **pattern count** to the number of meshes you want to appear.
3. Set the **pattern translation** to describe the change in position each duplicate mesh will have from the previous mesh..

The count and translation are related. In this example, since we have a translation of 2 units along the X axis, and a count of 5 meshes, the last mesh is at position 8 on the X axis.

- Changing the pattern count will add or remove duplicate meshes.
- Changing the pattern translation will change the overall length of the linear pattern.

The linear pattern is not limited to just one of the three axes. Enter any **vector** into the pattern translation to define the line used in the pattern.

Linear Pattern manipulations with Snap

Like any other feature, linear patterns 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 a customer to specify the length of a fence.

- Create a number field called “Fence Length”.
  We’ve set our field with a default value of 3, precision 0, step 1, and constraints to ensure the length is between 1 and 10. We’re using a slider control.

- Create a second number field called “Post Spacing”.
  We’ve set our example with a default of 1, precision 0, step 1, and constraints to ensure the spacing is between 1 and 3. We’re using a slider control for this field as well.

When we run the scene, we see the linear pattern and the fields, but they are not connected.

- To connect them, create a new scene rule, called “Build Fence”.
- Calculate how many fenceposts are required. It would be the fence length, divided by the post spacing.
- Then use the **set feature** block to set the *count* and *translation* of the linear pattern feature called “property line” of the mesh called “Fence Post”.

When we run the scene, we see the linear pattern is now driven by the fields.

Linear Pattern: Beyond the Basics

Linear Pattern is a powerful feature, but keep in mind some useful suggestions.

One common problem: linear patterns may not fill all the space you need.

In our fencepost example, if we had a total fence length of 5 and the post spacing was 1, the fence appears correctly. Specifically, we see a post at position 1 and at position 5. However, adjust the post spacing to 2, and we don't see a final post at the correct position.

Why does this happen?

Each repeated element in a pattern consists of both the mesh, and the space which follows the mesh. Positioning is calculated from both.Keeping the spacing in mind, we see the final element is positioned correctly.

In some cases, you may want to end with an element, not with the space that follows it.

- One solution: create a second mesh, identical to the first but with no pattern applied. Use Snap rules to make the second mesh visible and move it to the correct position at the end of the pattern.
- Another solution: you can add the unwanted extra space of the final element to the total length of the pattern, so the last element appears as expected.

Another common question: how can you apply a linear pattern to multiple meshes, instead of just one?

For example, maybe we want to add a decorative finial to the top of our fenceposts. How could we have the finial be duplicated and positioned the same way as the fencepost?

- One solution is to treat the finial as a separate mesh, and manipulate it in parallel to the fencepost mesh.

  In other words, it would have a linear pattern feature (just like the fencepost does), and Snap rules would manipulate that finial feature (just like they do the fencepost feature).

- A second solution would be to combine the finial and the fencepost together into one mesh.

  (You can learn more about combining meshes by watching another course on the geometry join feature.) While this simplifies your scene objects and your code, it is also inflexible. Your users couldn't easily select another type of finial for the same fencepost, for example.

Here's a tip. Remember that multiple features can be stacked (or applied in order) to the same mesh.

You could create a checkerboard of fenceposts, for example, by applying a second "transform geometry" feature after the first, with its vector going in another direction.

When stacking multiple features to a mesh, the order of those features can make a difference in the result. For example, if you are using the UV Map feature to apply a material texture, as well as this linear pattern feature, note how the order of the features changes the look of the meshes.

- Do you want each patterned mesh to appear with the exact same texture pattern?

  Then apply the UV map before the pattern. You'll see the texture applied many times, once to each mesh, making them identical in appearance.

- Or, do you want each patterned element to appear slightly different from the others?

  Then apply the UV map after the pattern, and use a large texture in the UV map. You'll see the texture applied once over the entire group of elements, which can give each of them slight variations and a more realistic appearance.

(You can learn more about controlling material textures by watching a separate course on the UV map feature.)

Recap

As a recap,

- You reviewed the theory of how a linear pattern can repeat a mesh or group along a curved arc.
- You know how to automate the linear pattern feature using Snap rules.
- And you learned some tips and tricks in using this feature.

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