Simple NURBS editing in Maya

Introduction
NURBS (Non Uniform Rational B-Splines) are square surfaces – known as patches – that define a single surface when their edges are connected within certain distances. This means that editing a smooth NURBS model is very different to editing a polygonal mesh or subdivision control cage. We'll look at a few tools available in Maya to work with patches.

Lofting
This is a creation rather than an editing tool, but the splines connected with the new surface are NURBS so in that sense it can be thought of as an editing procedure.

Start with two or more CV curves; these can be open or both closed (use Curves – Open/Close to toggle this property) but mixing these properties can result in odd surfaces. If there are more than two then select them in a consistent direction or the surface will loop back on itself. Note that you can select the resulting surface and also toggle its open/close property, this time with Surfaces – Open/Close.

Cutting a hole in a NURBS patch – using curve projection
There are a couple of ways to do this. You can start with a closed CV curve that is closer to the active viewpoint than a NURBS surface (in this case a plane, but it can be any shape). Then select the surface, shift-select the curve, and use Surfaces – Project Curve. The curve will be projected in the top view (not the active view you may be looking at) on to the surface. Move the CV curve around to adjust the projected curve on the surface until it's where you need it. Then select the surface and use Surfaces – Trim Tool but this time enable the dialog box. The surface will be split by the projected curve. Depending on whether the Selected State in the dialog box is set to Keep or Discard click on the part of the surface you want to keep or lose so the dotted lines turn solid. Then hit Return.

Note that moving the original curve will move the cutout in the surface; you can have the hole go through an edge or even off the surface entirely. You can also edit the curve to change the hole.
Cutting a hole in a NURBS patch – using Make Live

Create a surface – in this case we’ll use a cylinder – and select it. Click on the Make Live icon to enable drawing on the surface.

This is the Make Live tool – it looks like a magnet with dots at the end of the arms and will turn blue when active. Now draw a curve on the surface and close it. End the tool operation by hitting Q and click on the Make Live icon again to disable it, then select the surface (it can’t be selected when Make Live is active) and use Surfaces – Trim Tool to cut the surface as before.

You can extract this curve for use in making a lofted surface that emerges from the hole. Right click on the surface to show the Marking Menu and choose Trim Edge from the top circle of options. Left click on any part of the edge and it will be highlighted. Then use Curves – Duplicate Surface Curves to create a separate object that is a duplicate of the edge of the hole; move this away from the surface as below.

The surface curve and the new curve can both be selected to create the basis of a new lofted surface.

Making a trimmed surface

A trimmed surface is a regular NURBS patch that is bounded (trimmed) by a CV curve. Make a closed curve as left and then choose Surfaces – Planar. A new surface will be created inside the curve; you can then move and edit either the surface or the curve independently, though the curve will define the surface’s boundary as long as the surface’s history is not deleted.
Here the surface has been moved down from the curve and its control vertices have been moved to give it a 3D form. The curve can still be edited to change the surface’s profile, however. This profile will always be a top-down projection.

**Revolving a curve**

Again, this is more of a creation than an editing tool, but the interlinked forms of curve and surface, similar to the other tools in this handout, mean that it can be defined as either. In front view, create a curve. The Revolve tool will rotate this around a vertical (Y) axis running through the center of the curve’s origin point. Select the curve and choose Move (W) to see the origin point (at the intersection of the arrows). Very likely it will be in an unsuitable location, so hit D to enter origin point editing mode. Move the origin using the arrows to where the center of revolution should be and then hit D again. Now use **Surfaces – Revolve** to create the surface of revolution. If your curve is not closed it will create a single surface with no thickness, and very often with the normals facing inside so that the outside looks black in preview mode. Select the surface and use **Surfaces – Reverse Direction** to fix this. Alternatively use a closed curve to give the wall of the revolved object some thickness and to have the normals facing correctly on both inside and outside.

You may have to change the origin point for the revolved surface. For a regular shape a better way to do this is to use **Modify – Center Pivot**.

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