

GA2211 – Hard Surfaces Modeling Section A & B – Class Notes – Week 4

Working with SPLINES:

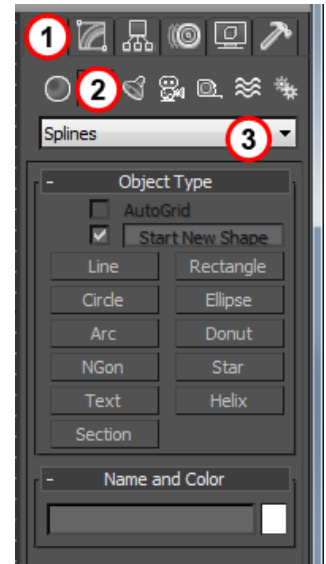
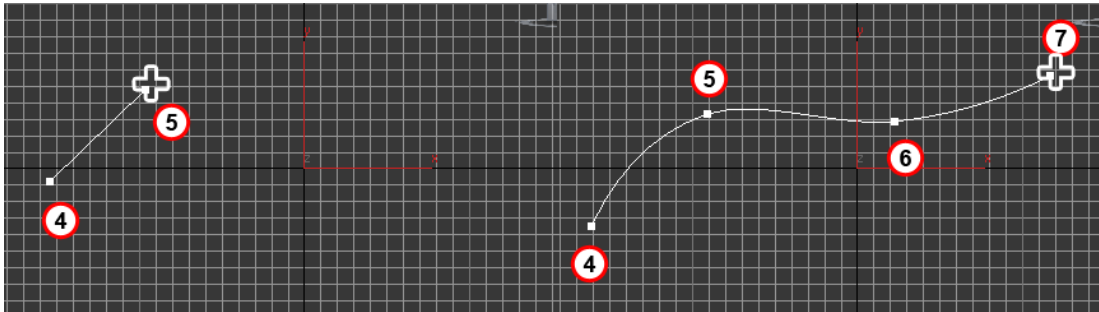
SPLINES are another type of geometric object you can use to model. They are lines in 3D space, which are drawn through points. The curvature of the SPLINE object can be changed by the Tangency and type of the point. More on this later.

To create a spline object:

In the CREATE tab (1), select the second icon (2) (“Shapes”) and select “Splines” (3) from the drop menu.

You will have some preset spline types, but most often you will use “Line”.

Click the “Line” type and begin to click inside the viewport..



A new point will be created whenever you click...and a line connecting the previous point will result.

Creation Options:

There are some options you need to be aware of when creating a Spline LINE object:

8) “Start New Shape” - ON by default, this will decide whether you want the SPLINE object you will make to be part of a previously selected SPLINE shape, or a unique new shape. Clicking it OFF will let you further refine an existing SPLINE by adding another Shape (Line, Circle, etc) to the existing SPLINE.

9) “Creation Method: Initial Type” - This area lets you decide on what type of tangency to apply to the first vertex. Usually, you will want “Smooth”. You can always change tangency later, so set it to “Smooth” for easiest initial curve profile creation.

10) Creation Method: Drag Type” - This area lets you decide on what type of tangency to apply for the remaining vertices. As you click to add a new vertex, you have the opportunity to drag out a tangency profile before releasing the button. Since you can convert vertices later, it is often easiest to just leave it on “Smooth”.

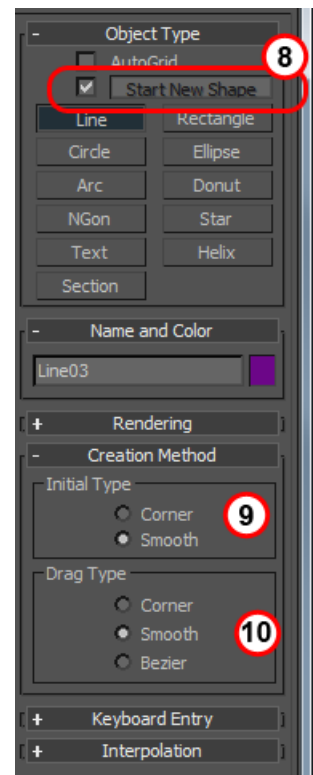
Spline Sub-Object mode:

Splines have 3 Sub-Object modes:

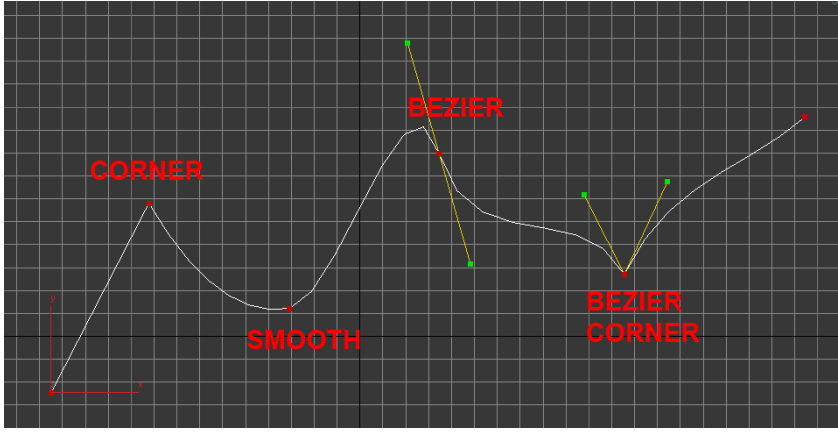
Vertex – This lets you move vertex position and, more importantly, adjust the tangency type for each vertex.

Segment – This lets you select and move line segments between vertices.

Spline – This mode lets you select whole Splines. For single Splines, this will mean the whole object...but for complicated attached Splines, this will mean long runs of connected verts/segments.



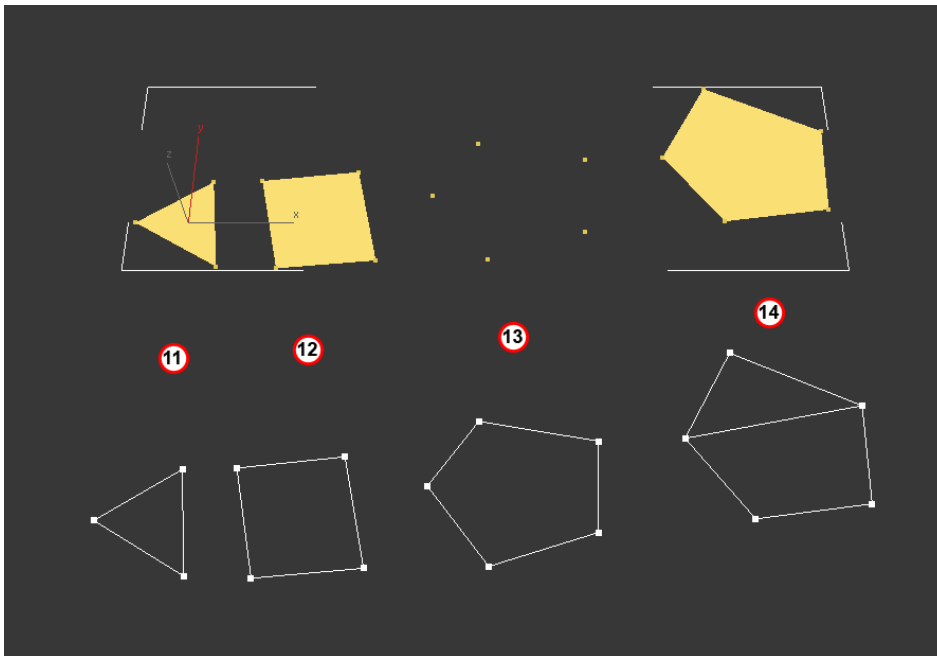
VERTEX TANGENCY:



general purpose tangency method for basic block-out of your shape.

Bezier – The Bezier tangency type will give you a unified set of handles to control the curvature. Dragging these handles out will cause a wider curve profile and bringing them in will create a tighter profile. Note that the handles are always parallel. This ensures a smooth curve point. This works like Bezier Curves in other packages, like Photoshop and Illustrator.

Bezier Corner – The Bezier Corner is the most customizable tangency type. It is like a standard Bezier, but lets you break the handles and make changes to them uniquely. This added control lets you create corners, smoother curves and any combination of tangency profile before and after the vertex.



any way, other than by NOT creating the face. If your patch is not visible, check the number of vertices around the outside...it should be 3 or 4.

14) You can bridge the gap to create a 3 or 4 sided spline at any time by attaching or creating a spline to the previous illegal spline. Notice how, now it will create the patch fine once there are no more than 4 sides.

To effectively use the SURFACE modifier, you need to assign it to any Spline. Then, working lower in the stack, you can continue to edit the spline – adding spline segments and working the tangencies - and seeing the result on the SURFACE.

15) To see the results of your SURFACE modifier higher in the stack, select the “Spline/Editable Spline” in the stack and hit the “Show End Results” button to preview the result all the way up the stack.

Spline Vertices have 4 ways to define the curvature as it enters and leaves the vertex. You can convert the tangency profile at any time by Right-Clicking on a vertex and choosing a different type from the top-left Quad menu:

Corner – The Corner tangency type will not attempt to do any curvature at the vertex. This will leave a hard corner.

Smooth – The standard Smooth tangency type will try to do a linear smooth curve based on the distance between the previous and next vertex. It is a good

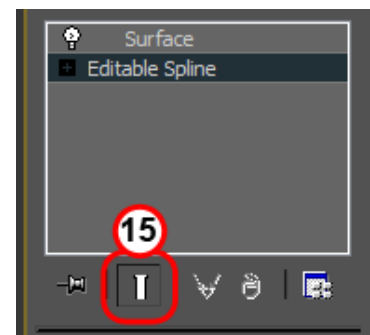
SURFACE MODIFIER:

The **Surface** Modifier will build a patch surface between any cage of Splines that make a 3-sided or 4-Sided boundary. It is important to note that **ONLY** 3 and 4 sided spline boundaries will create a patch. If you are not seeing a patch, check that there are no more than 4 sides to the boundary region:

11) This 3-sided triangular spline will create a patch when the surface modifier is applied (above).

12) This 4-sided square spline will create a patch when the surface modifier is applied (above).

13) This 5 sided spline shape **WILL NOT** create a patch when the Surface modifier is applied (above). Max will not warn you in



Creating a Spline Cage:

There are several ways to add Splines/Segments to an existing spline – to create a full spline cage:

16) Attach another Spline – You can attach any spline to an existing spline with the attach button. You can attach multiple Splines at once with the “Attach Mult.” button. Click the button and then select the spline you wish to attach. Once attached, the new shape contains both Splines.

17) Create Line tool – In vertex sub-object mode, you can use the “Create Line” tool to create new, attached Splines.

18) Refine + “Connect”- In Vertex sub-object mode, the REFINE tool will let you add vertices. If you select the “Connect” option ON, it will let you add line segments in between the newly created points.

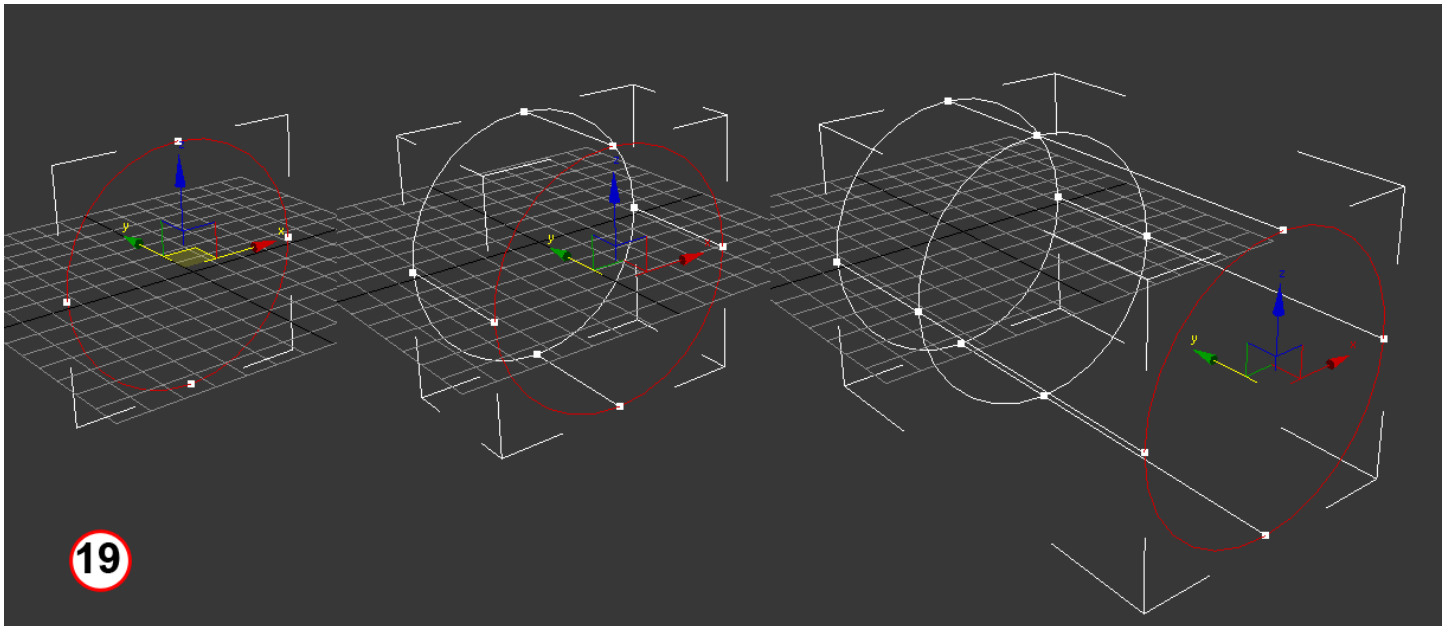
[Note:] The new line created by REFINE + Connect will only appear after you finish the tool (Right-Click).

Create a new Spline with “Start New Shape” OFF – If you check OFF the “Start New Shape” (8) flag and have another spline selected; it will automatically attach the new line to your selected spline.

19) SHIFT-Clone with “Connect Copy: Connect” ON – In segment sub-object mode, if you check ON the “Connect Copy: Connect” flag, you can shift-clone new segments. Shift clone is



accomplished by using the transform/move tool while pressing . This will create a copy of the segment you selected, and connect to the original segments with spline rails.

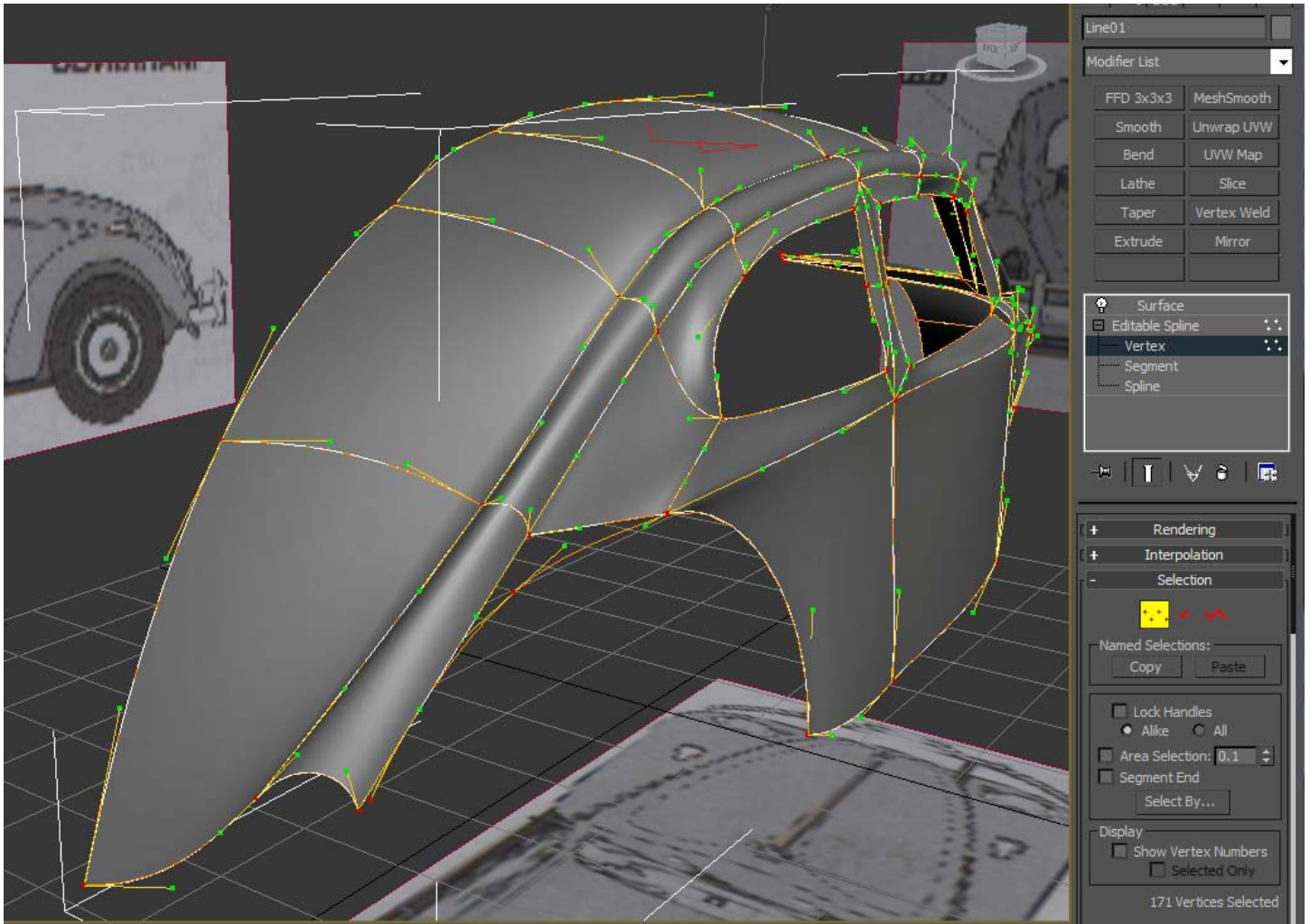


Other useful tools:

20) FUSE – In vertex sub-object mode, you can use “FUSE” to make the vertices coincident – that is, sitting in the same location. While this does not actually weld or consolidate the verts, this makes the Surface modifier create a surface at lower positional tolerances.

To see vertices, even when not selected, turn on “**VERTEX TICKS**”. Select your object. From the right-click Quad Menu (Bottom Right) Choose “Object Properties” and Turn ON “**Vertex Ticks**” in the *Display Properties* section.

Working with the **Surface** modifier in the stack (above your **Editable Spline**) - and with the “**Show End Results**” button active – continue to create lines, edit the vertex tangency to sculpt out your shape:



Axis Constraints: Another useful tool is the axis constraints menu. This menu will let you make discreet movements that are aligned to either one axis or a plane created by 2 axis. This is most useful when trying to move a Bezier handle in 3 Dimensions. Since Bezier handles are a 2 Dimensional construct, Max can get confused when pulling these in a 3D viewport. Use Axis Constraints to force Max to adhere to one plane of movement.

To turn on Axis Constraints:

Right-Click in any open area in the Main Toolbar – and select “Axis Constraint” menu.

A floating menu will appear. Click on any axis or select a Plane from the drop menu (“XY”, “YZ”, “ZX”).

