

Z-Modeler User's Guide

Appendix - Splines Explained

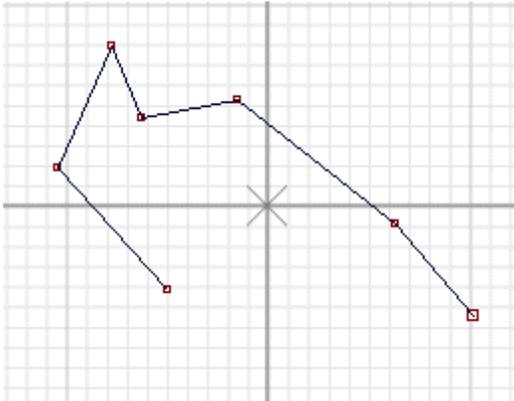
In this Chapter:

- *What are they?*
- *What do they do?*
- *How to create them*
- *How to modify them*
- *Creating Surfaces*
- *Do's and Don'ts*

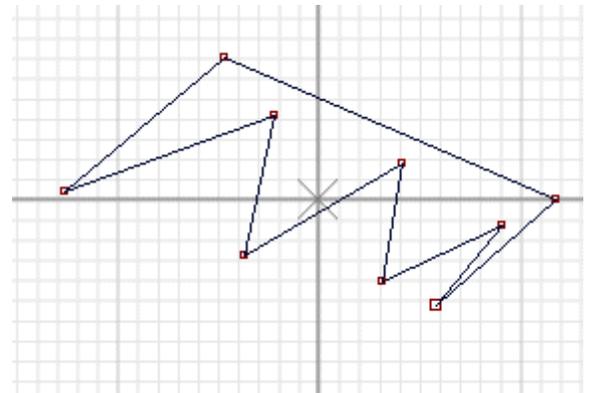
Splines are often a source of confusion, frustration, and mystery for Z-Modeler beginners. Splines are familiar to those who use 3D Studio Max, and other high-end 3D modeling suites. For users of Z-Modeler, however, they may be a totally foreign concept. That's why this appendix will define splines first, then go on to show how they function in Z-Modeler, and most of the things you can do with them. Note: This Appendix was written directly after the second chapter, so a knowledge of the first two chapters would be advisable when reading it.

What Are Splines?

The definition of splines is rather elusive. A good start is found in Z-Modeler's help: "Splines are Z-Modeler's helping [structures] that are used for generating various surfaces." So, what are these various surfaces? They are lines connected to Verts, but not normal Verts, and not normal lines. Splines are SPecial LINES that allow you to create surfaces made of real polys, Verts, and edges. However, Splines in and of themselves, are not meshes. Splines do not actually have part names, cannot be hidden, but they can be moved, rotated, and deleted. They are also described as either open or closed. An open spline, is a line, or a curve that does not connect together. See below left:



Splines can also be closed, or can be said to have a closed path if the last point on the spline connects back to the first point on the spline:



Open and closed splines make the difference in how some tools work, so keep that in mind. Another characteristic of splines can be seen in those two pictures above. You'll notice in both pictures how one spline vert is bigger than the rest. That is the beginning vertex of the spline. It's where you started drawing the spline. When making objects with splines, you have to remember where the beginning vert is. Splines have two levels, object and vert. You access these levels by selecting their real mesh counterparts (select vert or object level) and then select the Spline level. You do this by clicking the Splines button next to the level selectors:



Clicking the splines button (or using it's hot key, the accent mark "`", to the left of "1" on English keyboards) prevents you from modifying any real objects.

How are splines used?

At their most basic level, splines are guides for Z-Modeler to make real surfaces. You can draw the cross-section of a vase or wheel with a spline, and then rotate it around a center to make a perfectly circular representation of that cross section. You can also make a path, and a cross section, to make a complex object that uses the cross section along the path. This is explained in my *Tabulated Surfaces Tutorial*. You can also outline a flat shape and fill it with polys, or create a highly detailed composite shape based on four splines.

Creating Splines

The main toolbox has a drawer called Create-->Spline which we did not cover in the "Z-Modeler Commands" chapter. Its contents are discussed in a table on the next page.

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Create --> Spline

Tool	Description
Create-->Spline-->Point	This creates a spline's vertex. it basically is just a single point. I'm not sure when this would be used. Just click in the desired view and it will put a spline point where you clicked.
Create-->Spline-->Line	This allows you to create a single-segment line. You click in the desired view to start it, then move to where you want the spline to end and click again. You have your single-segment line.
Create-->Spline-->Linestrip	This, to me is the most useful tool in here because it allows you to create a point, a single-segment line, or a multi-segment line. Click once in the desired view, and you have created your point. If you click again somewhere else, you will get a single-segment line. If you continue clicking, you will create a multi-segment line with as many points and segments as you want. When you're finished, at any time, right-click the mouse to stop drawing the line-strip. Also, if you click back on the first vert of the spline, it closes your spline and doesn't allow you to continue making segments.
Create-->Spline-->NGon	This tool is also very useful, because, in conjunction with the Numeric Bar (#1), it will draw a closed, elliptical spline that has a variable number of segments. You adjust the number of segments that it uses with the Numeric Bar. Just select your number, and drag an ellipse, and release. The ellipse, to the specified number of segments, is there.

Modifying Splines

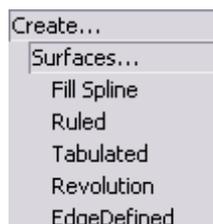
As stated before, you can move, rotate, and delete splines, or their vertices. But since splines' elements can't be selected, you have to do this one at a time. The general rules applying to moving, rotating, and deleting apply here. When deleting, however, watch out for SEL mode. If it is on, you will delete all the spline verts, or spline objects in your file. This can be frustrating or disastrous. Under the Modify --> drawer, however, there are three spline tools that you will find quite useful as well. Lets' take a look.

Tool	Description
Modify-->Spline-->Insert	This tool inserts a point, or a series of points, into an edge on an existing spline. You click on the edge where you want the extra vert, and note that the edge is now moving with the mouse. Wherever you click next is where the new vert will be placed. Now, after you click to add that vert, it allows you to keep adding verts in that particular edge. The edge is still connected to the mouse, so successive clicking will give you more verts. To finish inserting verts, just right-click.
Modify-->Spline-->Open	This actually disconnects two verts of a spline by deleting the edge between the two of them. It works in the Spline Objects mode, and you just click on any spline edge to delete it. On closed splines, this tool opens the spline. It is no longer a closed spline. On open splines, it actually splits the spline in two. You now have two splines where you had one before. You can see this because now the new object has a larger starting vert visible.
Modify-->Spline-->Connect	This tool connects two open splines together or closes an open spline. To connect two splines, click on the last vert of one, and the starting vert of the other. The splines are now connected between those two points. However, they are still two separate spline objects. There's no way to make two spline objects one spline. To close an open spline, just click on the last vert of that spline, and the beginning vert of that same spline and you will have a closed path.

That's about it for spline-specific modifying commands, however, almost the entire Create-->Surfaces drawer of our toolbox allows us to create objects from splines. Let's delve into that next.

Creating Surfaces with Splines

Splines are useless unless we can somehow translate them into a real mesh. So, there are tools for that purpose. They are found in the Create-->Surfaces drawer of the Main Toolbox:



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Tool	Description	How to Use
Create-->Surfaces-->Fill Spline	This tool works on a closed spline, and fills it with polygons in the most efficient way.	Create a closed spline where you need your surface to be. Then activate the tool and click on the spline. Z-Modeler will prompt you to name the new object, and when you click OK, it will fill the spline.
Create-->Surfaces-->Ruled	This tool works similarly to the Fill Spline tool, except that it uses two splines instead of just one. It connects the two splines with polys, starting with each spline's first vert.	You create two splines across from each other. Each represents one side of your surface. Modify the splines until they represent your surface accurately. For best results, the splines should have a similar amount of verts in them. Also, having the first vert of your spline on one side being opposite from the first vert on the other spline can create some nasty objects, so try and draw them both from left to right (or from right to left). Now activate the tool, and click on the first spline, then on the second spline. This is useful for creating convincing landscape with splines.
Create-->Surfaces-->Tabulated	Please see the entire tutorial about this tool.	
Create-->Surfaces-->Revolution	This tool allows you to create an open cross-section spline and rotate it around a point in space. It will even fill in the ends of your object, allowing you to create an object without holes in it.	Create in the TOP or the FRONT view, your cross section, of the object from a side. Since it's a round object, it doesn't matter what side you choose. Think of the spline as representing the outside edge of that object. This may be hard to do, since some objects must be represented by more than your eye can see. For example, this is a good cross section of a tire, however, you can't see that by looking at a tire from the front. Once you have made the cross section to your liking, try creating a surface from it. In the SIDE view, click on the spline, and click where the center should be. Then, Z-Modeler will ask you for a name, and how many segments you want the object to be. (In the "Horizontal Steps" area of the box) This is basically how many times the spline is rotated around the center to make the object. More=Smother. Then, it will ask you if you want to Cap the Start, and if you want to Cap the End. This means that Z-Modeler will actually fill the openings of your object with respect to the center if you select yes. If you say yes to "Cap Start?", then the area bordered by the rotated Starting Vert of your spline will be filled with polys that start at the center. If you do the same for "Cap End?"
Create-->Surfaces-->EdgeDefined	This is possibly the strangest of all the Surfaces tools. It requires you to make four splines, all separate, but still connected at their endpoints, so that the starting vert of one is the ending vert of another. Then, it makes some interesting objects as a composite of those splines. Remember that each spline must have the same number of verts.	Make your splines using the linestrip tool. Make your first spline, then right click to finish it. Click directly on the last vert in that spline and create your second spline. Continue this process until you have four splines. Your last spline should end at the starting point of the first spline. Now, activate the command, and click on your splines in counter-clockwise order, starting from the first one. It will prompt you to name your surface, and when you click OK, it will appear. The Edge-Defined tool appears to work on the principle of following the horizontal and vertical contours of each spline, making a smooth composite shape. It's very difficult to explain and I don't fully understand it, but it appears to be capable of making some very complex shapes from a minimum of splines. Check it out.

So that's quite an overview of the tools associated with splines. There's a great deal that you can do with splines, and each of these Surface tools could have it's own devoted tutorial. As mentioned, the Tabulated tool already does. Let's wrap things up with some useful Do's and Dont's.

DO:

- *Learn to use splines*
- *Spend time fooling with them*
- *Try different applications of the tools*

DON'T:

- *Be afraid of them*
- *Use them too much*
- *Use them as your primary modeling tool*
- *Use UNDO with them. This will usually crash Z-Modeler.*
- *Make your spline-created objects too high-poly. (This is easy to do)*

I hope this clears up the mysterious world of splines for you, that's the best I could explain them, so for now, just read this and try everything out, you'll be using splines like a pro in no time!