



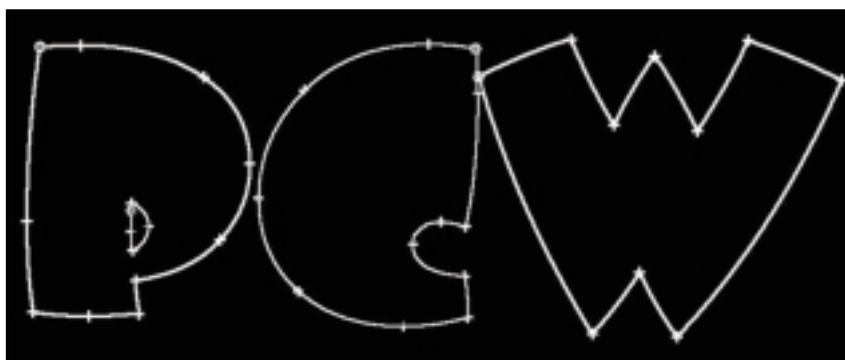
Bending the letter

Benjamin Woolley chips away at **some familiar 3D text** to produce curvaceous Boolean bends.

You might think that text is as relevant to creating 3D graphics as smells are to composing music. These are two fundamentally different media. Obviously, 3D graphics is about pictures and text is about words. But text constantly crops up in 3D scenes, often in the form of company and product logos, sometimes within signs imparting information, even on the pages of virtual books (as featured in several games, notably *Myst*).

This month I want to look at some of the ways text can be used in 3D graphics, with an exercise based on my unofficial (and uninvited) revamp of the famous PCW logo.

First, though, we need to consider how text appears in 3D scenes. It takes two entirely different forms. In signs and suchlike, it is usually applied as a material to a 3D object, such as a flat plane or cube. This is the quickest way of introducing letters and numbers into a scene. For example, if you have created a model of a car and want to add a number plate, it makes sense to add the registration number as a bitmap. This is easily done, as most paint programs include some sort of text tool, and these



Screenshot 1: The shapes of the letters used to create the new, fun PCW logo. The tick marks show the positions of the vertices that determine the curvature of the shape

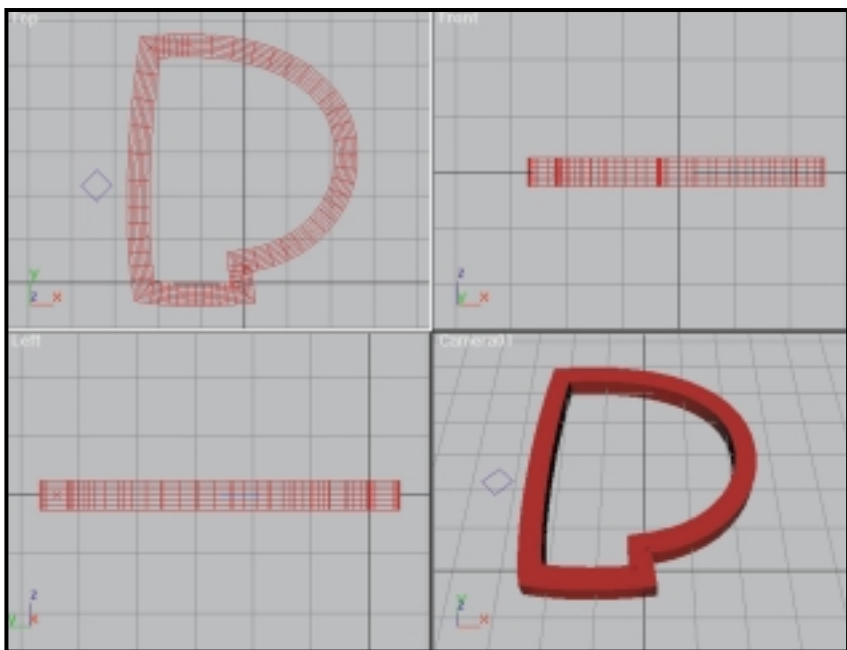
days many of these tools use TrueType fonts to generate the letters, providing a wide range of typefaces to experiment with. You simply insert the text you want using the appropriate font onto an empty background (or a textured one, for that matter, if your paint program allows for this), save it as a bitmap, and apply it as a material to the object that will display the text in the final render (such as an oblong shape with the dimensions of a number plate).

There can be complications with

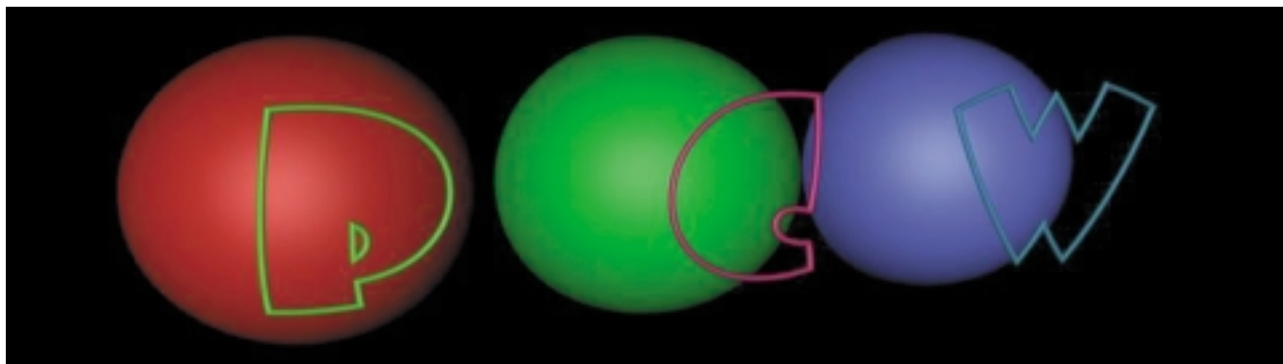
applying text as a material. The main one is that the material can become distorted or blurred by the way it is mapped onto objects. If, continuing with the number plate example, the bitmap applied as the material is of a low resolution, and the number plate at some point fills the foreground of the scene, the letters and numbers might become blurred. So it is best to establish in advance roughly how many pixels the text will take up in the final render, and make sure the bitmap is of an equivalent or greater resolution.

You will also have to consider the shape of the object to which the bitmap containing the text is to be applied. Fonts do not respond well to being stretched or twisted, so you will either have to create a bitmap with the same aspect ratio as the surface it is being mapped onto, or apply the bitmap as a decal (like a sticker). If you choose the latter, you may also need to think about applying a texture beneath the text, which means generating an original bitmap with a transparent background. For best results, this means using a paint program that supports alpha channels (also known as masks), and saving the bitmap in an appropriate file format (eg as a .tiff file).

The other approach to adding text to a scene is to add it as geometry. All the 3D packages I know include some sort of

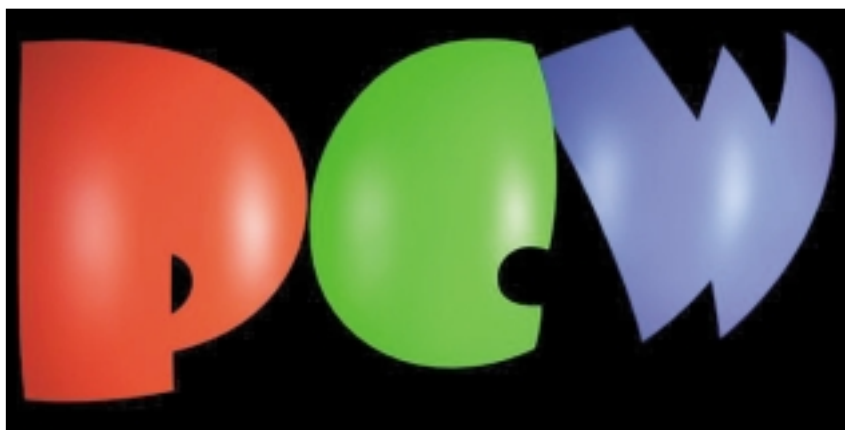


Screenshot 2: Here the outer line of the P shape has been used as a path to 'loft' a square shape. The resulting model could be used in conjunction with a Boolean subtract operation to engrave the P outline into a model of a block of stone



facility that enables you to do this, and many of them, like the paint programs, can generate the letter forms using TrueType fonts.

This was the approach I took when creating my Toytown version of the PCW logo. **Screenshot 1** shows the letters as they are first created. They are basically curved lines or 'splines' with vertices (indicated by the tick marks) which can be manipulated to control the shape of each segment. Using spline editing tools, you can alter the shape of each letter you create as much as you like, a level of flexibility not possible using a paint package. The letters used in this experiment were based on a tubby TrueType font called 'Beesknees'.



Screenshot 4: The finished result. The highlights on the surface of the plastic material applied to the objects emphasise the letters' tubby shape

Having chosen a font, inserted the letters into the scene and messed about with their shapes, the next decision is deciding how to turn them into 3D models. The shapes on their own won't render (or if they do, only as outlines). They are simply 2D lines. To turn them into proper renderable surfaces, you need to use them to generate some 3D

geometry. One option is to 'loft' a 3D object using the letter as the path, and another shape as the cross section.

Screenshot 2 shows the result of using the outline of the letter P as a path with a square cross section. Note that the P shape is in fact made up of two splines, one for the outside of the letter, the other for the inside. I had to delete the inner spline because a lofting path can comprise only a single, continuous line.

The results of this lofting process can be used in various ways. One that is particularly effective is engraving. If you loft all the shapes that make up the text you want to insert, you can then use a Boolean operation to cut the shape of the lofted letters from, say, a slab of

stone (ie a slab-shaped object textured as stone). If you want to do this, bear in mind that such complex Booleans don't always produce very tidy geometry. This in turn can create some texturing headaches, as you may find that the resulting object has stray faces. One possible solution to this is to texture the slab with a 'procedural' material. Most 3D packages include a marble or woodgrain procedural, that mathematically calculates the way the grain will appear in the object to which it is applied. Such materials often cope

Screenshot 3: These are the three letter shapes set before three hemispheres. The aim is to produce 3D letter objects with the curved contours of the hemispheres

better with complex or disorganised geometry than those using bitmaps.

You can, of course, produce engravings by applying a bitmap of the same text as a bump map. This will be quicker and more efficient, but you will have less control over the finished result.

I decided to use my letters to create a different sort of geometry (**screenshot 3**). I used each letter form as a sort of cookie-cutter. Different 3D packages offer various methods for doing this. It can be achieved using a Boolean operation. First, you would extrude the letter shapes to create three blocks with the letter shape as the cross-section. For each letter block, you create a hemisphere that is wider but not deeper than the block, using a Boolean intersection operation. This leaves the block with the upper surface curved to the contours of the hemisphere.

I did something similar using a 3D Studio MAX modifier called ShapeMerge, which enables you to use a shape as a sort of cookie-cutter. This meant I ended up with just the curved surface of each letter, as opposed to an entire block (see **screenshot 4**).

These are by no means the only ways of using text in 3D scenes, there is endless scope for experimentation. One rule, however, applies whatever you do: before you perform that geometry-destroying Boolean operation, or the final high-resolution render, check your spelling.

CONTACTS

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