



Changing rooms

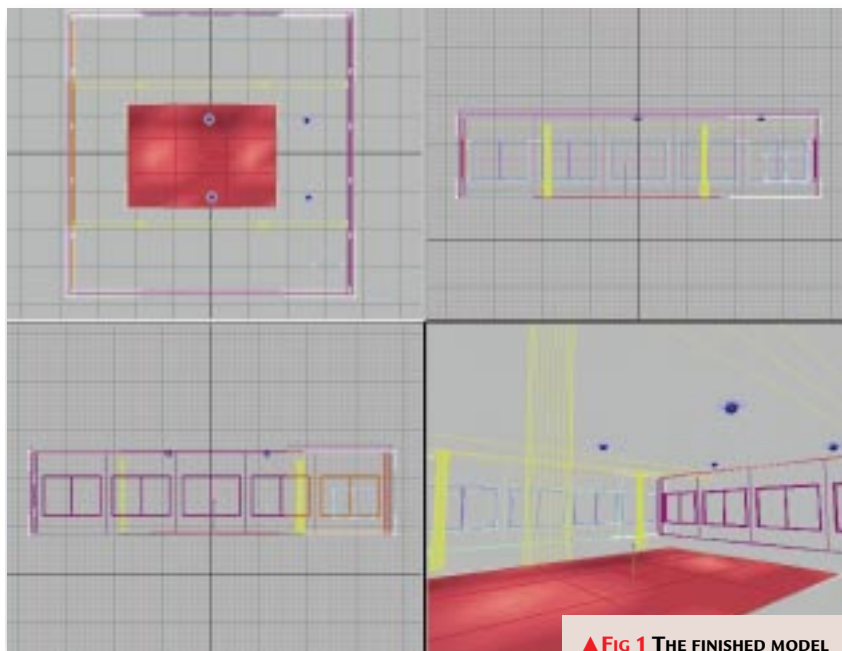
You can use 3D graphics to try out room plan and **decoration ideas**. Benjamin Woolley explains.

A DIY enthusiast and amateur interior designer who was always rather puzzled by my preference for fiddling around with virtual spaces rather than real ones, recently pointed out to me that one useful application of 3D graphics would be to model room interiors and then use the result to test out various décors and colour schemes. I have just spent the past few days trying to do exactly that, discovering along the way some salutary lessons about the difficulties of using a computer to simulate physical environments.

Light fantastic

The first stage of the task was relatively easy to fulfil: build up a model of the interior to be designed. The space, a warehouse conversion, is a relatively simple one, little more than a flattened cube [Fig 1]. The only architectural flourishes are the cast-iron pillars, which hold up two heavy beams that traverse the ceiling, and some light fittings.

Once the basic model was complete, I next had to consider how best to light it. This provided the first big challenge, as lighting a virtual scene that is supposed to correspond with a physical one is a tricky business. The problem is to do with both the nature of virtual lights, and the accuracy of renderers. Virtual lights do not necessarily behave exactly like real ones. For example, in my scene there is a soft "omni" (as in omni-directional) beneath the room, the light from which actually penetrates the underside of the floor before it hits the ceiling. The reason I have put it there is to make up for another peculiarity of virtual lighting: there is a set of spotlights in the ceiling which cast quite intense pools of light onto the floor, but due to the inadequacies of the general-purpose renderers you get with 3D authoring packages, the light is not reflected back into the room. So, even when the spots are pointing at a shiny parquet floor, the rest of the room remains in gloom. I have



▲ **Fig 1** THE FINISHED MODEL OF THE ROOM'S INTERIOR. THE LARGE RED OBLONG OBJECT IS THE PLANE UPON WHICH THE RUG HAS BEEN MAPPED

had to use the omni to compensate.

There is a third light in the scene, which represents the sun. It is a so-called (in 3D Studio MAX) "direct" light which casts its light in parallel beams and, unlike a standard omni, casts shadows (i.e. the light is blocked by opaque objects in its path). By moving the sun around the model, I can reproduce the different lighting conditions the room's inhabitants will experience at different times of the day, and by switching it off I can give an idea of what the artificial lighting will achieve at night time.

With the modelling and lighting completed, I was now ready to start on the décor. This, for my DIY friend, is the whole point of the exercise. Once you have got a rough model of the space to be decorated, you can experiment with different schemes simply by changing or editing textures. For example, the pillars and beams are textured with a mottled

cast-iron finish which happens

to be black. By simply altering the diffuse colour properties for that material, it can instantly become white, blue, purple or

whatever you want, while retaining its distinctive texture. You can instantly repaint the walls a different colour using the same technique. When you start to apply texture

maps as well as colours, a whole host of new possibilities arises. The parquet flooring can be changed to stone or marble. It can be rendered as highly polished or dull, bumpy or smooth, simply by changing the appropriate parameters in the materials editor.

The final rendering of the scene [Fig 2] shows how you can even try out artefacts you have spotted in a catalogue. The rug, called a "Gabbeh", is a form of tribal weave from southern Iran. For my virtual rug, I scanned a beautifully-printed colour picture from a catalogue, using a

Virtual lights do not necessarily behave exactly like real ones



◀ **Fig 2** THE RENDERED RESULT OF THE MODEL, WITH A SHINY PARQUET FLOOR AND WALLS PAINTED A TASTEFUL SHADE OF BLUE. I HAVE USED A POST-PRODUCTION EFFECT TO ADD SOME GLOW TO THE LIGHTS

others with stripy wallpaper, and so on. The result was very pleasing, and provided a reasonably good indication of which colour and pattern schemes would work, and those that would not.

flatbed scanner, and applied the resulting bitmap as a texture map to a simple flat plane (that is, a square) placed just above the floor. The rug did present one problem: it was not a perfectly rectilinear shape and its edges were softened by fringes. If I mapped it on to the plane without taking this into account, I would end up with hard, cropped edges; to avoid this, I used a 2D paint package to create a mask out of the rug, using the

alpha channel (see the December '97 column for more on this topic). This mask was then used as an opacity map, making the areas around the edges, and even between the tassels, transparent so that the floor beneath would show through.

When I had finished texturing, I was able to render endless versions of the room, each with a different wall or floor covering: some with terracotta tiles,

➔ **There are specialist software packages** for using 3D graphics to plan room interiors (notably Visual Home, from Fasttrak) but only by doing it yourself with a proper 3D authoring package will you get the flexibility to see what is possible, as well as discovering the limitations. This exercise provides a reminder of just how unrealistic so-called photorealistic renderers remain. In particular, the way light behaves in a virtual scene is different to the way it behaves in a real one, in a way that is of particular relevance to trying to reproduce interiors.

If I had, say, a bright red floor and pure white walls, none of the red light reflected off the floor would be reflected by the wall. Furthermore, the overall level of brightness of the room would remain the same whether you use light or dark colours. The only way around this is to add, as I have done, false lighting and tint it appropriately. Unfortunately, the more you do this, the less reliable your virtual room becomes as a guide to what the real one will eventually look like.

A STANDARD CHRISTMAS WISH

In the time-warped world of monthly magazines, this January issue comes out before Christmas. So, I have only one thing to ask of Santa: a standardised, extensible 3D file format/rendering language — although if he could throw in a workstation with an Intel Xeon processor, it would be appreciated. A “standard” hardly sounds like the most

scintillating present, but it really would be a boon to the world of 3D graphics which remains obstinately stuck with a series of proprietary and incompatible standards. There is DXF, but that remains woefully inadequate as it does not allow for textures. There is VRML, but that is specifically designed for 3D content which is going to be sent over the internet and rendered in

real time. An industry-approved format would allow us to pick and choose different software tools from different suppliers. It would mean that, for example, you could use a texture editor from one company with a renderer from another. We would no longer have to rely on one monster package to provide everything we wanted. What a real gift that would be to us all.

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