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Image and Intention with LightWave and Piranesi
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By Darlene A. Brady

When Charles Gaushell, AIA first used DataCAD in 1989 to develop a 3D model of the Memphis, Tennessee Ronald McDonald House, he learned how powerful the computer could be as a design tool. Because the CAD program was easy to use and enhanced the ability to envision the final project, he also realized that 3D modeling can be an important presentation tool.

These understandings drew him to the field of architectural illustration. Because many firms cannot develop digital expertise in house, Charles Gaushell and Scott Carter started Paradigm Productions, LLC in 1992 to fill this need. The Memphis firm specializes in 3D computer graphics, animation, and multimedia services.

Initially, Paradigm completed renderings that were started by an architecture firm, or they created renderings from scratch. Their work has now expanded to include medical visualization, exhibit design, television, video production, legal reenactments, and interactive multimedia markets.

From Architecture to Illustration

Both partners of Paradigm Productions come from architectural backgrounds. Carter has a bachelor's in architecture from the University of Arkansas. Gaushell is a registered architect with a bachelor's degree in architecture and a minor in finance from Louisiana Tech University.

They find that these backgrounds give them a fuller understanding of the potential of the medium than would a traditional background in animation. Working within a virtual 3D computer world is a natural extension of architectural design.

Gaushell says the flexibility of digital media makes it a "fantastic" presentation tool. He notes that with hand renderings, there is only one view at a time. With a 3D CAD rendering "you can place the camera wherever you want and develop additional renderings with little additional cost. Animations allow for even greater flexibility."

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Their backgrounds in traditional architectural media also influence their work and choice of software programs. In college Gausshell developed a fondness for Prismacolor renderings. Carter likes watercolor renderings. As a result, they make a point of taking the "computer edge" off their renderings.

Technology: Getting Started

The technology used to create the renderings includes Windows NT, a dual processor Pentium II 450mhz PC with 512MB RAM; LightWave 3D by NewTek; Piranesi by Informatix; Paint Shop Pro by Jasc Software; AutoCAD; and DataCAD.

Typically Gausshell receives digital drawing files and/or hand-drawn sketches from the architect. If necessary, he uses AutoCAD or DataCAD to convert those files to a 2D file format (DXF or 3DS) that can be loaded into LightWave 3D. In LightWave, he creates the 3D model, sets up all textures, lighting, and camera positions and then renders a view as an Epix file for Piranesi. Once in Piranesi, Gausshell adds entourage if desired and/or paints on top of the image to create a stylized look.

Lightwave: Models, Lights, Materials

Working from the imported drawings, all of the 3D modeling is done in LightWave 3D. LightWave is not a drafting package but a 3D surface modeling, rendering and animation program. Gausshell uses LightWave 3D because it has a "soft edge" and produces subtle lighting changes which help reduce the "computer look." Piranesi also helps take this further with post-process "over painting."

Gausshell sets the materials in LightWave because there are an "infinite number of bitmap and algorithm-based layers that can be added to any surface to make it look real."

He also adds lights to the perspective in LightWave to obtain the desired color and highlight balance. The colors, intensities, and light types (spotlight, linear, area, etc.) in LightWave are adjusted based on "percentages" of brightness, not "real" specifications of lumens, footcandles, or watts. Although the results can be very realistic in appearance, setting relative brightness is an intuitive process of trial and error.

However with ray tracing, shadow mapping, radiosity, and caustics, an algorithm to compute light reflected from curved or transparent surfaces, it is easy to create multi-layered soft lights and shadows in LightWave. It is also possible to control how each object accepts or rejects lights, shadows, reflections, and so on to heighten the realistic effect.

The ability to control color, luminosity, diffusion, specularity, glossiness, reflection, transparency, refraction, translucency, and bump textures in a multitude of combinations, in addition to material plug-ins, adds realism to a perspective view. In paint programs, by contrast, he can only add previously created images to the surfaces, which is not as effective.

Piranesi: Entourage and Effects

Gaushell uses Piranesi to add photorealistic entourage to the scene, such as people and trees. He also uses the program to paint over the top of the LightWave image to create accurate perspectives with a hand-drawn "atmospheric" look.

He saves LightWave views as Epix files, which he then opens in Piranesi for adding entourage and stylizing. This file format includes 3D depth and material information in addition to the raster data of the image.

Informatix describes Piranesi as a "3D painting" program. It includes 2D color data similar to any paint program. Although Piranesi is not a 3D modeler, it "understands" the 3D geometry of the scene. This makes it possible to zoom "into" the image, but not to rotate or change viewing angles.

Piranesi also has a feature that allows elements added in the program to be erased without affecting the underlying view. This means the image can be easily and quickly manipulated without altering the 3D information from LightWave.

Although adding entourage is possible in LightWave, Gaushell finds this easier to do in Piranesi. In LightWave, it is possible to map an image of a person or plant to a single rectangular polygon to create an entourage object, but this is awkward for several reasons:

The mapped image, or object, has to rest properly on the ground; this can be difficult in LightWave, especially on a sloped site. Also, the object must face the camera or it will appear flat. Adding many trees in a 3D modeling/rendering program increases the rendering time and requires a lot of memory.

Because it retains the 3D depth and material data from the CAD file, Piranesi lets the user add entourage and change materials without having to re-render the file in LightWave.

In a typical 3D modeling/rendering program, adding entourage means the entire scene would have to be re-rendered. In Piranesi, only the "added" elements and effects are rendered.

The locations of the entourage can be quickly changed in Piranesi. To avoid distortions, the program also keeps entourage graphics squarely facing the camera view, even if it associated with a surface at an angle. The system adds shading and modifies the size automatically depending on where the objects are placed in the 3D image.

In Piranesi, entourage can be placed "behind" objects in the original LightWave rendering. For example, a person can be put behind a column and Piranesi will automatically clip out the portion that should be hidden. The ability to "drop in" entourage with 3D data and create automatic shadows is a great time saver.

Materials are changed by applying new bitmap textures. The 3D paint brushes change size depending upon the depth of the pixel being painted so that textures are rendered in perspective.

The painting tools can also be locked to materials, colors, plane, or orientation. Gaushell notes it is possible to lock "the brush to the material (e.g. only the carpet), the plane (e.g. only the right side wall), or the color (e.g. only the red on the seats)."

After all modifications are finished, the Piranesi image can be saved as a JPEG or several other raster file formats.

Illustrating with Intent

The purpose of an illustration to be created should play a pivotal role in the choice of medium.

Highly polished or detailed computer renderings can look "final." This may not be the message that the architect wants to communicate if the project is still developing. Digital renderings that have the less definitive look of a free-hand sketch or watercolor may be more appropriate because it does not convey the impression that the design details are decided and unchangeable.

For a schematic design, such as the Hampton Inn project, a watercolor sketch gives the architect additional freedom to present ideas as the design evolves.

By contrast, when the intent is to convince the viewer of a final proposal, a photorealistic rendering with subtle material and light effects can be more effective. The Flagstar Bank prototype studies, for example, convey detailed design options and the effects of color schemes.

With the urban plaza renderings, the viewpoint is taken from the vantage point of someone standing on the ground in the plaza. Because these images are used for marketing purposes, it is important to place the viewer in the scene complete with entourage.

Gaushell notes that selecting digital media based on the desired results not only saves clients time and money, but enhances the communication process.

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About Paradigm Productions, LLC

Paradigm Productions of Memphis, Tennessee, was founded in March of 1992 by a group of architects that had a strong desire to provide 3D computer graphics and animation services. Since that time, Paradigm Productions has steadily progressed as a specialist in architectural animations. But because of their creative ideas and abilities, Paradigm Productions has found it's way into the medical, exhibit design, real estate, aviation, broadcast, legal reenactment, and interactive multimedia markets.

Since the partners come from architectural backgrounds, working within a virtual 3D computer world has been a natural extension. They have spent many hours over the years developing a unique combination of skills including the ability to design and understand complex 3D projects, strong design backgrounds, and a thorough working knowledge of video and computer technology. This gives Paradigm Productions an edge over traditional animation and graphic companies with employees that have limited areas of expertise or no working knowledge of architecture and design