

Making Virtual Real

by Tina Sarawgi

Student projects: Julie Barghout and Michelle Herrera

When a design studio extends itself into the real world, it starts to offer unique learning opportunities to the students. Studio projects grounded in reality can enable students to understand the complexities of real-life projects through a learning-by-doing paradigm. However, in projects of such scope, it is important to be able to convey the proposed design solution to the clients such that it makes them excited about the space they are about to inhabit.

Over the past two years, dialogues with Gensler at Charlotte, NC, led to the integration of real-life projects into the 3rd/ 4th year digital design studio at The University of North Carolina at Greensboro. The projects included an 18,500 sq. ft. fabric showroom for Culp Inc. at High Point, NC, and a 13,000 sq. ft. workplace environment for Mullen Advertising Agency in Winston-Salem. Both projects were completed by Gensler, Charlotte a few months before the students started working on them in a design studio environment. The studio challenge was to develop comprehensive design solutions in conjunction with regular discussions with the clients and site visits. Two studio projects by Michelle Herrera and Julie Barghout are featured here outlining their digital explorations with materials and lighting.

THE PROCESS

Designers at Gensler provided information on the site and program, the scope and size of which were adapted to fit the academic curriculum parameters so that the project could be completed within a semester. The real clients: VP of Human Resources and Sales in Culp, and the VP of Human Resources and Creative Services Director in Mullen interacted regularly with the students over the semester, providing them an in-depth insight into the spaces, activities, and experience desired by the clients. Having a real client to talk to, understand the needs of, and then respond to, not only placed a sense of responsibility on the students, but also steered them toward making their design decisions relevant to the users of the space. In the same vein, visiting a real site to experience, assess, and understand opportunities and constraints of, provided a deeper insight into the design problem at hand.

DIGITAL EXPLORATIONS

Our perception of space results from a combination of the shape and reflectance of surfaces, the distribution of lights in the environment, and the observer's point of view (Vangorp et al., 2007; Adelson, 2001). The intrinsic mechanics of the material (such as elasticity, viscosity, etc.) acted upon by outside forces leaves it in a certain shape. For example, a fabric drapes and folds in different ways depending on how thick or stiff or elastic it is. The intrinsic optics of the material (such as reflection, refraction, transmittance, and absorption of light) determines the way it is illuminated by the lights in the scene. And finally, the position of the observer (or camera) at some viewing point in space, looking in a certain direction with a certain focus apparatus combines with the material's intrinsic mechanics and optics to form an image (Adelson, 2001). Visual observation of the everyday world conditions us into doing a good job of guessing the intrinsic mechanics and optics of materials.

Knowledge of these physics-based properties of materials and lights can help one make a rendered space look realistic. But to express the immeasurable aspects of architecture, one needs to go beyond form and construction and capture the spirit of a place. This requires understanding and representing the "presence" of materials and light, taking inspiration from its behavior in real-life.



Figures 1, 2: Examples of texture maps used by Michelle Herrera.



Figures 3-6: (3) Views of the showroom with display boards and shelving to display the Culp Inc. fabrics; (4) the waiting area; (5) the fabric bolts along the hallway; and (6) the café. Models and images by Michelle Herrera.

form•Z was chosen over other programs ^[1] as the *virtual* tool to develop the final visualizations of the real projects because of its user-friendly options available to evoke the intrinsic mechanics and optics of materials, and lighting in the space. The intention was not photorealism but to express the essence of something that was not yet built. The material and lighting explorations in the spirit of this view are discussed below.

MATERIALS

In the Culp Inc. fabric showroom design project, Michelle's goal was to achieve a comfortable atmosphere that would encourage the visitors to occupy the space for a longer period so that they would possibly end up buying the fabrics on display. She achieved this goal through the use of warm colors (accents of burgundy) and soft materials (plush fabrics) to make the clients feel relaxed, thereby spending more time in the space.

Texture mapping was used to wrap the material image around the objects (Spalter, 2000). Michelle chose to go with images gathered from various resources such

as photos, scanned images, or Web sites to define the materials in her project (Figures 1, 2). The images were adjusted in Photoshop to avoid tiling before they were imported into **form•Z**.

Object reflectance played a key role in developing the renderings. The reflectance of an object consists of three components: ambient, diffuse, and specular. The ambient color does not vary across an object. The diffuse color varies according to the Lambertian law. The illumination component that changes the fastest is specular. Specular highlights can help illustrate object detail in an object with high curvature (Lee et al., 2004) as seen in the chairs and the pendant lights in Figures 4 and 6. It is important to consider the viewing direction, surface normal and/ or light direction for specular highlights on a shiny surface.

By adding a combination of ambient, diffuse and specular reflectance properties to surfaces, light bounces off of surfaces simulating the effect of real environments. Notice the reflectivity added to the textures, especially on the wood ceiling and the concrete floor surfaces in Figures 3 through 6. Michelle also found that white objects often



Figures 7, 8: The tiling seams of the concrete texture above is reduced by increasing the reflectivity of the surface; and the texture for concrete mapped in the project. By Julie Barghout.

appear gray when rendered in **form•Z**. A small amount of glow added to the surface properties renders it white. Reflectance, glow and transparency options were adjusted in **form•Z**'s surface style settings to achieve the overall appearance of materials.

In the Mullen Advertising office space, Julie's project's central theme was to create "a space to see and be seen." This was emphasized through the use of transparent and translucent materials. Julie also found an unlikely application of material reflectance. She tweaked the reflectivity of materials to camouflage the flaws in the texture, which would otherwise be apparent and distract the reviewers (Figures 7,8).

LIGHTING

Lighting is an equally important part of the perception of objects in space. Materials alone cannot make a virtual space look convincing without appropriate illumination. A shiny object will not look very shiny if seen in an environment with broad diffuse illumination (Adelson, 2001). When placing lights in a scene, it is also important to keep the layers of lighting, which include ambient, focal, task and decorative, in mind (Benya, 2001).

Although **form•Z** offers radiosity-based rendering options capable of achieving photorealistic renderings, they were not used by the students. Lights were used in both projects to approximate the properties of real lights. Instead of faithful visual reproduction, lights were used in both projects to suggest and at times exaggerate the experience in the space, whether it was warm and inviting in the Culp Inc. showroom space or transparent and creative in the Mullen Advertising Agency office space.

For the most part, Michelle used point lights for both ambient and focal lighting within the space. She used the lights in combination with reflective surfaces to create images that emphasize light and shadow. Point lights were used predominantly because they give the most reasonable results, while area and line lights slow down rendering time significantly.

In Julie's project, point lights were employed for ambient illumination and cone lights for focal lighting. Direct lights were used at places to add dynamism to the space (Figures 9, 10). Color was used as a wayfinding element by defining the various departments of the advertising agency in different colors. Lighting was used to further highlight the color scheme of each department.

The final renderings seemed to convey the representation of the place as a multilayered integrated experience of the senses. Compelling results achieved in **form•Z** required little or no post-processing in Photoshop.

CONCLUSION

In the words of Peter Zumthor, "the best images of something not yet built are the ones that give you a broad, open feeling, like a promise" (Melvin, 2006). This would not have been possible with photorealistic representation. The final images created by students in both projects are not exactly true to the physics of light or materials, but they take inspiration from their properties in real-life and use it to create something that inspires and stimulates imagination, thus going beyond creating a visual likeness alone. These images spread the enthusiasm for the projects amongst the clients, conveying to them the essence of the space. This was recognized and appreciated during the final critiques.



Figures 9, 10: The images above show the cone light used in the linear light fixtures; point lights for general illumination; and direct light for creating a dynamic imagery (by Julie Barghout). The account services department is color-coded green, while the creative department is color-coded red.

Another noteworthy aspect of the project stemming from the academia and professional alliance was that the projects were worked out to a greater level of detail than is usually found in studio projects (Wood and Oxley, 2007). Faced with responding to the aspirations of real clients and seeing that their design decisions affected the lives of people whom they were interacting with, the students went beyond meeting the project requirements as a checklist.

In conclusion, these projects demonstrate a way of bridging between the academia and the profession, made possible with the use of robust digital rendering tools which fuel imagination and convey the ‘atmosphere’ of a place (Zumthor, 2006).

NOTES

[1] The students in the design studio, in addition to **form•Z**, worked with a variety of other software programs such as Sketch-Up, AutoCAD, etc. The former was used for its quick modeling capabilities. AutoCAD was used to convey the construction and millwork details two-dimensionally. However, when it came to the depiction of lighting and materials in the space, **form•Z** was selected.

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