Customizing Visualization in MicroStation

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Visualizations

Visualization- by means of Rendering or an animation - simplifies even the most complicated design idea. Its has become an important part of the over all design process and can no longer be dismissed as irrelevant to a project. Computer visualizations can be made so realistic that it can be difficult for the viewer to determine if the rendering is an actual photograph or a computer model.

Up until a few years ago, serious visualization work for engineering and architecture required additional software. But with the release of MicroStation SE, and more recently MicroStation/J, that has changed. Now just about everything needed to create professional renderings and animations is provided within MicroStation.

A starting set of palette files, which contain materials and pattern maps, are delivered with MicroStation. Using these materials and patterns, you may be able to produce high-quality renderings. However, once you've mastered the basic skills of visualization, you will gradually move on to creating new materials and patterns for your rendering requirements.

ModelVision, Inc. of Madison, Alabama (www.modelvision.com), has developed an extensive library of materials for use with MicroStation visualization. Its CD libraries include an expansive selection of render-ready cells, hundreds of rendering materials, and an extensive collection of skies for use as backgrounds in your images.

If you are ready to develop your own material, this article is meant for you. This article is written with the intent to help an intermediate visualization user begin to customize the available tools, and to provide explanations for some visualization material settings. Basic lighting techniques are also discussed.

Customizing palette files

Once the decision has been made to begin adding customized materials, there are several recommended steps you should take before making any modifications to the existing palette files. When installed, MicroStation will place all the palette files along with the materials and patterns in a sub-directory named c:\Bentley\Workspace\system\materials\(or c:\win32app\ustation\material\ if you are using

MicroStation SE). As new versions of MicroStation are installed on your computer, these material directories are overwritten by the new installation. If you choose to develop your own library of materials and pattern mappings, it is best to store your libraries in

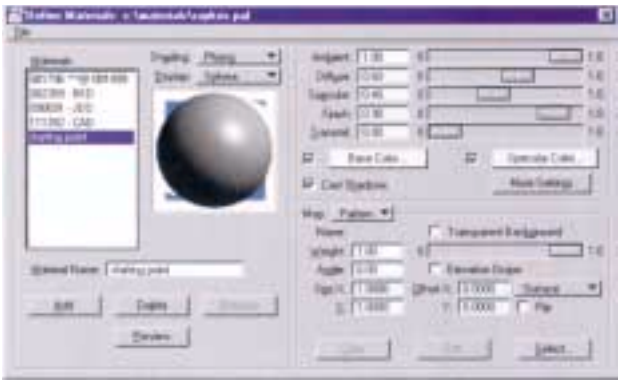

Figure 1. Define Materials

directories separate from MicroStations existing directories.

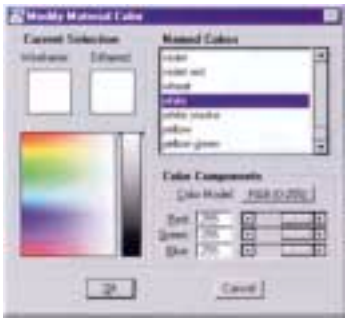

Figure 2. Modify Material Color

Before modifying any delivered material, or adding a new material, be sure to copy the existing palette files, along with any materials and patterns, to a directory outside the parent c:\Bentley. By doing this, you will avoid inadvertently overwriting any modifications you make to the existing palette files, or any new palettes you develop, the next time you update MicroStation. My materials are stored in a directory named c:\materials.

Creating a new palette file

One you have made sure your new materials will be safe, create a new palette file. Any new palette file should always have a starting point material. A starting point material is one that you will use when creating any new materials. All the material settings are set to a point that is common for most materials. The Define Materials dialog with the Starting Point material settings is shown in Figure 1.

Next, take the starting point and make a new color material. Select the starting point and then click on the Base Color dialog button. The Modify Material Color dialog will become active (see Figure 2). Pick a bright color for this first example, than select Specular Color and select a color for this setting as well. Now save the color using a descriptive name without adjusting any other setting.

Take a look at the adjustable settings in the Define Materials dialog and how they can affect a material.

Ambient measures the degree to which the overall ambient lighting is reflected by the material. The Global Lighting Ambient Lighting setting dialog, together with the material ambient lighting setting, will determine the appearance of the surface in the final image.

To help you better understand this, the following table shows some examples of this formula.

Ambient Effect Examples (Ma x Ga = AE)

Material Ambient Global Ambient Ambient Effect
(Ma) x (Ga) = (AE)
1.0 0.1 0.1
0.8 0.3 0.24
0.5 0.2 0.1

Diffuse color is based on either the design file element color or the base color, if one has been defined. If set to 0.0, the material will be black. If set to 1.0, the material will display 100 percent of the diffuse color.

Specular sets the intensity of the specular highlights for the material. If Specular Color is on, the specular highlights will display this color. If Specular Color is not selected, the specular highlights will display the element color in highlighted areas.

Finish sets the size of the specular highlight. The finish setting can range from 0.0 for a smooth surface with no polish to 1.0 for a highly polished surface.

Transmit determines the amount of light that will penetrate your material. A high setting of 1.0 is fully transparent or clear, while a lower setting of 0.0 allows no light to penetrate the material. This setting is useful in creating glass among other materials. Transmittance can also be adjusted for a material to give the special effect of a see-through wall.

By selecting [More Settings] the More Material Settings dialog appears and the following settings may be adjusted (Figure 3).

Reflect sets the materials reflectivity. A low setting of

Figure 3. **More Materials Settings.**

0.0 will give the material no reflectivity and a high setting of 1.0 will simulate a perfect mirror.

Refract sets the index of refraction of the material. The index defines how much light bends as it enters the material. A setting of 1.0 does not bend the light at all, whereas a setting lower than 1.0 causes the light to bend away from the surface normal of the object. By contrast, a setting of a value greater than 1.0 causes the light to bend toward the object.

Fresnel effects are calculated for the material when ray-traced. Fresnel effects cause the degree of transparency and reflectivity to be adjusted based on the angle by which the material is seen in the rendered view. An example of this would be to view a piece of clear glass, first by standing directly in front of it, than by moving to an angled viewing point. As you stand in front of the glass, it is fully transparent but as you move to a point which is at an angle to the glass pane, it becomes less transparent and more reflective. This is the effect that will be achieved if Fresnel is on in your ray-traced image.

Radiosity is used with other settings. Radiosity solving is a more advanced lighting technique we will save for a future article.

All of the settings discussed will affect your material whether or not a pattern or bump map is applied.

Attaching patterns to materials

By attaching a pattern to a material you can increase the realism of your rendering. A pattern is a raster image of a material such as brick, wood floors or marble. The possibilities for patterns in materials are limited only by your own creativity. Follow along to create a material with a pattern mapping.

Begin again with the starting point material. Double-click the starting point material to open the Define Materials dialog. In the lower-right corner click on the Select button, which opens the Select Pattern Map dialog.

For this example, pick any of the images files delivered with MicroStation, (located in a sub-directory named \patterns). After selecting the material control returns to the Define Material dialog. Again, save the new material with a descriptive name.

Bump maps simulate a textured surface by varying the way the object reflects light. Lighter areas of the material maps reflect more light than the darker areas. By varying the height, you can achieve different bumping effects. Any image file can be used as a bump map. As you experiment with this, you'll discover the varying possibilities that can be achieved by adjusting bump map settings, including the height, size and offset of the bump mapping.

By changing the Pattern button to Bump, you can then select an image to act as the bump definition. Materials can have a pattern applied and bump applied. The pattern and bump do not have to be the same image and you can also apply a bump without a pattern and vice-versa.

Transparent Background

When a digital or scanned photograph such as a person or a landscaping element is applied as material mapping, it is usually preferable to create the material with a Transparent Background. If done properly, this setting will display the image of the person or

landscaping element without any ghosting. Ghosting is the appearance of unwanted pixels around the transparent image that appear when the pixel colors do not exactly match the transparent color.

When initially creating the image that will have a transparent background, it is best to place the subject against a solid colored blue-screen background when the photograph is taken. While ideal, it isn't always possible. There are other ways to achieve the same effect.

Using photo-editing software such as Adobe Photoshop or Paint Shop Pro, you can erase the unwanted areas around the image. It is important to erase as much of the unwanted areas as possible, then save the image on a solid color background. The background color you choose must not appear anywhere else in the image or those areas will become transparent as well. For example, if you put a person with white shoes on a white background the shoes will become transparent and the person will appear to have no feet.

Figure 4. Original scanned photograph before editing.

Figure 4 shows a photograph of a child in an everyday setting. This image was scanned and then brought into Photoshop where the unwanted areas were erased. The remaining image was then saved on an orange background (Figure 5). It is now ready to be used in MicroStation as a transparent material mapping.

When a material is created with a transparent background, MicroStation assumes the color of the first pixel in the upper left-hand corner of the image to be the transparent color. Because of the high rate of image compression available in the JPG image format, it is preferable to use the TIF image format when creating images that will be transparent. JPG images are sometimes more likely to give a ghosting effect because the original image is so highly compressed in its JPG format.

If you've been following along with the steps taken, you can now create a material using the transparency selection in the Define Materials dialog. Once the material is created, map the new material to a MicroStation shape element in your model. When mapping people to shapes, it is particularly important to create the MicroStation shape proportionate to the pixel size of the image. Otherwise, the people you place in your visualizations may look unnatural. Trees and other landscape elements are created in a similar way to the example of the child shown earlier.

Figure 5. Background removed

Saving and creating palette files

When materials are assigned to a design file, the material assignments are stored in a material file that has the same name as the design file. For example, the materials for mybldg.dgn are stored in the mybldg.mat file. The material file also contains the names of the palette files that have been used in the material definitions. Once a material is created and saved in a palette file, the material can be used in many different renderings. While you can choose to develop a palette file for each rendering, it is not necessary. Creating one palette file for each rendering project is time-consuming and will lead to unnecessary duplication of materials.

Image Lighting Techniques

Image lighting is perhaps one of the most important areas of visualization. The most detailed model can lack any sense of realism if it is improperly illuminated. But few designers have ever studied lighting, and don't have a full understanding of its effect on every-

thing we see. Too many designers shrug their shoulders and leave the lighting settings on their defaults.

The key to understanding lighting is to develop an appreciation of how lighting affects everything we see. Look around your current environment as you read this article. Take notice that the lighting creates hot spots, areas that receive harsh direct light, and cooler spots, areas that receive reflective or defused light. Shadows are either harsh or soft depending on the lighting source and the amount of ambient and reflective light in the area.

Figure 6. Solar light with Solar Shadows.

MicroStation offers the ability to adjust lighting in several ways. Unlike other areas of visualization where default settings can be appropriate, in most cases the default lighting settings are not desirable for illumination of your rendering. There is no one right way to set lighting that can be used for all models. Each rendering will require specific lighting to achieve the desired effect for that particular model. Here well look at some of the basic ways to adjust lighting and the effects of those adjustments.

Ambient lighting adds an overall lighting effect to every element in the model file. Each elements direction, shape or placement has little or no effect on the way it receives the ambient light. Ambient lighting is effective to add light to darker areas of an image, but ambient light alone creates an image with little definition and depth.

Flashbulb, like its description, simulates a light source from the eyepoint or camera.

Add Sky Light to all Solar and Distant Lights can simulate atmospheric lighting. Cloudiness and Air Quality can be used to match the sky or atmospheric lighting.

Figure 6 shows the exterior of a facility with a Solar lighting value of 1.0 with Solar Shadows on. Add Sky Light to all Solar and Distant Lights has also been selected with a Cloudiness value of 0.00 and the Air Quality set to Urban. No other light is applied to this image and Ambient and Flashbulb have been turned off.

Figure 7. With Solar Ambient

The image in Figure 6 is quite dark, and without any ambient light the materials are barely visible. Figure 7 shows the same Solar lighting value as Figure 6; Ambient light has been added at a value of 0.3. There is no Flashbulb in use. Notice that the image is much more visible, but some areas on the right side of the building that are still in deep shadow.

Figure 8 also uses the Solar light value used in Figures 6 and 7. But by lowering the Ambient light value to 0.25 and adding two Distant Lights on the right side of the image with an intensity value of 0.5 and 0.2, the image is now much closer to real life than either Figure 6 or Figure 7. A sky background has been added to this image as well.

MicroStation also provides other lighting properties, including Point Lights, Area Lights and Spot Lights, which all add more choices for image illumination. These more sophisticated lighting techniques will be discussed in a future article.

Environment maps and ray tracing

Environment maps are images mapped to an imaginary cube surrounding the MicroStation design file.

Figure 8. Solar with two Distant Lights.

An environment map can only been seen by a reflective or transparent material. In ray tracing, when a reflective or transparent material does not see any other elements in its view, it will see the environment map. If there is no environment map, there is nothing to see and therefore black areas may appear in your reflective or transparent material.

Scratching the surface

There are many more visualization features in MicroStation than the ones covered in this article. I hope you are encouraged to experiment with the various parameters to find the best settings for any particular visualization. Digital visualization, while very technical in nature, is still, and will always remain, a form of art. As with any art, the results are a signature of your own personal creativity that can only be achieved through practice and experimentation.

Raymond Dwyer leads visualization efforts for Burns and Roe Enterprises, Inc. of Oradell, New Jersey. His images have appeared in EEM World and other publications. He is co-founder and current chairperson of the TMC Visualization Special Interest Group. He welcomes user comments and questions regarding visualization via e-mail rdwyer@roe.com.