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Computer Graphics

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Texture Mapping

The task in this assignment is to output the teapot along with a texture mapped onto its 3D surface. The term for this type of texture mapping is commonly known as UV mapping and it is commonly defined as “the 3D modeling process of projecting a 2D image to a 3D model’s surface for texture mapping.” It is used to apply any kind of texture to a 3D object. This process is what will turn a simple 3D model into an object that seriously represents an object in the real world.

The term UV mapping comes from U being representative of the X axis, and V being representative of the Y axis. It’s simply alternative terms for X and Y because those are already used to talk about the triangle vector space. So, by using different terms, it’s easy to recognize that when someone mentions UV, they are talking about a texture coordinate, and when someone mentions XY, they are talking about vector coordinates.

The first step to mapping the UVs to the 3D object is to assign UV values to all of the vectors. Fortunately, the tris.txt file provided already provides these values for us. This makes the implementation a simple process of interpolating the values through linear interpolation. In our implementation of OpenGL, the GZ library, we’ve already implemented several interpolation methods, one for color, real xy values, and normal values. In order to interpolate these texture coordinates or UV values, we will simply add one more interpolation function. This time, it will

deal with finding the values of the UV based on the input X and Y values. This is done using the same linear interpolation as the color interpolation from the previous assignments.

After that's done, it's easy to map these interpolated UV values by simply multiplying the U and V values respectively with the width and height of the provided texture. This will provide the pixel or GzColor that we can use to set the color in the final image for output. With this, the mapping is complete.

Works Cited

"UV Mapping." *Wikipedia*, Wikimedia Foundation, 19 Nov. 2020, en.wikipedia.org/wiki/UV_mapping.