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Assignment 3: Material Rendering

Shader Documentation

Gouraud Shading

The Gouraud shader applies a shade on our object on a per vertex basis. In the vertex shader, the program computes:

- The ambient color by multiplying the ambient material and ambient light colors.
- The diffuse color by first calculating the cosine of the angle between the light vector and normal via dot product. Then we multiply this angle with the diffuse material and diffuse light colors.
- The specular color by getting the vector pointing to the camera and the reflection vector from the normal & light vector. We then calculate the amount of specular power to use by getting the dot product of the reflection vector & vector to the camera, up to the power of the SpecPower variable. Finally, we multiply this specular power with the product of the specular material & specular light components.
- The spotlight factor by getting the dot product of the negative light vector & direction of the light, which is set to the power of the SpotPower variable.

The final color is calculated by adding the ambient, specular, and diffuse colors together multiplied by the spotlight factor to get the extra shine from the spotlight.

In the pixel shader, it simply returns the calculated color computed in the vertex shader.

Phong Shading

The Phong shader applies a shade on our object on a per pixel basis. In the vertex shader, the program:

- Sets our normal to be of unit length.
- Transforms vertex position to world space coordinates.

In the pixel shader, we calculate our individual ambient, diffuse, and specular color components.

- The ambient color is calculated by multiplying the ambient material and ambient light colors.
- The diffuse color is calculated by multiplying the diffuse material and diffuse light colors. This value is then multiplied by the Spot variable, which amplifies the color's light.

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- The specular color is calculated by calculating how much light makes it's way into the camera. This value is then multiplied with the product of the specular material & specular light colors.

Finally, the final color is generated by adding the calculated ambient, specular, and diffuse colors together. This final color is returned from the pixel shader.