

CSE4431: Lab 2

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1 Introduction

In this lab you will implement the ambient-diffuse-specular (ADS) illumination model using both the reflection direction and halfway vector formulations in both the vertex shader and the fragment shader and observe the differences in the resulting images.

2 ADS Vertex Shader

Copy the files from the directory `/cse/course/4431/labs/02/` into a directory owned by you. The files are:

<code>ads.vert</code>	a vertex shader using the reflection direction for specular illumination
<code>passthrough.frag</code>	a fragment shader that passes through the interpolated color
<code>adsvertex.glib</code>	the <code>glman</code> configuration file

Run `glman` and load the `adsvertex.glib` configuration file. Observe the appearance of the specular highlight.

2.1 Implement the Halfway Vector Formulation

`ads.vert` uses the reflection direction in the specular illumination calculation. Create a new vertex shader that uses the halfway vector instead of the reflection direction.

Recall that the halfway vector, \mathbf{H} , is the vector half way between the vectors \mathbf{L} and \mathbf{V} where \mathbf{L} is the unit vector from the point to the light source and \mathbf{V} is the unit vector from the point to viewer. The specular illumination is then calculated as:

$$I_{\text{specular}} = L_{\text{specular}} * \rho_{\text{specular}} * (\mathbf{H} \cdot \mathbf{N})^f \quad (1)$$

where L_{specular} is the specular light color, ρ_{specular} is the specular reflection coefficient of the material, \mathbf{N} is the normal vector at the point, and f is the specular exponent (shininess).

Create a new `glman` configuration file to test your implementation and observe the difference compared to the reflection vector formulation.

3 ADS Fragment Shader

Create a new vertex shader and fragment shader where the ADS illumination is computed inside the fragment shader.

The vertex shader needs to compute (as out variables) the location and normal vector of each vertex in eye coordinates. The fragment shader takes (as in variables) the interpolated vertex location and normal vector and uses them to compute the ADS illumination.

Create a new `glman` configuration file to test your implementation and observe the difference compared to the ADS vertex shader.

3.1 Implement the Halfway Vector Formulation

Finally, create a new fragment shader that uses the halfway vector instead of the reflection direction.

Create a new `glman` configuration file to test your implementation and observe the difference compared to the reflection vector formulation.

4 Time Permitting

If you have time, consider adding attenuation and spotlight effects to the light source.