

# COSC 4370 - Homework 3

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<https://replit.com/@theofficialjaco/Homework-3#main.cpp>

## 1 - Problem

The task at hand for this assignment was to implement the Phong shading model within the OpenGL framework, aiming to achieve realistic lighting effects on a simple cube object.

## 2 - Method

To understand the Phong shading model, I first had to figure out what Phong's purpose was and could do and that led me to a systematic approach. This involved understanding the principles of Phong shading, including ambient, diffuse, and specular lighting components. The primary focus was on integrating these components into vertex and fragment shaders effectively to achieve the desired lighting effects. Additionally, proper handling of the camera's view and projection matrices was essential to ensure accurate rendering of the scene.

## 3 - Implementation

The implementation phase began with the modification of the provided vertex and fragment shader stubs (phong.vs and phong.frag). In the vertex shader, computations were performed to transform the object's vertices into view space and to calculate the lighting contributions. This involved determining the normal vectors for each vertex and computing the ambient, diffuse, and specular lighting intensities based on the properties of the light source(s) and material.

Subsequently, in the fragment shader, the interpolated lighting values from the vertex shader were used to determine the final color of each fragment. This included combining the ambient, diffuse, and specular components along with considerations for attenuation and the viewer's position relative to the surface normal.

Furthermore, adjustments were made to the main.cpp file to incorporate the Phong shading model into the rendering pipeline. This included setting up the necessary uniform variables and ensuring proper interaction between the shaders and the application code.

## 4 - Results

The successful implementation of the Phong shading model yielded visually appealing results, as demonstrated by the rendered image of the cube object. The shading appeared realistic, with smooth transitions between light and shadow regions, effectively highlighting the object's contours and surface details. By accurately simulating the interaction of light with the object's surface, the Phong shading model enhanced the overall visual quality of the rendered scene.

### 4.1 – Phong Model

