

Assignment 4: Shaders

DUE: April 7 11:59pm

Template: [assignment4.zip](#) – this will only work properly with a graphics card that supports OpenGL 2.0 or higher. Computers in the labs do support this. Without 2.0, it may still run, but the lighting will be wrong. **This project can be completed by making just a few small changes to the shader and the OpenGL program.**

TIP: Download and use Typhoon Labs Shader Designer:

(<http://www.opengl.org/sdk/tools/ShaderDesigner/>) to compile and test your shaders before you try them in OpenGL

Objectives:

You will slightly modify existing shaders. The book offers vertex and fragment shaders for per-pixel Blinn-Phong lighting. Start with these (already set up in template). Just draw one object so that you can see the effects of lighting (you can feel free to use the included torus for this)

Make the following changes to the shaders and add some keypresses to the OpenGL main program that *toggles the effects (use separate programs with `glUseProgram`)*:

- A. Calculate and use the correct reflection vector instead of using the halfway vector for the lighting calculation of Phong shading. (press p to toggle between using the halfway vector and using the true reflection vector)
- B. **Grads:** extend this to include a texture on your object that is modulated by the per-pixel lighting colors (press t to toggle texture).
- C. **EXTRA CREDIT:** Give the user the ability to invert all the colors (press 'i') (i.e., $\text{color} = [1,1,1] - \text{color}$)

Submit all files through blackboard or email to the TA: the files or a weblink.