

CPSC 414

Assignment 3

Due Thursday April 8, 2004, 11:59pm

Answer the questions in the spaces provided on the question sheets. If you run out of space for an answer, use separate pages and staple them to your assignment.

Name: _____

Student Number: _____

Question 1	/ 4
Question 2	/ 4
Question 3	/ 30
TOTAL	/ 38

1. (4 points) Local Illumination

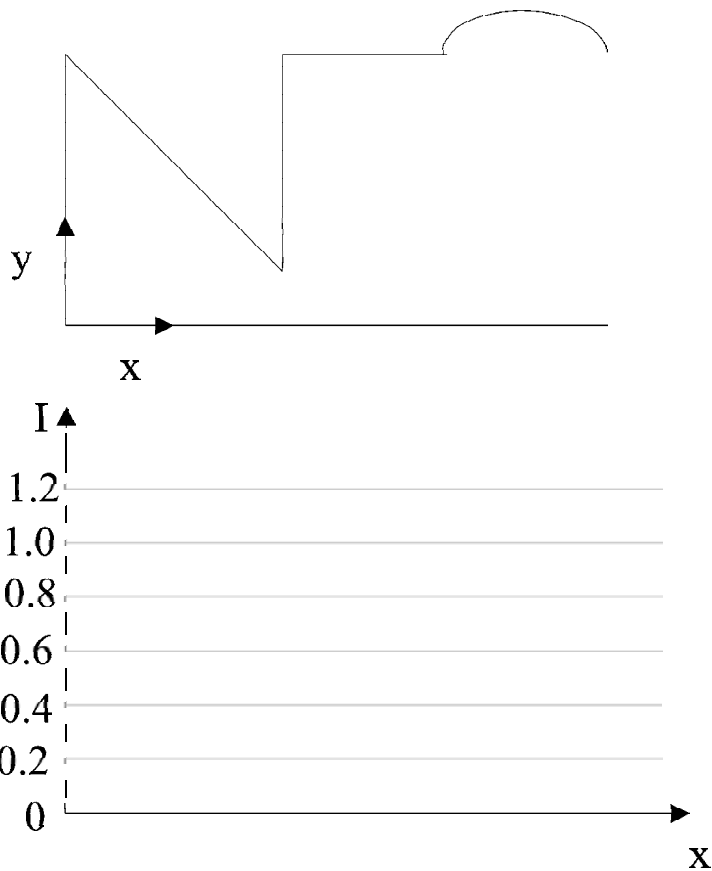
For the following scene, sketch the graphs of the ambient, diffuse, specular, and total illumination seen by the eye. Your graphs should sketch I as a function of x . Use the Phong illumination model, given by:

$$I = k_a I_a + k_d (N \cdot L) + k_s I_s (R \cdot V)^n$$

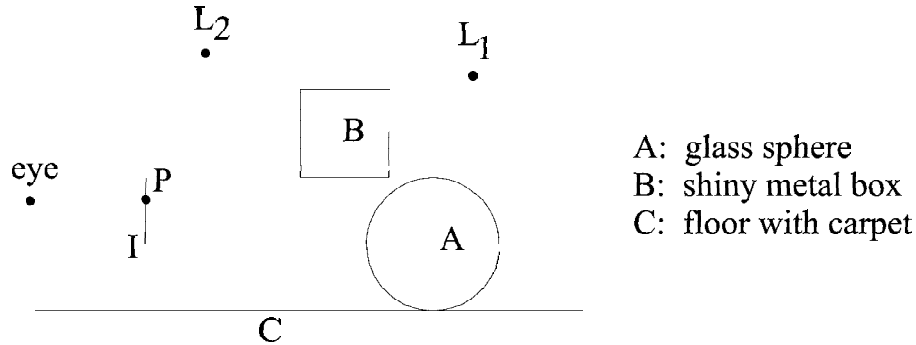
and the following parameter values:

I_a	0.2
I_d	1.0
I_s	1.0
k_a	0.3
k_d	0.6
k_s	0.5
n	100

light • • eye



2. (4 points) Sketch the paths of the reflected and transmitted rays that result for the ray cast through the pixel P . Also draw a “ray tree” diagram. Label the relevant points and the rays in the scene and in your ray tree diagram. Label your shadow rays, and annotate the blocked shadow rays with an 'x' in your ray tree diagram. Only illustrate the ray tree to a maximum depth of 3.



3. (30 points) Graphics Demo

Implement a scene, animation, game, or tutorial of your choice in OpenGL. It is recommended that you work in groups of two. hand in one project. Suggested projects are given below. The assignment will be marked out of 10. You can use any of the OpenGL demo programs provided during this course as a starting point if you like, although you should document this in your README file.

If you need help regarding how to implement any particular features, do not hesitate to ask the instructor or the TAs. Be sure to develop your project in testable stages. The best projects will be glorified forever in the 414 Hall of Fame!

Driving Game

Create a world with roads, or perhaps rough terrain without roads. Implement a mouse or keyboard interface for steering your virtual car around in this world. Ideas for optional features could include collision detection, night-driving mode, having the car leave tracks on the pavement or sand, providing control over the camera point-of-view (first person, third person, etc.), adding other autonomous cars in the world, etc. Be creative and add your own features.

Sketch Alive

Implement a 2D sketch program that allows you to sketch a 2D stick figure, and have the stick figure slowly “come alive” as it is drawn. For example, suppose you first draw the head with just a circle. Then you draw one of the eyes with another circle. The program recognizes that you just drew an eye and it automatically adds a pupil to the eye, which immediately begins moving, as if it is watching you. Each arm starts moving by itself (perhaps waving and doing other things) once it has been fully drawn. Suppose you’ve drawn the character, but you have forgotten to add feet. The character could look at you impatiently and point down to their feet, implying that you should draw his feet. You now draw his feet and the character now walks off the screen. The idea is to make a graphics program that is simple enough for kids to use, that is highly interactive and entertaining, and requires little instruction to use. Glut allows you to easily track mouse presses and mouse movements.

Tutorial

Implement a tutorial for part of the course that you think would benefit from a demonstration or tutorial.

Painting Plants

Implement a type of “paint program” that allows you to add trees and flowers to a scene by simply clicking on a terrain or painting over an area with the mouse to add multiple trees.

Particle System

Use simple physics ($F=ma$) to implement a fireworks simulation.

Hand-in Instructions

You do not have to hand in any printed code. You need only do one submission for a group of two. Create a README file that includes the names and login ID of the group members of your project, and any information you would like to pass on the marker.

Create a folder called 'assn3' under your cs414 directory and put all the source files, your makefile, and your README file there. Also include any images that are used as texture maps. Do not use further sub-directories.

The assignment should be handed in with the exact command:

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handin cs414 assn3
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