

University of Colorado  
Department of Computer Science  
Computer Graphics – CSCI 4229  
Spring 2003

Problem Set 11

Issued: 8 April 2003

Due: 15 April 2003

**Reading:** finish Chapter 6.

1. Do exercises 6.2, 6.3, and 6.20 on pp302-304 of the textbook. Please submit your answers in writing at the beginning of class on 15 April.

2. Spend a couple of hours playing with the geometry and rendering of your virtual world and making it interesting. Your results should

- involve *more than one room* (this will require you to design and use a data structure that stores the geometry of your world)
- demonstrate that you understand how to:
  - set the various material parameters to achieve a desired effect,
  - create and site different kinds of light sources, and
  - work with color (of lights and of surfaces).
- incorporate the avatar from PS10, together with its wall-collision detection/reaction behavior, implemented *using vectors*, not inequalities
- incorporate the the camera interface from PS10: roll, pitch, and yaw, plus sideways, vertical, and depthwise movement, all in the camera frame

Grading will take all of these things into account; a black-and-white room with one ambient light source, for instance, will not receive a high score.

Please email a gzipped tarball containing the source code for problem 2, together with your Makefile, to `csci4229@cs.colorado.edu` before 5pm on 15 April. Call this file `ps11.c` (or `.cxx`). As always, your code must both compile—**using the Makefile in your tarball**—and run on the CSEL machines.

## In-Class Problem: Lights and Material Properties

1. Download `room.cxx` from the course webpage; compile and run it. Now try turning the ambient light component of `GL_LIGHT0` off. Does this affect the scene in the way that you expected?
2. Leave the ambient component of `GL_LIGHT0` off, and change the `GL_LIGHT0` spectral component to pure green. Does this affect the scene in the way that you expect?
3. Now add a second light source: a spotlight up in the corner of the room, shining at the egg. Does this affect the scene in the way that you expect?
4. Move the spotlight *inside* the egg. Do you see anything? *Should* you?
5. Make the egg emit red light. How does this affect the scene?
6. Experiment with the material properties of the table, egg, and walls, making sure that the results are consistent with your understanding of ambient, diffuse, and specular effects. Hint: turning off all forms of ambient light and perhaps adding another (non-white) light source may make this easier to understand.