

ME/HCI/CS/CprE 557 - Computer Graphics

Assignment 3

Light and Material

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The goal of this assignment is to build two scenes with different objects, to implement different light sources and materials, and to compare the results. Your learning goal should be to understand how the different parameters affect the rendering of the scene and how you have to adapt the parameters to obtain a high-quality scene.

The parameter we have to deal with are usually,

- light source including position, direction, color, intensity, attenuation. Note, the parameters depend on the type of light you wish to implement.
- material / reflection parameters
- geometry of the mesh model including number of triangles, size of the object.
- topology of the scene.

This homework is a group homework; the group assignments will come via email.

Problem 1

Objects in virtual scenes, such as the teapot shown in Figure 1, are typically illuminated by several light sources. Implement a GLSL shader program that illuminates a sphere model with a) a diffuse light, b) a spotlight with sharp cutoff angle.

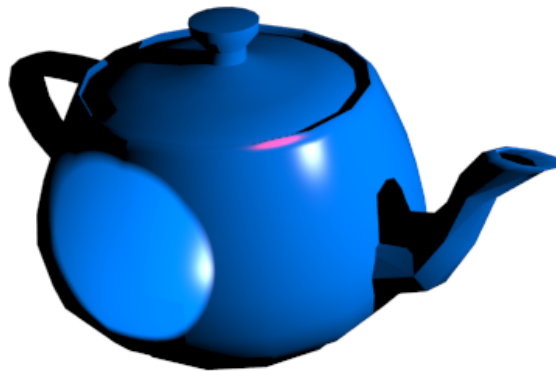


Figure 1: An example teapot

In addition:

- Select the position and direction of the light on your own (if required), however, both light sources need to overlap on the surface of the sphere.
- Select the material of the sphere on your own. Make sure that the light source parameters and the material parameters align with each other.

Problem 2

The quality of the illumination and reflection depends on balanced light and material parameters. Thus, to create four renderings such as shown in Figure 2 is possible, however, not trivial.

1. Prepare a scene with four spheres.
2. Select light sources and material parameters as well as geometry parameters to create a scene similar to the scene shown in Figure 2.
3. Balance the parameters, observe and discuss the effect.
4. Write a report in which you record all your different observations. MAKE SCREENSHOTS.

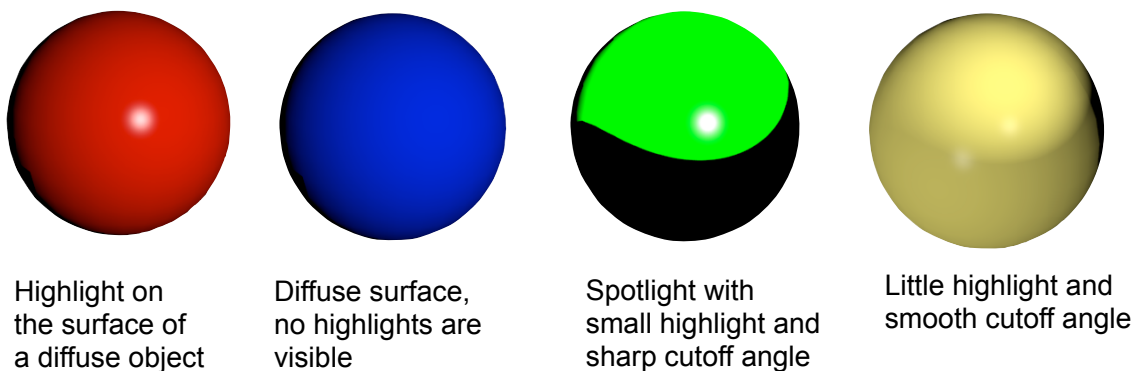


Figure 2: The 3D model that you need to create

In addition:

- Select colors which are similar to the color shown in the image.
- You have to prepare a program from scratch, however, you can start with example code projects. No shader program or basic program is provided.

Deliverable

The following deliverables must be submitted via git:

- A written report (2 page max) that answers the questions asked in Problem 1. Upload the document to your git repository to a folder *Homework_3\p1*
- Upload your solution (code) into a folder *Homework_3\p1* on git.
- Upload your solution for Problem 2 into a folder *Homework_3\p2* on git.

Due data: Thursday, Oct. 8th, 2015, 8:00 pm

Late submissions will not be accepted!

Grading

The grading incorporates two parts: self-grading (60%) and instructor-grading (40%).

Self-grading (10pt): between grading: two / three team members grade the third/fourth team member (1-worst, 3(4)-best).

- Contribution: on a scale from 1-3, how much did the team member contributed to the overall solution?
- Approachable: on a scale from 1-3, how easy was it to connect / contact the team member and how responsive was he/she?
- Solution: on a scale to 1-4, how would you rate the quality of the contribution of this team member (for instance, code does not work: 1. Code works perfectly without any adaptations: 4) ?

For all three items: a justification (1 sentence) is required.

Instructor-grading (10pt)

- Deliverable: the code and documentation is complete (code, shader code, document with screenshots), 1pt
- Code: the code is readable and I am able to find the most important lines without problems, 1pt
- Problem 1: you have two light source in your code, 1 pt
- Problem 1: the two light sources work as expected, 1pt
- Problem 2: red sphere appears as expected, 1pt
- Problem 2: blue sphere appears as expected, 1pt
- Problem 2: green sphere appears as expected, 1pt
- Problem 2: yellow sphere appears as expected, 1pt
- Problem 2: the report describes and documents the effect of two parameters, 2pt.

as expected: the object looks similar to the objects in Figure 2. No artifacts are visible, the surface is not white (except the highlights), all edges are sharp (no or only little aliasing). You can ask me in advance if you are unsure; with screenshot.