CIS 636 Introduction to Computer Graphics

CIS 736 Computer Graphics

Spring 2011

Homework 2: Machine Problem

Lighting, Shading, and Mapping Effects in OpenGL

Assigned: Wed 09 Feb 2011

Due: Fri 24 Feb 2011 (before midnight)

The purpose of this homework is to give you more experience with viewing and mapping effects in OpenGL.

This homework is worth a total of 20 points (2%). Upload an electronic copy of the assignment in PDF form (converted from your word processor, or scanned) to your K-State Online (KSOL) drop box before the due date and time.

Acknowledgements

This machine problem was inspired in part by Stanford’s CS148 (fall, 2010): <http://bit.ly/fkMGfZ>

References

NewTek Lightwave tutorials:

* Lighting Techniques, Part I, by Amaan Akram: <http://bit.ly/gRW3vS>
* Texture Building, by Vance Kovacs and Vera Milosavich: <http://bit.ly/hRiiPS>

Photoshop rotoscoping tutorial: <http://adobe.ly/gtChSN>

NeonHelium tutorials: <http://nehe.gamedev.net>

OpenGL FAQ: <http://www.opengl.org/resources/faq/>

OpenGL viewing docs: <http://www.opengl.org/resources/faq/technical/viewing.htm>

OpenGL material smoothness documentation: <http://bit.ly/eIVF4d>

*OpenGL Programming Guide*, Chapter 9: Texture Mapping: <http://bit.ly/fNFoxN>

1. (20% for 636, 10% for 736) Parsing scene files. Download the sample scene files from <http://bit.ly/gbI9fM> and look at the inline specifications. Write a program in C/C++ to read in these scene files. Turn in your parser as part of mp2.c.
2. (30% for 636, 20% for 736) 3-D low-polygon rendering. Next, adapt your OpenGL programs from Labs 1 – 2 to do the following:
   1. (10% / 10%) Vector test render. Display a wireframe of the mushroom. Turn in your source (mp2.c) and a screenshot (mp2\_2a.jpg).
   2. (20% / 10%) Shading. Display smooth-shaded versions of the rest, following NeHe tutorials 3 through 5. Turn in your source (mp2\_2b.c) and a screenshot (mp2-2b.jpg).
3. Do only the parts that you are required to for the course you are enrolled in.

For this machine problem, you will need to download trial versions of NewTek *Lightwave 10* and Adobe *Photoshop CS5*. (You may use your own copy of *Lightwave* or *Creative Suite* if you own either one; indicate which version you are using.)

(50%, 636 only) Lighting and rotoscoping.

* 1. (20%) Lighting. Experiment with different colors of light and objects: modify your OpenGL program from MP2-2 above to display a smooth-shaded version of the house that is colored light blue with yellow light, and set the light color to light red with a white house. To experiment with lighting colors and effects using *Lightwave*, follow the tutorials given above; may use any monochrome model and do not have to load the house. Turn in your source (mp2.c) and four screenshots: mp2\_3a-gl-BOYL.jpg and mp2\_3a-gl-ROWL.jpg for your OpenGL renders, and mp2\_3a-lw-BOYL.jpg and mp2\_3a-lw-ROWL.jpg for Lightwave. (Here color ranges over {R, G, B}, ‘O’ stands for “object”, and ‘L’ stands for “light”; hence “BOYL” denotes “blue object, yellow light”.)
  2. (30%) Material smoothness and rotoscoping. In this exercise, you will use a commercial software product in conjunction with your own program to produce the desired visual effect.
     1. Follow the material smoothness and Photoshop-based rotoscoping tutorials given above to incorporate a silver version of your house into this picture: <http://bit.ly/hlXjJy>

The image is © 2002 Electronic Arts, and is part of a CG still from *SimCity* artwork, and appears in Gino Santa Maria’s tutorial on linear perspective (<http://bit.ly/e2X2AR>).

* + 1. Composite your house into the scene as in this architectural mock-up:

<http://bit.ly/edOeMn>

This image is © 2009 by Amanda Lavete Architects and appears in the Arch Daily website under tag “amandalavete” (<http://bit.ly/e24yjR>).

Turn in your source (mp2.c with rotoscope section identified by comments in your code, or a separate source code listing named mp2\_3b.c). Also, include a screenshot of your final render (mp2\_3b.jpg).

(50%, 736 only) Transparency and Mappings.

1. (20%) Blending and transparency. Follow NeHe Tutorial 8 (<http://bit.ly/fF3AKG>) to display an opaque red instance of the house behind a translucent light blue one. The result should be purplish as expected. Turn in your source (mp2\_3a.c) and a screenshot of the result (mp2\_3a.jpg).
2. (30%) Reflection *aka* environment mapping. Follow NeHe tutorial 23 (<http://bit.ly/e3Zb8h>) to make your house “silver” using a sphere map. Use this image as your environment:

<http://bit.ly/evlNlk>

The image is © 2008 by Tartiflop and appears in <http://bit.ly/h58W4M>

Turn in your source code (mp2\_3b.c) and a screenshot (mp2-3b.jpg) of the house after the mapping.

Extra Credit: Submit an entry to the Logo Design Contest preliminaries for 636 and 736 – instructions will be posted on K-State Online and the public mirror.

Class Participation (required): Consult the project ideas (<http://bit.ly/gCJXAi>) posted by the instructor to the Discussions message board and commit to a term project topic by Fri 18 Feb 2011. Either select one of the options you posted by Fri 11 Feb 2010, or select a new topic based on discussion with the instructor in office hours during the week of Mon 14 Feb 2010. Post a draft proposal in the class mailing list [CIS636-L@listserv.ksu.edu](mailto:CIS560-L@listserv.ksu.edu) before you finalize your choice, and ask any questions you like.