University of London International Programmes
CO3355 Advanced graphics and animation
Coursework assignments 2015–2016

Coursework assignment 1

Part A (45%)

1. (10%) The file torus.pde contains *Processing* code that generates a torus shape. Write a program that renders the torus. Enable camera navigation using the peasycam library [1].

2. (35%) Incorporate a point light that moves following the mouse position. Write and incorporate appropriate GLSL shaders in order to accommodate the following shading methods:
    a. Gouraud shading
    b. Phong shading
    c. Flat shading.

    Make the shading method selectable through your program by using appropriate buttons (either keyboard or using a screen GUI).

Part B (30%)

1. (20%) Extend your program to include extra lights with constant positions. Incorporate parameters that control the torus resolution, the number of lights and the number of torus objects in the scene, respectively. For each of the shading methods, experiment with those parameters and comment on their effect on the visual quality and the performance achieved.

    For performance measurements you may use the frameRate variable. You may also want to set a constant rotation rate so that you can compare results across different settings.

2. (10%) Modify your shaders so that they use the Phong illumination model; namely, by incorporating specular and ambient light components. Experiment with the contribution of each component.

Part C (25%)

Look online for an explanation of the Cook-Torrance shading model. Outline briefly how it aids in modelling the reflectance properties of different materials.

Further extend your code to use the Cook-Torrance shading model. Experiment with the representation of materials. You can find the reflectance components for many of them in [2]. How does the result meet your expectations?

[Total 100 percent]

Notes

For every step of the coursework assignment, you are required to provide screenshots from multiple viewpoints. Describe your modelling approach and expose the problems you faced and the design decisions you made. Also, include an assessment of how well the techniques you used apply to what you are trying to do, identifying advantages and disadvantages.

A very useful reference for the *Processing* GLSL shader API can be found in [3]; while [4] contains a walk-through tutorial for shaders in *Processing*. You can also find a quick reference card for GLSL in [5].

Note that frameRate in *Processing* is capped by default at 60 frames per second. To modify that, use the FrameRate() function.

Submission

Submit a single .zip file which contains:

- your coursework assignment as a single .pdf. This should include listings of the software you have developed, with your own contributions highlighted and an attribution for the remaining code (such as code taken from the subject guide or external sources).
- all source code files that you have developed for this coursework assignment, with instructions (as comments in the source files, or as a separate readme file) on how to run them.

When naming your zip file ensure that you include your full name, student number, course code and assignment number as follows.

e.g. FamilyName_SRN_COxxxxcw#.pdf (e.g. Zuckerberg_920000000_CO3355cw1.pdf)

- **FamilyName** is your family name (also known as last name or surname) as it appears in your student record (check your student portal)
- **SRN** is your Student Reference Number, for example 920000000
- **COXXXX** is the course number, for example CO1108, and
- **cw#** is either cw1 (coursework 1) or cw2 (coursework 2).

References

[1] http://mrfeinberg.com/peasycam/

[2] http://devernay.free.fr/cours/opengl/materials.html

[3] https://codeanticode.wordpress.com/2014/05/08/shader_api_in_processing_2/

[4] https://processing.org/tutorials/pshader/

[5] https://www.opengl.org/sdk/docs/reference_card/opengl45-reference-card.pdf

[END OF COURSEWORK ASSIGNMENT 1]