

University of London
Computing and Information Systems/Creative Computing
CO3355 Advanced graphics and animation
Coursework assignment 2 2018–19

Important notes

For each step of the coursework assignment, 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.

It is important that your submitted coursework assignment is your own individual work and, for the most part, written in your own words. You must provide appropriate in-text citation for both paraphrase and quotation, with a detailed reference section at the end of your assignment (this should not be included in the word count). Copying, plagiarism, unaccredited and/or wholesale reproduction of material from books or from any online source is unacceptable, and will be penalized (see [How to avoid plagiarism](#)).

What to submit

- a single **.pdf** file. 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).
- a single **.zip** file which contains all source code files that you have developed for this coursework, with instructions (as comments in the source files, or as a separate readme file) on how to run them. The files should be categorised in folders that correspond to coursework parts.

Your **.pdf** and **.zip** file must be named using the below file-naming conventions, and include your full name, SRN, course code and assignment number:

YourName_SRN_COxxxxcw#.pdf (e.g. MarkZuckerberg_920000000_CO3355cw2.pdf)

- **YourName** is your full name as it appears on your student record (check your student portal)
- **SRN** is your Student Reference Number, for example 920000000
- **COXXXX** is the course number, for example CO3355, and
- **cw#** is either cw1 (coursework 1) or cw2 (coursework 2)

Coursework assignment 2

Part A (30%)

The folder PartA contains a pair of GLSL shaders that attempt to implement the Phong illumination model [1]. Read through the code and make sure you understand how it works.

1. Write a Processing program that makes use of the shaders. Make the following parameters adjustable by the user: *SpecularFocus*, *SpecularContribution* and *DiffuseContribution*. Also incorporate a point light source and make it move according to the mouse position. Demonstrate the effect on two different objects¹, experiment with different parameter values and comment on the results.

[10 marks]

2. Add an ambient component to your shader and make it adjustable by the user.

[5 marks]

3. Add two more lights, making their position change over time. Make the number of lights on the scene selectable by the user.

[5 marks]

4. Change the light sources so that they have colours (instead of being white). Implement coloured lighting in your shaders by changing light intensity variable(s) to colour vectors. How does the inherent colour of the surface influence the resulting (perceived) colour?

[10 marks]

Part B (70%)

In this part of the coursework assignment you will use GLSL to alter an image and attempt to mimic a visual effect or a painting style. The result will be mapped as a texture on an object.

1. Do some online research on non-photorealistic 2D rendering techniques and choose an effect that you will attempt to mimic. Describe the chosen effect and how you intend to implement it. Also, select an image that you find appropriate for this and provide reasoning for its selection. You can use [3] and [4] as starting points.

[10 marks]

¹ You may use primitive Processing objects or import OBJ models, as long as they serve your purpose. A useful resource for OBJ files can be found in [2].

2. Implement GLSL shaders to perform texture mapping of the *original* image on a torus-shaped object. Demonstrate the result.

[5 marks]

3. Implement your effect and map the outcome on the torus. Comment on the results, providing multiple screenshots. To what extent did you achieve your goal? Expose difficulties and suggest possible ways of improvement.

[25 marks]

4. Further extend your code and improvise to see how far you can go. Some ideas for experimentation could be based on modifying the position of vertices according to the texture and incorporating lighting, making your effect vary with time and/or applying it on a video *etc.* Capture your journey and reflect on it.

[30 marks]

[Total: 100 marks]

References

- [1] "Phong reflection model" in Wikipedia, The Free Encyclopedia, retrieved December 2018 from https://en.wikipedia.org/wiki/Phong_reflection_model
- [2] John Burkardt, "OBJ Files - a 3D Object format", retrieved December 2018 from <http://people.sc.fsu.edu/~jburkardt/data/obj/obj.html>
- [3] Aaron Hertzmann and Ken Perlin "Painterly rendering", retrieved December 2018 from <https://mrl.nyu.edu/projects/npr/painterly/>
- [4] "Cel shading" in Wikipedia, The Free Encyclopedia, retrieved December 2018 from https://en.wikipedia.org/wiki/Cel_shading

[END OF COURSEWORK ASSIGNMENT 2]