University of London International Programmes
Computing and Information Systems/Creative Computing

CO3355 Advanced graphics and animation
Coursework assignment 2 2017–2018

Part A (30%)

Write GLSL shaders to implement: (a) per-vertex; and (b) per-pixel shading. Incorporate the shaders into a *Processing* program that creates a scene with a 3D object and includes a point light. Modify your shaders so that they use the Phong illumination model; namely, modelling specular, diffuse and ambient light components. Make these components adjustable by the user and show how each one of them affects the result. Compare and contrast the two shading methods and comment on their effect.

For your experimentation, you can use the same objects as in the first coursework assignment.

You may find article [1] useful for this part.

Part B (70%)

1. (20%) Create a Processing program that reads a 2D image and converts it to greyscale. Write GLSL shaders that use the pixel values of the image as magnitude in order to displace the vertices of an object in the direction of the surface normal. Incorporate a point light and demonstrate the result. Run your experiments on at least two images of your choice and comment on their effect.

2. (30%) Write GLSL shaders that modify the surface normals (that is, not the position of the vertices). Make it so that the new XYZ coordinates of the normal are calculated from the RGB values of a given image (essentially, a three-dimensional array). Demonstrate the result and generate an RGB image so that the results are as similar as possible to the ones you achieved with displacement mapping. Explain how you calculated the image values and compare the results achieved with each technique.

3. (20%) Experiment with a combination of the two methods (displacing the vertices and modifying normals). Improvise with different images and ways to interpret them and/or lighting properties and colours to create more advanced effects.

You may find articles [2] and [3] useful for this part.

[TOTAL 100%]

Important submission requirements
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 in detail. Also, include an assessment of how well the techniques you used apply to what you are trying to do, identifying advantages and disadvantages.

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). It is important that your submitted coursework assignment is your own individual work; and, for the most part, written in your own words. In addition to indicating any code re-use, you must provide appropriate in-text citation for any paraphrase and quotation, and give a detailed reference section at the end of your assignment (see: how to avoid plagiarism).
- 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:

YourName_SRN_COxxxxcw#.zip (*e.g.* MarkZuckerberg_920000000_CO3355cw2.zip)

- **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).

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

References
The following Wikipedia articles may provide a useful starting point for your reading.
[1] https://en.wikipedia.org/wiki/Phong_reflection_model
[2] https://en.wikipedia.org/wiki/Displacement_mapping
[3] https://en.wikipedia.org/wiki/Normal_mapping

[END OF COURSEWORK ASSIGNMENT 2]