

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

Coursework assignment 2

Part A (50 per cent)

1. (35%) Using a sinusoidal function of your choice, create a simple procedural 2D texture. Write appropriate GLSL shaders and Processing code to map your texture onto a surface using the following map shapes:
 - a. planar
 - b. spherical
 - c. cylindrical
 - d. cubic

Demonstrate the result on different objects, including a cube and a torus. Include camera navigation. Comment on the results.

2. (10%) Experiment with adding different types of noise to your texture. Make the noise magnitude change with the frame count of the scene.
3. (5%) Modify your planar mapping shader code so that the mapping direction changes according to the camera position.

The tutorials [1] and [2] may give you ideas for this task.

Part B (25 per cent)

Write a program that detects edges [3] on a given 2D image. To this end incorporate a GLSL fragment shader that implements a Laplacian filter [4], which sums the values of the neighbouring pixels and then subtracts the sum from eight times the value of the middle pixel, essentially implementing a convolution with the following array:

$$\begin{bmatrix} -1 & -1 & -1 \\ -1 & 8 & -1 \\ -1 & -1 & -1 \end{bmatrix}$$

Emphasise the edges detected on the original image and map the result as a texture on a cube. You may use any of the map shapes mentioned in part A.

Experiment with different images of your choice, commenting on the result.

Part C (25 per cent)

Do online research to investigate how non-photorealistic, cartoon-like effects can be applied to 3D models; a process known as Cel shading [5].

Choose a relatively simple methodology, which will be based on the use of a reduced number of colours and on the emphasis of the edges of 3D objects, and implement it. Improvise and see how you can enhance the effect. Experiment on a torus and other objects as adequate.

Section 5.10.1 of the suggested material [6] may help you with this task.

Notes

For every step of the coursework assignment, provide screenshots from multiple viewpoints. Describe your modelling approach and expose the problems you faced and the design decisions that 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.

Submission

Submit a single .zip file that contains:

1. 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).
2. 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 coursework assignment number

e.g. FamilyName_SRN_COxxxxcw#.pdf (e.g. Zuckerberg_920000000_CO3355cw2.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 CO3355, and
- **cw#** is either cw1 (coursework 1) or cw2 (coursework 2).

References

- [1] http://www.siggraph.org/education/materials/HyperGraph/mapping/r_wolfe_mapping.pdf
- [2] <http://www.upvector.com/?section=Tutorials&subsection=Intro%20to%20Procedural%20Textures>
- [3] https://en.wikipedia.org/wiki/Edge_detection
- [4] <http://homepages.inf.ed.ac.uk/rbf/HIPR2/log.htm>
- [5] https://en.wikipedia.org/wiki/Cel_shading
- [6] Angel, E. and D. Shreiner *Interactive computer graphics*. (2011) sixth edition.

[Total 100 per cent]

[END OF COURSEWORK ASSIGNMENT 2]