School of Design and Informatics

Session 2018/19

Module Code: **CMP301**

Module Title: **Graphics Programming with Shaders**

Module Deliverer: **Dr Paul Robertson**

Unit of Assessment: **Unit 1 of the module assessment – 100%**

Submission date: **Tuesday 11th December 2018.**

Suggested Feedback Return Date: **22nd January 2019.**

Feedback Type: **Feedback will be provided via Blackboard within a Rubric.**

Assessment overview

This coursework comprises two parts: the graphics application and a report detailing the work completed.

Task 1: Graphics Application (50%)

Develop your own shaders and an accompanying application to demonstrate them. Create a single scene to demonstrate the shaders created. This scene does not have to be overly large or populated; the focus is on the use of the programmable pipeline. The brief is designed to be as open as possible providing you the opportunity to develop something of your own interests and design. Ideally the coursework should demonstrate the use of all the shader stages: vertex, pixel, tessellation (including Hull and Domain), and geometry. The scene should demonstrate key graphical techniques:

- Must contain an example of vertex manipulation
    - The geometry should be correctly textured and lit after manipulation.
- Must contain a post processing technique
    - Post processing must make use of render to texture.
    - Demonstrate pixel manipulation on a pixel by pixel basis.
- Lighting and shadows
    - All geometry must have correctly calculated/transformed normals and must make use of correct lighting algorithms.

For an improved grade your scene should also demonstrate:

- Tessellation
    - The tessellation should be non-trivial and impact the scene ie do not just tessellate a flat surface.
    - Tessellated geometry should be correctly textured and lit.
    - Consider dynamically controlled tessellation.
- Geometry Shader Stage
    - Non-trivial geometry manipulation and/or generation
    - Geometry created or processed by this stage should be correctly textured and lit.

Your project should utilise an object oriented approach with appropriated classes. All code should be well structured and well commented. You should differentiate your coursework from the examples provided in lectures and labs. **Do not return my own code examples to me**. The application must run on the lab computers. The scene must demonstrate your ability to synthesise concepts from class into a single scene that demonstrates lighting, texturing, manipulation, post process together, not separately.

The minimum requirements for this coursework are a working and non-trivial set of vertex and pixel shaders that demonstrate simple vertex and pixel manipulation (e.g. texture blending and lighting, or post processing). You should aim to demonstrate all shader stages.

Task 2: Report (50%)

Your application must be accompanied by a report that will highlight how you addressed the coursework requirements. This report should include the following:

1. Overview of the scene
    - What objects are in the scene and what techniques they demonstrate
    - How you have responded to the coursework brief
    - Outline any UI elements and controls beyond the standard controls
2. Algorithms and Data Structures
    - An in-depth explanation and justification (based on complexity and/or hardware architecture) of the algorithms and data structures used in the scene
    - Important calculations used, data passed and shader stages
    - This should focus on the hlsl/shaders written

    - Providing diagrams, code snippets and supporting screenshots as required
3. Critical reflection of the application
    - Discussion of what your learned, any shortfalls, areas for improvements, how you might extend the application, what you would do differently if doing it over again. Offer possible solutions to the challenges or how it could be taken forward.
    - This should refer to the coursework plan done during week 7/8
4. References
    - References for any images, models or techniques incorporated in your application. Cases of plagiarism will be taken very seriously.

A sufficiently detailed document will be between 4-8 pages. Best practice is to write this document as if explaining to another student how your code works and is constructed.

Submission

Electronically via Blackboard by Tuesday 11th December 2018.

- The submission should include the source code/project, an executable file and documentation. These files should be contained within a zip file for uploading, using the following folder structure:
    - A folder titled "source" containing the entire Visual Studio project. You should delete the **.vs** hidden folder as this will increase the size of your submission but are not required.
    - A folder titled "exe" containing the executable file and any shaders or other assets required for the project to run standalone.
    - A folder titled “docs” containing a PDF of your report.

All submissions must be uploaded to the appropriate location within the Blackboard system. You will be able to have multiple submissions (in case of errors) but only the last submission will be marked.

Marking scheme

Literal Grade	Evaluative Descriptor	This Assessment
A+	Excellent overall. • Demonstrates an excellent grasp of the subject matter. • Excellent capacity for original and creative enquiry. • Excellent ability to critically evaluate, analyse, synthesise and integrate complex information. • Excellent communication skills. In addition, exceptional in at least one of the above.	
A	Excellent overall. • Demonstrates an excellent grasp of the subject matter. • Excellent capacity for original and creative enquiry. • Excellent ability to critically evaluate, analyse, synthesise and integrate complex information. Excellent communication skills.	A meticulously constructed application demonstrating all of the shader stages and utilising techniques researched by the student. Code is well structured and well commented. Report is well written, very detailed, with good critical reflection and correctly

		referenced. Application is well presented.
B+	Very good overall. • Demonstrates a very good grasp of the subject matter. • Very good capacity for original and creative enquiry. • Very good ability to critically evaluate, analyse, synthesise and integrate complex information. • Very good communication skills. In addition, excellent in at least one of the above but overall performance deemed to be very good.	
B	Very good overall. • Demonstrates a very good grasp of the subject matter. • Very good capacity for original and creative enquiry. • Very good ability to critically evaluate, analyse, synthesise and integrate complex information. Very good communication skills.	A well-constructed application demonstrating many of the shader stages and utilising some of techniques discussed in class and some based on external research. Code is well structured and well commented. Documentation is well written, detailed, with some critical reflection and correctly referenced. Application is presented well.
C+	Good overall. • Demonstrates a good grasp of the subject matter. • Good capacity for original and creative enquiry. • Good ability to critically evaluate, analyse, synthesise and integrate complex information. • Good communication skills In addition, very good in at least one of the above but overall performance deemed to be good.	
C	Good overall. • Demonstrates a good grasp of the subject matter. • Good capacity for original and creative enquiry. • Good ability to critically evaluate, analyse, synthesise and integrate complex information. Good communication skills	The constructed application demonstrates some of the shader stages and shows limited research into graphics techniques. Code is well structured and commented. Documentation is sufficiently detailed with few references and lacking sufficient critical reflection.
D+	Satisfactory overall. • Demonstrates a satisfactory grasp of the subject matter but limited grasp in some areas • Satisfactory capacity for original and creative enquiry.	

	• Satisfactory ability to critically evaluate, analyse, synthesise and integrate information. Satisfactory communication skills	
D	Adequate. Achievement of all threshold standards but grasp of some subject areas and graduate attribute development may be more limited.	The application meets the minimum requirements. Lacking extra shader stages or complexity. Documentation describes the application but lacking in detail.
MF	Marginal fail. Performance just below the threshold standard. A reasonable expectation that a pass is achievable by reassessment without the need to repeat the module.	A very simple application that fails to meet the minimum requirements. Relies too heavily on provided class examples. Poor documentation lacking sufficient information on the application constructed.
F	Performance well below the threshold level. Some limited evidence of achievement of the outcomes.	No working application, largely provided code from class or little evidence of work. Documentation lacking detail or missing.
NS	No assessments submitted or no evidence of achievement of the outcomes.	