Computer Graphics SET08116 - Coursework Specification

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General Information

Description

The aim of this coursework is to create a 3D scene using OpenGL. The coursework constitutes 60% of the overall assessment of the module. The choice of scene that you decide to implement is up to you, but you should develop a sufficiently complex and original scene (i.e., not the same as a colleague or one from a tutorial) to meet the coursework requirements. There are various standard scenes that can be generated from the graphics rendering literature – so I suggest you investigate these.

Expectations and Goals

This coursework is split up into two parts, weighted 40:60 of the total 60% of this module. The objective of the first part is to demonstrate your understanding of computer graphics principles. You must implement a certain set of features.

Part 2 gives you the freedom to implement something new and unique; something that hasn't been covered in the labs or workbook. You are required to implement some post-processing effects in addition to this, which *are* covered in the workbook. Part 2 should be based on the work you undertook for Part 1, so you should have a good idea on what you are going to attempt to implement in part 2 before starting part 1.

You can look at previous work here: games.soc.napier.ac.uk/graphics.html for inspiration

Scene Examples

A tropical island in the sea, with realistic water caustics and refraction.

A nighttime city street in heavy rain, with puddle reflections, wet material effects, post processing rain.

Fireworks on a cloudy night over a field, explosions light both the ground and the clouds.

A frosty snow covered country scene with day/night cycle, heavy use of specular reflections and texture blending.

A simple scene demonstrating an advanced effect: metaballs, deferred rendering, PBR, mirrors

Report

You are to deliver a report for each part of the coursework. Your report for part 1 will cover what you have implemented so far, what you plan to implement and how you plan to implement it. You should research and include a review of examples and inspirations for your scene.

Your second and final report will build upon the first, documenting how you achieved your goals, how the final product differs from the initial plan and what future work could be.

Your report must be written using the Napier Report Template, and delivered as a .pdf

github.com/edinburgh-napier/aux_latex_cw_template

Deliverables

Part 1 - 40%

A scene using lighting and texturing effects with a report. This should be a 'lite' version of your final scene.

Part 2 - 60%

A scene built upon your previous submission with more advanced graphics effects, accompanied by a final report. You must also produce a brief video demonstrating your project

Part 1 - Marking Scheme

Component and Overall Weighting	Individual weighting for Part 1
Report 20%	
Formatting, Citations, Grammar Correct use of Latex template. Your report should follow the academic language and style, i.e., use third person, be concise and formal.	6%
Content An example report is available on moodle. Your report should cover important details to explain and justify your work. Include a plan and a background/literature review of games and demos with similar effects.	14%
Source Code 20%	
Code quality Your code should be readable and well commented. The preferred code style is to use the Clang-format tool http://llvm.org/builds/ with a maximum line length of 120 characters.	5%
Software Engineering Scope management, naming, referencing, memory management	5%
Efficiency Maintain a high framerate and low frame latency, no unnecessary processing and asset loading.	5%
Evidence of good version control practice Committing work correctly, use of cloud hosting, good feature branching (if necessary)	5%
Graphical Features 60% - (Each of these features are mandatory)	
Multiple Cameras	6%
Multiple lights and light types	6%
Multiple transforms / transform hierarchy	6%
Texturing Applying textures correctly to objects of varying shapes	6%
Materials shading Use of Normal mapping. Objects with materials that have different diffuse and specular and colour values	12%
Shadowing Objects can cast and receive shadows, where appropriate.	12%
Scene Originality Your chosen scene must be sufficiently different from any lab and workbook example. This is not a mark for creativity, however you should aim to create something that will be visually interesting.	12%

Part 2 - Marking Scheme

Component and Weighting	Individual weighting for Part 2
Final Report 30%	
Formatting, Citations, Grammar	6%
Content You should cover the work you have done in detail, explain any maths/theories required to implement your effects. Discuss any difficulties encountered. Mention anything you didn't manage to include with explanations / discuss future work.	24%
Source Code 10%	
Code quality	2.5%
Software Engineering	2.5%
Efficiency	2.5%
Evidence of good version control practice	2.5%
Graphical Features 60%	
Post-processing	10%
Optimization Even if the project runs at 60+fps, you should investigate where your bottlenecks and slow sections are. You should also attempt some optimization methods, e.g., Camera frustum culling, Level of Detail. Describe this process and the results this in the report.	10%
Additional rendering techniques	40%

Important Notes

There are some constraints to the scene that you will develop:

- Your scene must use the rendering framework developed during the practical part of the module. This framework is built using C++ and OpenGL.
- Your scene should feature multiple instances of geometric objects. It must also have lighting and texturing effects in place. This is the minimum requirements for the coursework. Note, there are no marks for loading a model into your scene or creating a meshes using modelling packages.
- You must be able to demonstrate you understanding fundamental underpinnings, such as, transforms, multi-texturing (e.g., combining textures on a single mesh), lighting models, and so forth.
- You need to provide screenshots of your scene from multiple viewpoints.
- You should have at least one interactive (user controllable) camera
- You need to write a report (pdf, following the supplied template). This should include the design and evaluation of your scene, and any other relevant information.
- All coursework needs to be demonstrated prior to submission. This is to provide you with some initial feedback on the scene you have developed.
- Your coursework must be able to be compiled and executed on the B56 computers
- Your coursework should maintain a high framerate (60+fps) at a minimum of a 720p resolution

You should aim to spend at least 10 hours a week working towards completing this coursework, including time spent on practical work, how you split this time up depends on the scene you try to implement.

Remember, you're required to submit a high quality report, screenshots, and a professional video emphasizing your graphical submission – in addition to source code that can be compiled without intervention.

The coursework should be a lot of fun. Use your imagination and give your creativity a free rein! Invention and originality will be rewarded by the marking scheme. I hope you enjoy working on it.

Submission checklist

Coursework Part 1 <MATRIC>_set08116_cw1.zip	Coursework Part 2 <MATRIC>_set08116_2.zip
• **Initial Report - <MATRIC>_cw1_report.pdf** • **Screenshots** • **Source code** • **Working Release Executable**	• **Final Report - <MATRIC>_cw2_report.pdf** • **Screenshots** • **Link to Video** • **Source code** • **Working Release Executable**

Submission format Important notes

- Only submit your coursework files and content i.e., **do not** submit the entire SET08116 folder with the workbook and lab content.
- Your executable should be compiled in release mode. It **Must** work as a standalone executable (within a folder of assets). Do not submit the debug build folder.
- Package your submissions as **zip** files named <MATRIC>_set08116_cw[1/2].zip.
- Within the zip, have individual components in sensible locations.
- The Maximum file limit for each Zip file is 100MB.