Computer Graphics Coursework Assignment Brief

Introduction

This document provides an overview of the coursework assignment for the Computer Graphics unit. Students should submit all required materials to the coursework submission section of Blackboard. It is essential that this is done on the Blackboard page related to the MAJOR ("With Coursework") variant of the unit.

Replacing the weekly practical session during the coursework period will be an online support session on Teams. This session is for high-level Q&A regarding the nature and intent of the assignment and as such is NOT intended to be a "debugging service" - if you are having problems getting your code to run you should use the Teams discussion forum channel.

You may choose to incorporate "derived" code into your solution (i.e. samples found online or code generated using AI tools). However you should remember that you will only receive credit for code that *you yourself* have written. Automated code similarity checking tools will be used during the marking process to identify fragments of derived code that have been reused in your renderer.

You are expected to work on both of your optional unit courseworks during the coursework period as if it were a working week in a regular job - that is 5 days a week for no more than 8 hours a day. The effort spent on the assignment for each unit should be approximately equal, being roughly equivalent to 1.5 working weeks each. It is up to you how you distribute your time and workload between the two units within those constraints.

Assignment Overview

The aim of this unit has been to provide you with an understanding of a variety of different approaches to 3D rendering. Pre-recorded lecture segments and narrated animations have introduced the main theoretical content of this unit and the tasks from the weekly workbooks have allowed you to practically explore the key concepts that have been covered.

The assignment for this unit provides an opportunity for you to demonstrate your understanding of these concepts, as well as a chance to exercise the codebase that you have been accumulating over the course of this unit.

Many of the approaches to rendering that we have explored can only be fully appreciated by the movement of the camera through/around a model. For this reason, your task is to create a short (at least 15 second) animation to fully demonstrate your renderer. To provide a focus and purpose for your animation, you might like to create an "ident" for promotional use by the MVB hackspace. Note that the hackspace is only intended to provide you with some inspiration and does form part of the mark scheme.

For more insight into the concept of an "ident", you should view this compilation of BBC2 idents. Note that there are a wide variety of examples presented in this video - some are more relevant to this unit than others !

You are free to use any OBJ models you see fit in order to create your animation. Remember that the focus of this unit is rendering, not modelling - so it is fine to use any models you find. A texture-mapped hackspace logo is provided on blackboard in the form of an OBJ file - use this only if you find it useful for creating your animation.

Assignment Details

The aim of this assignment is to refine and extend the codebase that you have been developing during the completion of the weekly workbooks, in order to build a fully functioning C++ renderer. You MUST ensure that your animation clearly demonstrates *all* of the rendering approaches that you have implemented. If we can't see the features operating correctly, then we can't award marks for them. Note that you may find some features of your renderer can only be fully

demonstrated using certain modes of rendering (wireframe/rasterising/raytracing) so you will need to switch between these during your animation.

If you wish to attain a high mark, you should attempt to implement some of the approaches introduced in the "advanced topics" workbook. It is up to you to select which approaches you implement, however you should remember that there is a performance trade-off at work. The more complex the features you implement, the longer will be the rendering time for your animation. You will need to find an appropriate compromise between: renderer sophistication, algorithmic performance, animation complexity, animation aesthetics and rendering time.

Required Submission Materials

You must upload a single zip file to the relevant submission point on Blackboard, containing:

- Your entire project folder (containing your source code, all lib files etc.)
- A Make/CMake file that will build & run your code from the command line of the lab machines
- All OBJ geometry and material files required to run your code
- A single 480p (640×480) MP4 video file containing your ident (compressed to reduce file size)

Be sure that your project includes a working Make/CMake file to build your renderer and ensure that your code compiles and runs on the lab machines (this is where your code will be tested and marked !). When you submit your code, make sure the main method is written in such a way that it will render an initial rasterised scene. We should be able to run your code and see a render, without having to press any keys or otherwise interact with the renderer.

Upon submission, you must also fill out this questionnaire indicating which approaches you have used to implement specific rendering features. The aim of this is to help streamline the marking process (so that we don't spend time searching for a feature or approach that you haven't actually implemented !)

Specific Marking Criteria

Your work will be assess on the extent to which you achieve the following objectives:

- Successful implementation of different approaches to 3D rendering (wireframe, rasterising, raytracing)
- Successful implementation of a range of different approaches to lighting and shading (diffuse and specular lighting, shadows with ambient lighting, Phong/Gouraud shading)
- Effective animation of camera position, camera orientation and model elements
- Selection and implementation of advanced rendering features from workbook 8, including:
    - "Exotic" materials (e.g. glass, mirrors, metal)
    - Surface mapping (texture maps, normal maps, environment maps)
    - Advanced lighting approaches (e.g. soft shadows, photon mapping)

An indicative marking guide has been provided to illustrate the grades you might expect to receive for a given set of features and capabilities.

Academic Offences

Academic offences are taken very seriously by the University. This coursework is an individual piece of work. You should therefore not collaborate with other students. Suspected collusion will be dealt with in accordance with the University's policies and procedures. If an academic offence is suspected, you may be asked to attend a academic malpractice panel, where you will be given the opportunity to defend your work. The panel is able to apply a range of penalties, depending on the severity of the offence. These include: requirement to resubmit assignment; capping of grades to the pass mark (40%); awarding a mark of zero for an element of assessment; awarding a mark of zero for the entire unit.