

## Assignment 1 (MSc): Lights, Camera, Action.

**Handed-out:** Monday, week 6 (Oct 31<sup>st</sup>)

**Deadline for Submission:** Sunday, week 8 (Nov 20<sup>th</sup>), 10pm

**Hand in Method:** On MyDundee. The submission should be a single zip file named "lastname\_firstname\_ass1.zip", containing:

- Your executable in a separate folder with all other files needed to run your exe. I'd like to be able to just click on it and it should run. Please test this on a different PC to your development PC before submitting it! Please include clear instructions to run your program if it requires anything further than running an executable. Please speak to me in the lab if you have any difficulties with this.
- A short video to show your program running. This is mainly so that I can see what Graphics you created on your system, in case there are any issues that cause them to be different when I run them. This can be a link to a video and please make it no longer than 1 minute (shorter will be fine!). If you submit a link, please make it unlisted and not private, so that I can access to the link.
- Your OpenGL program source code folder (including the full, cleaned, IDE project or make file). Please check for and delete the large temporary Intellisense files. Check the size of your zip file and if it is large, find and delete the temporary files (ask me for help with this!)
- A short document containing a brief description of your design, noting any areas that you had problems with and anything extra that you accomplished that hasn't been covered in the lectures or has been implemented particularly well. Include references to any tutorials or articles you read for help or used.

**Date Feedback will be Received by:** Latest date to receive feedback will be Friday 10<sup>th</sup> December

**Penalty for Late Submission:** One grade point per day late (meaning if a submission is one day late and marked as a C2 it will receive a C3 grade) A day is defined as each 24 hour period following the submission deadline including weekends and holidays. Assignments submitted more than 5 days after the agreed deadline will receive a zero mark (AB).

**Percentage of Module:** This assignment is worth 30% of this module.

## Task

Select a real-world (3D) object, or (3D) scene, (or a section of a real-world object) with some parts and write an OpenGL program which models this object with lights, camera controls and some action (movement of objects). This means that there should be various moving aspects and/or parts of the object, there should be user camera controls and appropriate lighting (lighting can move too in some scenes!).

Some suggestions:

- some part of the mechanism of a car, bicycle, mechanical clock etc,
- a combination of wheels and levers such as part of an old steam engine or a sewing machine.
- A fly-by animation going around a windmill with moving blades or a 3D clock face with moving hands.

Please don't feel limited by these suggestions – originality is encouraged!

Your program should allow the user to vary (via suitable inputs) the speed and direction of movement, camera position and light position/direction. The scene should be portrayed in 3 dimensions, with facility for changing the viewing controls so that the whole scene can easily be viewed by the user. The important thing is realistic appearance, movement, good user camera controls and lighting. There is no need to provide any background context for the parts, they can just “float” in space. Please ensure that you specify the inputs that control your program in either a text file or output instruction text to the console.

Please ensure that your submission includes the following aspects:

- One or more 3D objects with moving parts
- Lighting
- Movable, user-controlled camera (view position), appropriate for your scene.
- Appropriate movement of objects in your scene, with movement speed adjustable through user controls.
- You can build the scene from basic objects provided and/or include your own. You should demonstrate your understanding of Vertex Buffer Objects (VBOs) and vertex normals by including at least one object that you create yourself with normals defined to enable lighting.
- Include a section on your report to justify the lighting model or models that you have used and suggest alternative lighting models (e.g. research them yourself) that could be used to improve your scene, and suggest how they could be implemented in your application. If you can, you could also have a go at implementing an alternative lighting model! Include references to any tutorials or articles you read for help or used.

## Remarks

- You are free to make use of any of the example programs on MyDundee for this class. This does not need to be referenced because I will be able to judge how much you have used and extended this. i.e., feel free to start with one of the class examples and extend it to your purpose.
- You are also free to use pieces of code obtained from books/Internet, but these must be clearly referenced by being marked as such in source files and full references and explanations given in the accompanying report. No credit will be given for this code, but credit will be given for adapting or modifying external code as long as it is clearly referenced. Please ask me if in doubt.
- You may make use of pre-created objects, but some credit will be given for showing that you can create your own normals so please ensure that at least one component of your model is defined using VBOs and normals.
- The mark for this assignment will be based mainly on the functionality and realism of the program, with some credit also for its design and structure.
- Collaboration is not permitted on this assignment.
- Please remember to structure and comment your code sensibly. E.g., name and date on all source files, a comment describing each function and other comments describing any tricky section of code. Marks will be deducted if standard good programming practices aren't followed.
- Extra credit will be given for simulating an object that moves in a realistic manner, good camera controls and lighting.

## Marking Scheme

The marking scheme is broadly based on degree classification. If all required aspects of the assignment have been completed to a good standard, then the expected mark will be in the *merit* range. For this assignment that means that a real-world object or scene with moving objects or moving parts will have been created with realistic lighting, camera movement and action. The objects will move in a realistic manner, be visible with realistic lighting, good user controls will have been implemented and the user will be able to modify both the movement of the objects and the viewing position in a realistic manner. All aspects of the assignment including the report and coding will have been completed to a good standard. You will have identified appropriate, alternative lighting models that would improve your scene and, in your report, described them and explained how they could be implemented in your assignment.

Additional credit will be given for other features that enhance the scene.

70% and higher is a *distinction* mark.

The submission must meet all of the assignment criteria with no major errors and should demonstrate a deeper understanding of the topic by including some innovation or some additional features or improvements that have been sourced from elsewhere which demonstrates your ability to read around the subject or extend topics using your own initiative. All use of additional sources (books, examples on the internet, outside tutorials etc.) are encouraged but must be properly referenced.

60% to 69% is a *merit* mark

The submission should meet all of the assignment criteria with no major errors. It may contain some minor errors or areas that could be improved but, overall, all aspects of the submission should have been completed to a high standard. The submission should demonstrate a good understanding of the topic.

50% to 59% is an *MSc* mark

The submission should meet all of the assignment criteria or most of the criteria. There may be some omissions or errors, but these should not be so significant that they result in an incomplete or incoherent submission. The submission should demonstrate a reasonable understanding of the topic.

40% to 49% is a *passing* mark

The assignment should meet some of the assignment criteria but will contain some major errors or omissions. There will be significant problems with either implementation or understanding. However, the submission should still demonstrate some understanding of the topic.

Below 40% can be considered as a *failing* assignment

The assignment does not meet most of the assignment criteria or will contain significant errors or omissions resulting in a seriously incomplete or incoherent submission. There will be significant problems with either implementation or understanding.