

# CS4052 Computer Graphics

## Assignment 4

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Due date: Midnight, Tue 18 Nov 2014  
Course Work %: approx. 20%



### 1 Outline

- The purpose of this lab is to build a more complex 3d scene environment, and implement a well-known lighting algorithm.
- Do not wait until the last day to start on the assignment and ask for help - make use of the online forum system far ahead of time, so that you can deal with unexpected problems.
- This project is the starting point for your Interactive Game Project, due at the end of term - think about an environment that might work in a game.
- This assignment is strictly individual (no group work).
- Submit your working programme on the due date, and the demonstrators will grade you.
- Submit a report on Blackboard by the due date. The report should include a written description and screen captures, along with any source code files (.c/.cpp and .h/.hpp)
- If you fail to attend the lab or to submit the report on time, you will receive 0%.
- Demonstrating a project that was not created by you is considered cheating and must be reported as such. Demonstrators will check if you have an understanding of the code that you have written.

## 2 Required Features

Your programme should have the following features:

- An interactive walk-through is to be created that allows the user to move a virtual camera using the keyboard and/or mouse. Minimum requirements:
  - controls for forward,back,left,right movement
  - controls for left,right turning

A good camera will receive (**maximum 20%**). An exemplary camera with **additional degrees of freedom** of rotation will receive (**maximum 25%**).

- **More than one** mesh is to be loaded from a file and displayed, and a consistent scene or virtual world should be created.
  - 1 or more meshes created by you (you may re-use your mesh from the previous assignment)
  - Additional meshes may be downloaded from the web
  - Meshes used should demonstrate a consistent theme (i.e. buildings and cars, a beach and shells, etc.).
  - Meshes may be re-drawn in multiple locations.

A good scene with more than 1 mesh file loaded (**maximum 20%**). An exemplary scene that demonstrates a parent-child **hierarchical animation** for one scene object (**maximum 30%**).

- Implementation of the **Phong Illumination** model
  - 1 light source
  - Any type of light may be used {point, directional, spotlight}
  - Normals must be transformed correctly.
  - Shading must use a combination of ambient, diffuse, and specular lighting.
  - Any **shading model** may be used of {flat, Gouraud, Phong}, as appropriate for your scene rendering style.
  - **Textures are not required** in this assignment - it would be a good idea to remove these whilst you work on your lighting implementations.

Good lighting will receive (**maximum 35%**). High quality lighting, affecting more than one model consistently, with one model rotating to show correct normal transformation, will receive (**maximum 45%**).

## 3 Notes

You have two weeks to complete this assignment - start early, and use all available help and resources, as this involves quite a lot more work than previous assignments, and will test your understanding and command of 3d programming. Take screen captures and ask for help on the discussion boards.

Aim to implement all of the most basic requirements first, and add the extra grades features when you are sure that you have available time for experimentation - these will require additional reading.

Each of your unique meshes should be associated with one vertex array object (VAO). This may be used to draw the same mesh in more than one location.

You may use one shader programme for everything, or you may decide to use a separate shader programme for each mesh so that you may render each one in a different style.

Try to keep your code as simple, short, and clean as possible, as you will be able to use this as the base for your game project.