

## CG 200 Computer Graphics Assignment 2

### “Under the Sea” using OpenGL

#### 1. REQUIREMENTS

In this assignment, you can unleash your imaginations and use OpenGL with C/C++ programming to produce a scene(s) that represents what you envision could possibly be seen under the sea. Please note that an image with just the text “Under the Sea” or alike will not be accepted.

Unlike Assignment 1, Assignment 2 is focused on the technical skills on OpenGL programming. Artistic creativity is encouraged, but not required. Please spend most of your effort learning OpenGL itself.

#### Program Requirements:

1. At least 6 objects with different shapes should be present in the scene. At least 3 of these objects should be composite, i.e., not just a sphere or a cube which can be implemented by a simply GLUT function. At least 2 light sources and 3 different surface finishing should be used. Having these features and the key functions below will ensure a passing mark. Higher marks will depend on the technical complexity of the objects and the scene, as well as other effect such as texture, transparency, fog, etc. Aesthetic aspect will not contribute to the mark, although they are still encouraged.
2. Pressing the keys <Z> and <z> shall invoke zooming in and zooming out effect with the increment of **0.1** respectively. The continuous levels-of-detail must be implemented, i.e., the smaller the object is, the fewer number of polygons/vertices is used and vice versa, to ensure the smooth looking of objects when looked closely.
3. Pressing the key <X> or <x> and <Y> or <y> shall invoke steady rotation of the whole scene about the X axis and Y axis respectively in the clockwise direction as seen from the positive direction of the axis. Initially, there should be no rotation.
4. Pressing the key <A> or <a> shall invoke some kind of pre-defined animation. You are encouraged to develop reasonable animation according to your scene design.
5. Pressing the key <F> or <f> shall make the whole animation faster.
6. Pressing the key <S> or <s> shall make the whole animation slower.
7. Pressing the key <T> or <t> shall pause animation. Pressing the key <C> or <c> shall resume the animation process.
8. Pressing the key <p> shall switch the rendering to the flat shaded polygonization.
9. Pressing the key <P> shall switch the rendering to the smooth shaded polygonization.
10. The command keys should be displayed on the screen after you run the program. You are encouraged to display the command keys in the actual window you created.

**The final version of your program must work on the lab workstations and be presented and assessed in the Lab.** No technical support will be provided for your work on your own PC.

Only simple textures are required for this assignment. I have uploaded a very simple program called “BMP-loader.c” under “Other Resources” for your reference on how a simple texture mapping can be done. The program is in .txt format as “BMP-loader.txt” there to ensure that

you can download it correctly. I downloaded the file from Nehe some time ago and it is a very simple and straight forward implementation of texture mapping.

There are plenty of OpenGL tools/codes available on the Web. You are encouraged to explore and **learn** from them (rather than simply copying them). Please ensure that clear reference is given if you do have to use some external codes and resources.

## 2. ASSESSMENT

This assignment is due on the **31st October 2016, Monday at 9:00am**. You must zip the following items into a single file:

- The source files with the make file (if any);
- A simple readme.txt which briefly describes each source file and the way to compile and run your code(s);
- The assignment cover sheet (attached) filled, signed and scanned. By submitting the sheet, you declare that the work submitted are solely your own;
- A short report of up to 5 pages. In the report, you must list the program's features implemented and briefly explain the main algorithms you used for modelling, rendering and animation. Please provide specific description on YOUR own work, not just a list of what are required. Please describe what simple or composite objects have been used to model YOUR OWN objects, and what kind of surface finishing you have employed for each of them. If you use an external tool to create a complicated object or finishing, please provide brief description on the tool, your usage of the tool and your reflections on using the tool. You are also required to describe the animation you have produced by providing the design ideas and their implementations. Please give brief descriptions on YOUR OWN work. The report will constitute 20% of Assignment 2 marks.

This compressed file should be uploaded to the Blackboard before the deadline. Just click on "Assignment 2" in Blackboard and you'll see the uploading page. **You are allowed only 2 submissions, so please make sure the completeness and correctness of your files before your submission. All late submissions will not be accepted.**

No hard copy submission is required.

In addition, you should leave a copy of the above files (not zipped) and **the executable file** in your main directory under `/cg200/assignment2/`. Please note that the time-stamp for the source files / executable file must be before the deadline.

During the practical sessions in Teaching Week 12 (Starting on 31<sup>st</sup> October 2016), you must first show the time stamp of your executable file to your tutor. You must demonstrate and be ready to answer any questions relating to your program. You may be asked to make slight changes to the program to check up your understanding of OpenGL graphics programming or to prove your authorship if any doubts arise. **Failing to turn up at the demonstration in your own enrolled practical session will result in a ZERO for Assignment 2, and may result in an F-IN for the whole unit.**

**Please note that there will be absolutely no possibility of an extension of the due date.** Please refer to the Department's policy on Late or Missed Assessment: <http://www.computing.edu.au/documents/latesubmissionguidelines.pdf>.

Enjoy!

"What you discover on your own is always more exciting than what someone else discovers for you - it's like the difference between romantic love and an arranged marriage.

- Terrence Rafferty"

**Appendix A Suggested timeline for your assignment**

You have 6 weeks to work on the assignment. Below is a crude time line suggested for you to monitor your progress. It does in no way serve as a hard guideline you have to follow strictly. Please note that I count the tuition-free week in since I hope you'll make good use of that week.☺

- Week 1: The initialization of the window including the camera setup, the lighting design and the projection effects; Design the objects and some simple animations
- Week 2~3: Implementation of the objects and animations
- Week 4: Key functions implementation
- Week 5: Improvement on the overlook of the scene using special effects such as textures, transparency, etc.
- Week 6: Testing, problem fixing and feature improvement, report writing

**Appendix B Cover sheet****Appendix C Assignment 2 Marking Guide****Appendix D Resources**

- <http://nehe.gamedev.net/>
- <http://www.videotutorialsrock.com/>
- <http://www.lighthouse3d.com/opengl/glut/>
- [http://www.opengl.org/documentation/red\\_book/](http://www.opengl.org/documentation/red_book/)
- <http://www.opengl.org/sdk/docs/man/>

**Appendix E “BMP loader.txt”**

Can be found under “Other Resources”