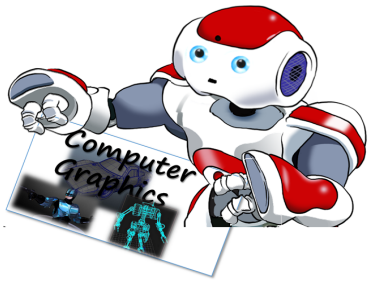


Aston University
Birmingham

Computer Graphics Coursework

Scene Construction and Animation in OpenGL

CS2150: Computer Graphics

Date due: 08/12/2017 Electronic Submission: Via Blackboard

1 Overview

The CS2150 coursework requires you to use the OpenGL graphics library in Java, which we have covered in the lab classes. The task is to **create a scene with some simple 3D animation** around a theme. The theme this year is **"outer space"!** Your scene should contain some animation which **is interactive**, i.e. the user can affect what happens in the scene.

Use your imagination to find an idea that **you** like, as this will likely make the coursework more fun.

The work should be your own, but you can incorporate pieces of code that define 3D objects and textures from other sources **if and only if** you acknowledge where these come from and include comments which discuss the steps you had to take to incorporate the models in your code. Do not expect a great deal of credit for using other people's code!

You should aim to spend up to 30 hours on this piece of work. You might find this coursework more fun than some of the other projects you have to complete and there may be a temptation to spend too much time on this animation. Don't – you are not making the next *Toy Story*!

2 Additional Requirements

You should ensure that your program runs without error on a lab machine at Aston and that all required parts (files, including textures) are contained in your submission. To help achieve this, ensure you follow the instructions in Section 4 of this document. It is also important that you use the right package structure, to avoid problems making your code run. It is your responsibility to ensure that the program compiles and runs correctly on an Aston lab machine - even if you developed it on a different one.

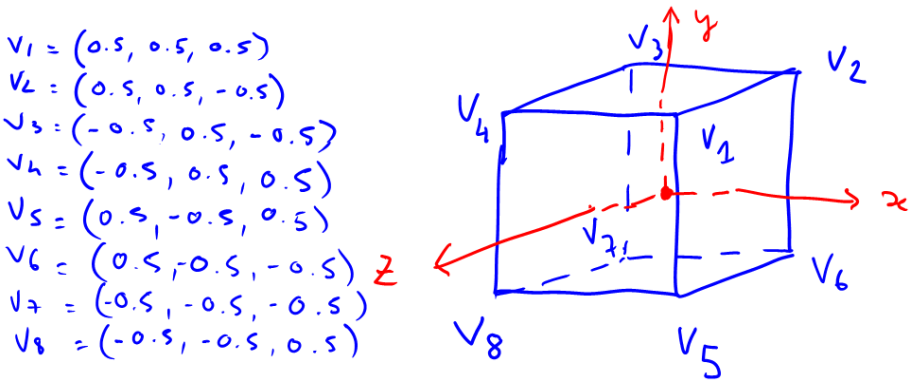
Note: If you do not follow the required package structure and/or use modified versions of classes that are not part of your submission, your code will likely not work as you intended, and you will use marks! To ensure this is not a problem, follow the instructions in Section 4 fully. If in doubt, ask!

Include a substantial comment at the top of the program which includes your name, course, year and a statement that this is your own work. As with the lab examples the comment **must include a scene graph** for your submission. This comment should also include:

- ➢ A description of what your program does (i.e. a brief explanation of how the animation works),
- ➢ User instructions on how to interact with the scene (i.e. which keys need to be pressed and what is their effect).

It is important that you document your code well, since this forms part of the assessment.

You will need to create at least one custom 3D object not found in the labs. **Your submission should include a document showing a drawing of your object, with its origin and vertex coordinates clearly indicated**. This document can be an image or a scan of a (readable) handwritten version. The image below shows an example of what this document might look like if your object was a cube. (Note that your object should NOT be a cube!)



3 Assessment

A total of 100 marks is available and will be allocated along the following lines:

	Criterion	Marks
☐	3D OpenGL program which renders correctly (with standard GraphicsLab classes)	10
☐	A basic animation (e.g. movement) of a simple object	5
☐	Basic user interaction	5
☐	A self-created, well-defined custom 3D object with correct normals	10
☐	Documentation showing how you designed your custom object	5
☐	Appropriate use of lighting, materials and textures	15
☐	Advanced animation (i.e. objects that move relative to each other)	10
☐	Clarity of the code (i.e. style, consistency, indentation)	5
☐	Good documentation (i.e. commenting) of the program	5
☐	A clear introductory description of the program and how to interact with it	5
☐	A correct scene graph, including transformations	10
☐	Quality of scene, and attention to detail	5
☐	Innovation and novelty in the scene and animation	10

You can create and animate any scene you wish (so long as it meets the theme specification). You must **not** collaborate with anyone on this piece of work. You may discuss high level issues, but there is **no good reason** for two people's scenes or animations to be similar. Try to keep your code as tidy as possible and use methods and display lists to encapsulate drawing components.

4 Installing, Using and Submitting the Coursework Template

This section will help you create a new package for your coursework as an addition to your current CS2150 lab projects.

Note that the following instructions assume that you have been able to build and run the lab samples using Eclipse. If you have not been able to build and run at least one of the lab samples by now, then please speak to a lab demonstrator before attempting to use the coursework template.

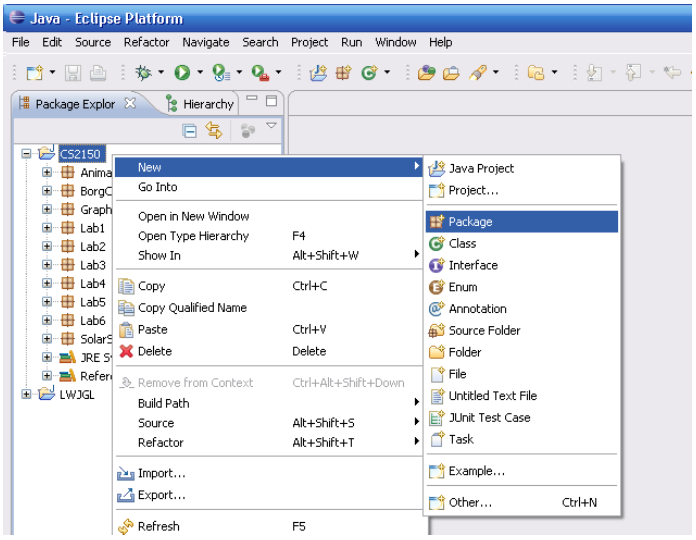
4.1 Java coursework template

To install the template, download the `CS2150Coursework.java` file from Blackboard (save it e.g. onto your Desktop) and follow the instructions on the rest of this page.

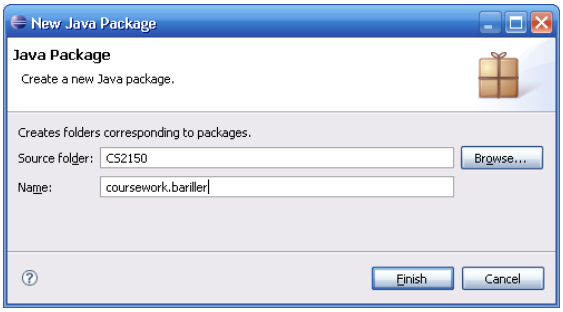
4.2 Creating a package for your coursework

Open the CS2150 lab code project by launching Eclipse and switching to the appropriate workspace if required.

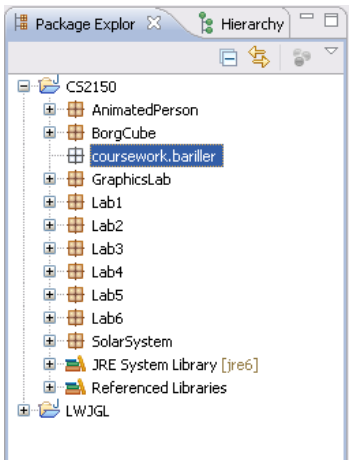
Once the lab code workspace is open in Eclipse, right-click the CS2150 project icon in the Package Explorer and select ”New” and ”Package” from the context menu that appears, as shown below:



This will open a ”New Java Package” dialogue. Make sure that the Source folder box contains the text `CS2150`. Enter `coursework.username` into the Name box, replacing “username” with your Aston username, as seen here:



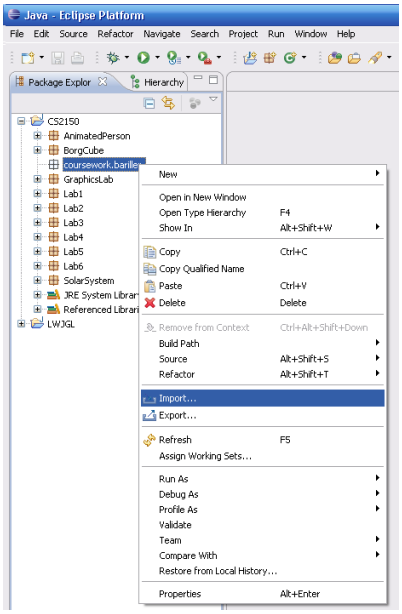
Click “Finish” to close the dialog. A new empty package called `coursework.username` should have been added to the CS2150 project, as shown below:



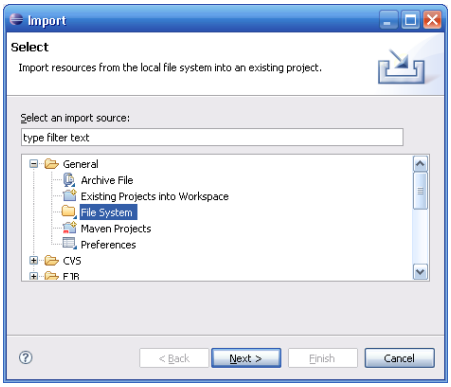
This actually creates a folder called `coursework`, and inside this, creates another folder with the same name as your username.

4.3 Importing the coursework template into your package

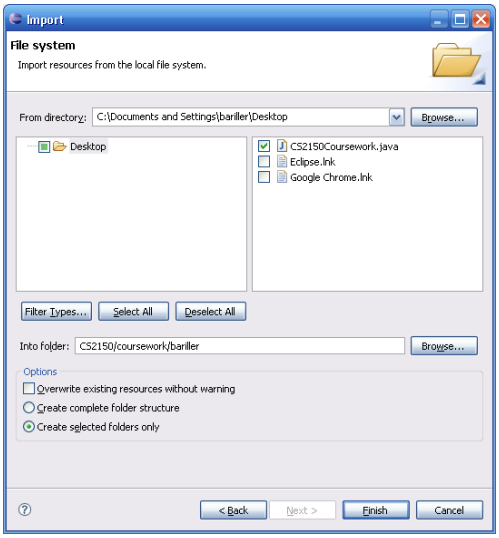
If you haven’t already done so, ensure you have downloaded the coursework template to your desktop. Then, in Eclipse, in the Package Explorer pane, right-click on the `coursework.username` package and select *Import*.



Expand the ”General” folder and select ”File System”, then click ”Next”

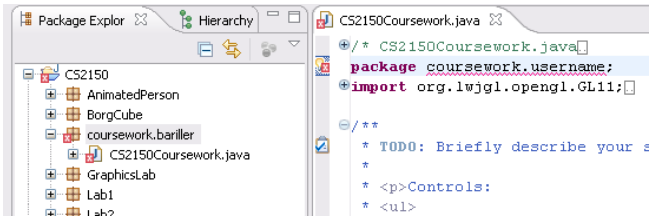


Click the *Browse* button and select your desktop. Then select the `CS2150Coursework.java` file from the right hand file list Make sure the "Into folder" box corresponds to your new package. It should read `CS2150/coursework/userna` Click *Finish*.

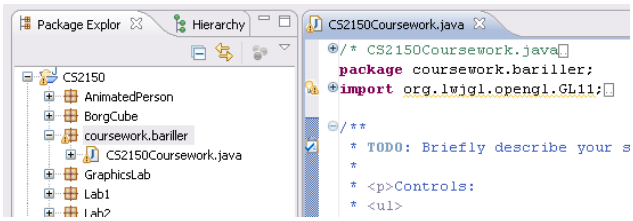


4.4 Fixing the package name

At this stage, you should see an error with the coursework template. This is because you need to update the package name to match your username.



Simply edit the `CS2150Coursework.java` file and replace "username" in the package declaration with your actual username:



You should now be ready to go (ignore the warning about GL11 not being used. It will be, as soon as you start implementing your own OpenGL code.)

4.5 Running the template

Right-click and run the `CS2150Coursework` package as a Java application. At the moment, you will only see a black screen (you are required to provide the content). However, you should be able to use the X, Y and Z keys to view the respective axes. You should now be ready to start editing the coursework template.

4.6 Submitting your work

The mode of submission will be electronic via Blackboard. You should submit the folder inside "coursework", with the same name as your username. You should zip this folder up into a single zip file, and then upload this zip file to Blackboard. Make sure you include i) any texture files and ii) your object drawing (as a PDF or image file), somewhere inside the username named folder. Of course, you will need to make sure the paths to textures are relative, so that they are loaded correctly.

Instructions for how to achieve the above:

1. First navigate to the `CS2150_Workspace` folder on your computer (not in Eclipse). Inside the `coursework` folder, there will be a folder with the same name as your username.
2. Ensure that everything you want to submit is inside this folder, including your design documents, and any assets that your program needs to run, such as textures. Make sure that your program loads textures using relative paths, so that it looks for them inside this folder.
3. Zip up (using 7zip, tar or similar) this folder, so that the resulting file is called something like `username.zip`. This zip file should now contain **everything** you want to submit.
4. Finally, upload that zip file to Blackboard.

IMPORTANT 1: Your coursework must be self-contained within the coursework/username folder!

IMPORTANT 2: Ensure that your coursework code does not rely on any custom changes to the GraphicsLab classes, that you might have made. If you aren't sure, re-download the CS2150 Workspace and test your submission by importing it into there first. If you want to further develop the GraphicsLab classes to help you with your work, you are advised to subclass them in your own package.