

CS 184: Assignment 0—Account Setup and Compilation

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This assignment gets all the groundwork ready so you can stop worrying about logistical issues and focus on the content in CS 184. In particular, you will set up your account and make sure you know how to compile and run OpenGL programs with shaders. You will also make use of the *submit* program. Please coordinate with the teaching assistants if you run into any issues.

Please also use the newsgroup we have created for the class. It is likely any problem you face will be shared with other students, and any answers and solutions you find are useful to all. Since there is no “test” in this assignment, feel free to post code and other suggestions that are useful for compilation (of course, do not post any code relevant to homework 1 or any future homeworks).

Please note the due dates. The first part, which is the account setup, is due on Aug 29. In addition, you must either submit the full assignment by that date, or your submission to the first part must clearly document what compilation issues you are having (please also get in touch with the teaching staff about solving them immediately). In any event, the full assignment must be submitted by Aug 31.

Account Setup

First, please sign up for a CS 184 class account. Try to choose initials corresponding to your name, rather than randomly (this is not strictly required, but would help a great deal). The account is useful for all class-related activity, submitting assignments, making websites for grading and so on.

In your account, create a world-readable sub-directory called *public.html* and create an HTML page *index.html*. This website should at minimum contain your name, and a link to where you will post optional and required assignment results. Feel free to include any other information and customize your website. Make sure you can load the webpage by going to <http://inst.cs.berkeley.edu/~CS184-xx> (xx should be replaced by your account name). You may also want to set up e-mail forwarding so we can send e-mail to your cs184 account and have it forwarded.

Submission: Your submission for this assignment (besides creating the website above) is done via the *submit* program as documented in <http://inst.eecs.berkeley.edu/cgi-bin/pub.cgi?file=submit.help>. (ask the GSIs or post on the newsgroup if you need help on this). This first part of the assignment is called *hw0a*, so run *submit hw0a*. Please submit a directory containing the following elements.

1. A file called *info.txt* that has separate lines for each of the following: Your name; your primary e-mail for sending announcements; your CS 184 account; your year and major (such as EECS Sophomore); your primary development platform (such as Windows 7, Ubuntu, Mac OS Lion, Python and Lisp on Iphone , etc.); any other information of interest. Example (please follow this template exactly):

```
Brandon Wang  
brandonwang@berkeley.edu  
cs184-xx  
EECS Senior  
Mac OSX Mountain Lion
```

2. A file called *photo.jpg* which is a JPEG image with a picture of yourself. The image should be recognizable and be of resolution 120×160 (otherwise we will resize it for the class roster). If you have any privacy concerns in this matter, please speak to the professor beforehand.
3. A file called *compilation.txt* that documents what you tried, any useful suggestions and any outstanding issues in completing the second part of the assignment involving compilation. If you have turned that part in, your file need only say “Turned in hw0b”, although if you did something unusual we’d still like to know and may (no promises) give you extra credit. In any event, you should contact the teaching staff to make sure you can turn in the second part by the deadline.

Compiling OpenGL programs

Much of the material for the class will be using OpenGL programs. One unit of the course will be on programming OpenGL, but you will be using it for the other assignments in any case. As of last semester, we also started introducing modern programming with programmable vertex and fragment shaders for the first time, using the OpenGL shading language (GLSL).

In *principle*, OpenGL and related code should be portable across many platforms, and indeed this is its strength. (In the spring class, while there were niggling issues, nobody had difficulty getting a working setup, across a wide range of machines, operating systems, and coding frameworks). As such, you may use any computer and platform you choose, but will need some kind of C++ development framework and an installation of OpenGL and Glut (more on the latter below). Please speak with the teaching assistants if you need a C/C++ development environment such as Microsoft's Visual Studio.

In *practice*, the above statement is pretty close to true, but you need different installs and tricks to get your machine set up to run the programs for this class properly; this differs on different operating systems. Moreover, the shading language is constantly evolving. All of this means that **you should definitely start as early as possible**. Post to the newsgroup and contact the teaching assistant regarding problems in compilation. If you come up with some interesting tricks to get things to work, let us know that too. As a practical matter, you cannot progress further in the course without being able to compile OpenGL and GLSL programs, so treat this assignment as being of utmost importance.

Assignment: To make sure you can run programs for the course, please download and compile two programs. The first is the skeleton code for assignment 1. The second is provided off our website and is our demo program for the OpenGL assignment. We include complete skeletons for major platforms. (In some cases, our versions include the compiled objectives and executable to help you, but please try to recompile the source code from scratch to make sure everything works.) If you develop on a different platform, you may need to re-create projects and Makefiles from the source code. *We also have a link on the main CS 184 website to a FAQ about compilation options of what students did last time.*

A brief description of the two projects. The homework 1 skeleton should show a teapot on a blue background. The solution should allow you to use arrow keys to change your viewpoint and look at the teapot from different directions. (We do not test that you compiled homework 1, but please do so anyway to make sure it works).

The larger demo program has a textured ground plane with 4 "pillars" and a teapot with lighting that moves. The mouse can be used to zoom in. Look at the *keyboard* function in *mytest3.cpp* to see the keys you can press. The "p" key will start and stop the animation of the teapot.

Once you have the program running successfully, press "i" to move the teapot into the correct position for our feedback servers. Next, press "o" to output the screenshot to the program's directory. Rename it to "screenshot1.png" so it isn't overwritten by a subsequent screenshot.

Next, I want you to change the color of the red highlight on the teapot to yellow (yellow is made by mixing red and green, which are the first two elements of the color vector: the third is blue). The relevant colors and code are defined in the *display* function of *mytest3.cpp* where it says "add lighting effects." Once you have done this, press "i" then "o" as before to output a screenshot. Rename this screenshot to "screenshot2.png".

Finally, submit these screenshots to the feedback server, which is available at the following URL: <http://ec2-50-18-150-78.us-west-1.compute.amazonaws.com/cs184web/hw0/> Use your CS184 login with the password posted on Piazza. Once grading is complete, the server redirects you to a report page. Save this URL for your submission. (As with other assignments, you may submit multiple times; save the last URL when you are satisfied).

Note for both programs the *shader* directories that contain glsl shaders. These are files that are loaded and compiled by the OpenGL program at runtime and therefore must exist, but need not be part of the Makefile or project.

Submission: Use the *submit* program to submit *hw0b* with a directory that contains the following files:

1. *hw0.txt* which includes the URL of your HW0 submission report on the feedback server, as described above.
2. *comments.txt* Comments on what you did to get things to compile, suggestions for us to make this more user-friendly for future years etc. If you have nothing to say, you may leave this file blank.

Compilation Hints: What follows below are some helpful hints for compilation. We now provide complete skeletons for all major platforms, and the main website has a FAQ of major issues, so you may not need the information below, but it is presented in case it is useful.

You probably already have **OpenGL** set up on your computer. Search for *gl.h* to see if you have it. If not, go to www.opengl.org and follow instructions to download the appropriate files. The website Nehe, at <http://nehe.gamedev.net/lesson.asp?index=01> provides useful OpenGL lessons, especially involving setting up OpenGL in various environments.

You probably don't already have **GLUT** set up (Mac OS machines actually do usually have a GLUT framework pre-installed). If you want, you can also find the download for that package from www.opengl.org (or just google for GLUT to find many sources for it). We'll also provide a link on the assignment website to download the three necessary glut files. The easiest way on Visual Studio for Windows is to simply move the files to the appropriate location, the dll file to the Windows System directory with other dlls, the header file to where the other GL headers are, and the lib file to where other library files are. Chris Wyman's website at <http://www.divms.uiowa.edu/~cwyman/classes/common/howto/winGLUT.html> has a good step-by-step tutorial. Fortunately the internet is your friend, and searching for installing glut for your system quickly brings up a lot of information. Note also that the newer version of GLUT is freeglut, available at <http://freeglut.sourceforge.net>. We will not be using any very complex GLUT functionality so any version should work.

As you can see from the source code for the demo program, once OpenGL and GLUT are properly set up, on my **Linux** machine, I just needed to add an include line to the main file, `#include GL/glut.h`. The compile line then just needs to link against `-lglut` and possibly `-lGL`. Importantly, you should define `GL_GEXT_PROTOTYPES` either in the source code, or as I've done as a compile-time option. It is possible that if you are running one of the newest machines and OpenGL versions, you may need to turn on compatibility profiles. If this is an issue, please speak to the teaching assistant. (The skeleton programs and Makefiles should take care of most of these issues, so for most people it will just work out of the box).

On **Windows**, an excellent resource for compiling OpenGL programs with shaders is maintained by Chris Wyman at <http://www.divms.uiowa.edu/~cwyman/classes/common/howto/winGLUT.html>. He discusses the various system paths to install the GLUT files. You also need to set your Visual Studio project to include additional linker dependencies such as `glew32.lib glut32.lib glu32.lib opengl32.lib` (modify as needed for 64 bit, or make sure you compile to a 32 bit executable). The visual studio project you download has this done already. The headers should also `#include GL/glut.h` as in Linux, but the order of includes does seem to matter; see what I did in the Windows version. (Again, for most people the skeleton should do all of this automatically).

When using **GLSL on Windows**, there is also an issue with extensions and the shading functions. There are a variety of ways to address this (just search online), but the preferred option is to install *GLEW*, that stands for *The OpenGL Extension Wrangler Library* and is found at <http://glew.sourceforge.net>. The library is cross-platform and may be useful on other machines as well. Follow the same instructions as for installing GLUT. The dll files go in the same directory as the glut dll files, same for lib files and header files. You need to `#include GL/glew.h` before you include GLUT. Crucially, you need to call `glewInit()`; in the main loop of your program, *after* you have created the GLUT window. The visual studio project and Windows source code includes all of these tweaks, and should work out of the box.

The skeleton code for assignment 1 includes the **GLM library** which is available for you to download at <http://glm.g-truc.net/>. This library is header-only, so should be very portable and includes many useful matrix-vector operations, and replacements for many deprecated functions. I have included the zip file and unpacked versions already in the skeleton. You just need to make sure you either move the files to your standard include location, or include the GLM libraries in your include path (this should already be done in the downloadable skeleton codes).

To repeat, for most people, most of the above discussion will not be required, and the skeletons should compile out of the box. Also, the main website FAQ has the most common issues. Of course, if you've tried things and it doesn't work, feel free to post on Piazza and contact the teaching assistants.

FreeImage Library: New for this version of HW0 is the introduction of the FreeImage library as a means of generating output image files for our grader. Our source requires that the FreeImage library be installed on your system in order to compile. For Windows and OSX, we have bundled the FreeImage library files with HW0, so everything should run with the default configuration.

On Linux, manual installation of FreeImage is required. There are several ways to accomplish this. The easiest way is through the use of your favorite package manager.

On Ubuntu Linux, run `sudo apt-get install libfreeimage-dev`. Again, this should be enough to compile and run HW0 successfully, assuming the OpenGL dependencies are also installed as described above.

For additional instructions, please see the HW0 compilation notes available here:

<http://www-inst.eecs.berkeley.edu/~cs184/fa12/compilation.html>

Acknowledgments: The first part of this assignment draws largely from Prof. O'Brien's. The compilation with glsl shaders was brand new in CS 184 as of spring, and requires extra work to make sure you have everything working. *So, please start early!*