

## A guide to setting up OpenGL at IFI2

This guide presents steps that are necessary to take in order to get OpenGL 3.1 working on Linux computers at IFI2. They have been tested on a RedHat machine on the second floor.

### 1. Directory setup

First you will need to prepare your directories that will hold the header files and library files needed. It is recommended to create dedicated directories for those files in a location accessible from all your code. For the sake of this presentation it is assumed that we have created the following two directories

- a. `~/inf3320/include`
- b. `~/inf3320/lib`

### 2. Download the GLM, FreeGLUT and GLEW libraries.

The next step is to download the latest versions of GLM, FreeGLUT and GLEW libraries and extract them to the directory of your choice. For the sake of this presentation I'll assume that we have extracted the libraries into following directories:

- a. `~/Downloads/glm-0.9.3.4`
- b. `~/Downloads/freeglut-2.8.0`
- c. `~/Downloads/glew-1.9.0`

### 3. Installing GLM

GLM is a header only library so no compilation is required, thus the only necessary step is to copy the whole directory `~/Downloads/glm-0.9.3.4/glm` to `~/inf3320/include`. At this point there should be a single subdirectory named `glm` in `~/inf3320/include`.

### 4. Building and installing FreeGLUT

We need to build and use a version of FreeGLUT that suits our needs (supports modern OpenGL 3.1). Within a command line browse to the `~/Downloads/freeglut-2.8.0` directory and type the following commands:

- a. `./configure`
- b. `make`

This commands will configure and build the FreeGLUT. Assuming there were no errors during this process we can now install FreeGLUT for our use. First copy the following files from `~/Downloads/freeglut-2.8.0/include/GL/` directory into `~/inf3320/include/GL` directory:

- c. `freeglut.h`
- d. `freeglut_ext.h`
- e. `freeglut_std.h`
- f. `glut.h`

Secondly copy all the files except the ones with `.a` extension from a hidden directory `~/Downloads/freeglut-2.8.0/src/.libs` into your library directory - `~/inf3320/lib`

### 5. Building and installing GLEW

We proceed in a fashion similar to FreeGLUT. First browse to the `~/Downloads/glew-1.9.0` directory within a command line and type the "make" command. This will build GLEW and assuming that there were no errors during this process we can now install it. Start by copying the following files into `~/inf3320/include/GL` directory:

- a. `~/Downloads/glew-1.9.0/include/GL/glew.h`

- b. ~/Downloads/glew-1.9.0/include/GL/glxew.h
- c. ~/Downloads/glew-1.9.0/include/GL/wglew.h

Now the only thing left is to copy the entire contents of GLEW library directory ~/Downloads/glew-1.9.0/lib into your library directory - ~/inf3320/lib.

#### 6. Hacking the makefile

The Makefile provided will do most of the job for you but it cannot guess where your include and lib directories are. Thus we need to modify it slightly. We provide the location of the include directory to the compiler by adding the -I\$(HOME)/inf3320/include at the end of the CXXFLAGS section of the Makefile. Similarly we provide the location of the lib directory to the linker by adding -L\$(HOME)/inf3320/lib at the end of the LDFLAGS section of the Makefile.

#### 7. Setting up access to shared libraries

At this point your program should compile but it may not run due to the failure to locate the shared library files we linked to (GLEW uses this mechanism). To fix this use one of the below options.

- a. We modify the ~/.bashrc file to include the ~/inf3320/lib in the PATH and LD\_RUN environmental variables. To do that we add the following lines to that file.

```
export PATH=$PATH:$(HOME)/inf3320/lib
export LD_RUN_PATH=$(HOME)/inf3320/lib
```

We also need to add --rpath=\$(HOME)/inf3320/lib at the end of the LDFLAGS section in the Makefile.

- b. We need to set the LD\_LIBRARY\_PATH environmental variable to point to our ~/inf3320/lib directory. We do this by editing the ~/.bash\_profile file (assuming you are using BASH) by appending the following two lines to it:

```
LD_LIBRARY_PATH=$(HOME)/inf3320/lib
export LD_LIBRARY_PATH
```

It is recommended to logout and login again for the changes to take place.