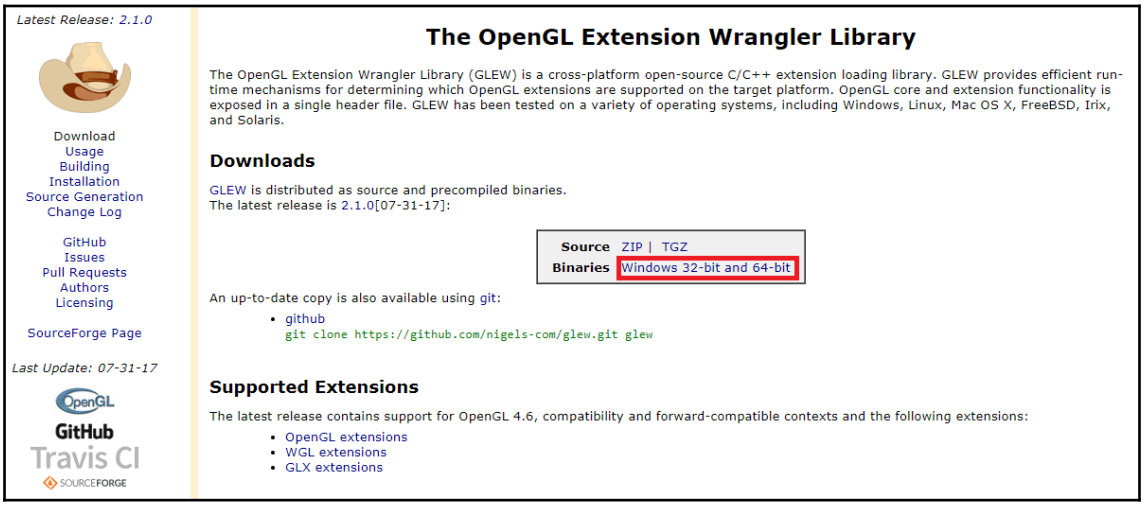
Chapter 1: Setting Up OpenGL



Latest Release: 2.1.0

Download
Usage
Building
Installation
Source Generation
Change Log

GitHub
Issues
Pull Requests
Authors
Licensing

SourceForge Page

Last Update: 07-31-17

OpenGL
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SOURCEFORGE

The OpenGL Extension Wrangler Library

The OpenGL Extension Wrangler Library (GLEW) is a cross-platform open-source C/C++ extension loading library. GLEW provides efficient run-time mechanisms for determining which OpenGL extensions are supported on the target platform. OpenGL core and extension functionality is exposed in a single header file. GLEW has been tested on a variety of operating systems, including Windows, Linux, Mac OS X, FreeBSD, Irix, and Solaris.

Downloads

GLEW is distributed as source and precompiled binaries.
The latest release is 2.1.0[07-31-17]:

Source	ZIP | TGZ
Binaries	Windows 32-bit and 64-bit

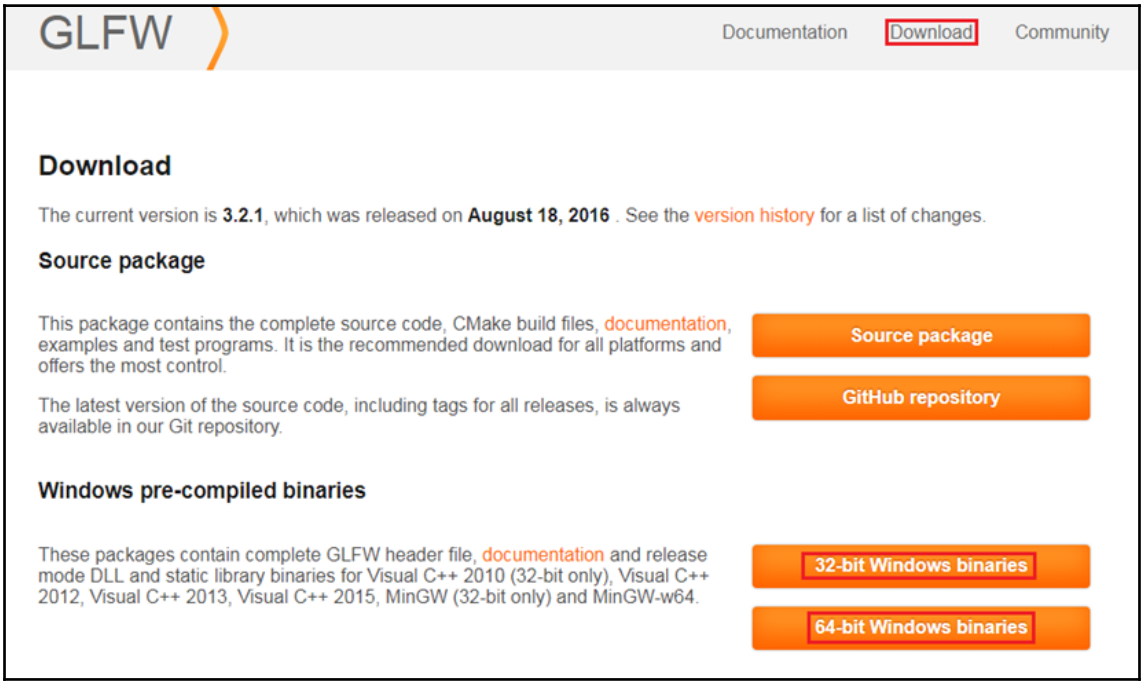
An up-to-date copy is also available using git:

- github
  `git clone https://github.com/nigels-com/glew.git glew`

Supported Extensions

The latest release contains support for OpenGL 4.6, compatibility and forward-compatible contexts and the following extensions:

- OpenGL extensions
- WGL extensions
- GLX extensions



GLFW

Documentation Download Community

Download

The current version is **3.2.1**, which was released on **August 18, 2016** . See the version history for a list of changes.

Source package

This package contains the complete source code, CMake build files, documentation, examples and test programs. It is the recommended download for all platforms and offers the most control.

Source package

The latest version of the source code, including tags for all releases, is always available in our Git repository.

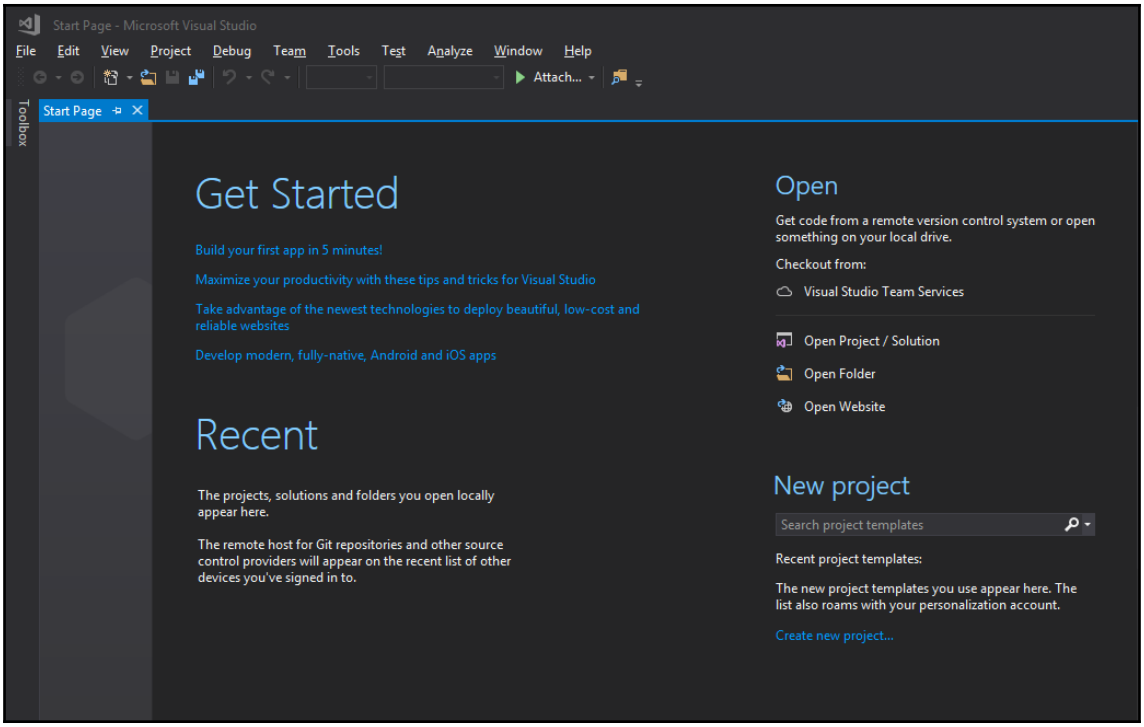
GitHub repository

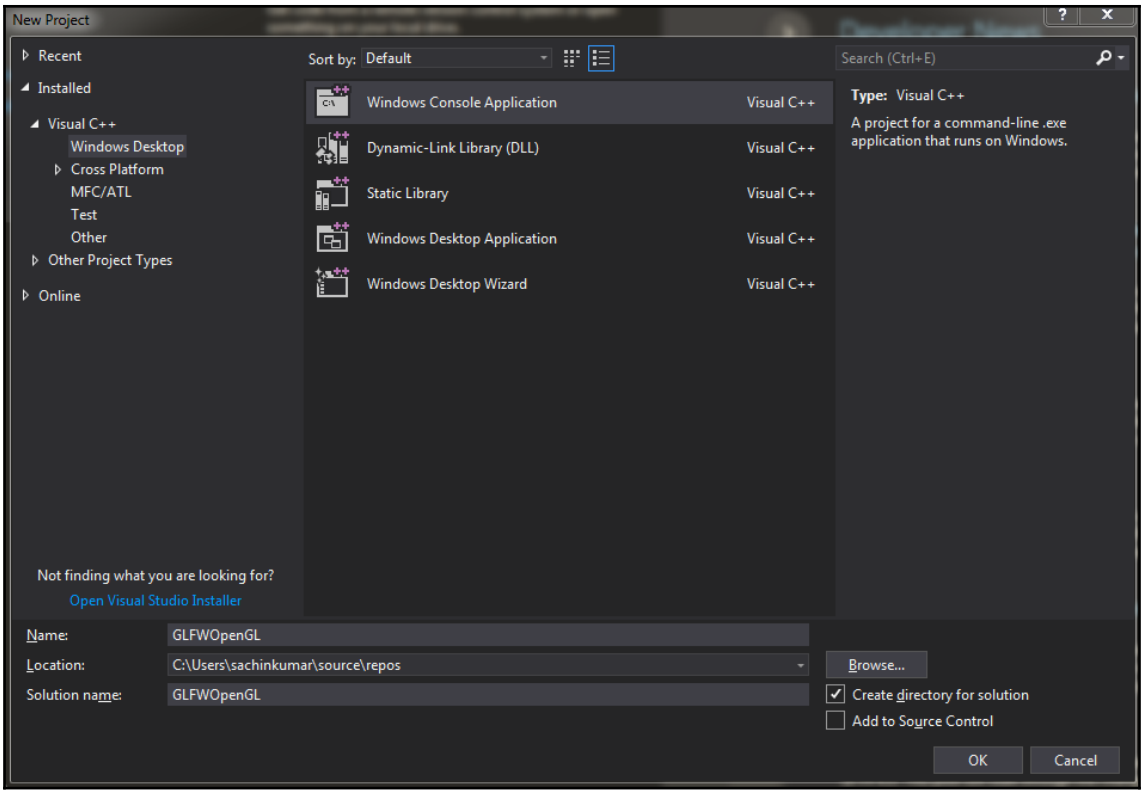
Windows pre-compiled binaries

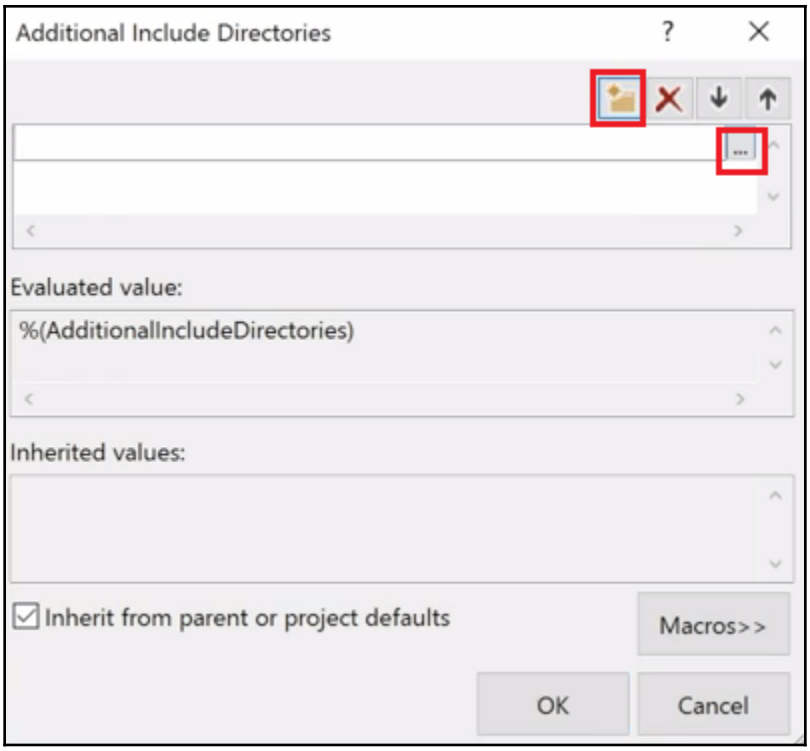
These packages contain complete GLFW header file, documentation and release mode DLL and static library binaries for Visual C++ 2010 (32-bit only), Visual C++ 2012, Visual C++ 2013, Visual C++ 2015, MinGW (32-bit only) and MinGW-w64.

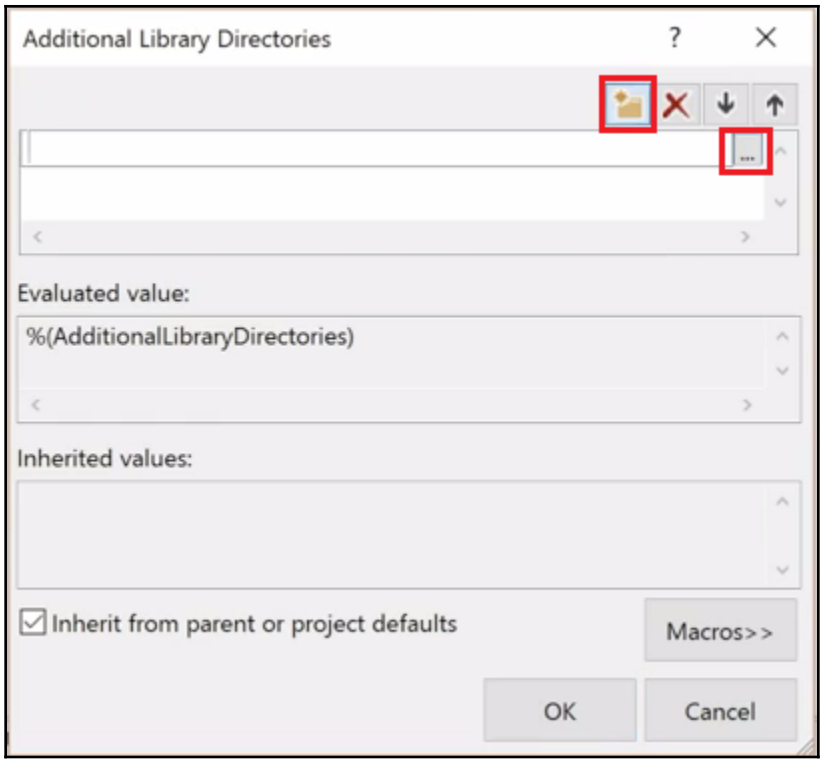
32-bit Windows binaries

64-bit Windows binaries


Start Page - Microsoft Visual Studio
File Edit View Project Debug Team Tools Test Analyze Window Help
Attach...
Toolbox
Start Page
Get Started
Build your first app in 5 minutes!
Maximize your productivity with these tips and tricks for Visual Studio
Take advantage of the newest technologies to deploy beautiful, low-cost and reliable websites
Develop modern, fully-native, Android and iOS apps
Recent
The projects, solutions and folders you open locally appear here.
The remote host for Git repositories and other source control providers will appear on the recent list of other devices you've signed in to.
Open
Get code from a remote version control system or open something on your local drive.
Checkout from:
Visual Studio Team Services
Open Project / Solution
Open Folder
Open Website
New project
Search project templates
Recent project templates:
The new project templates you use appear here. The list also roams with your personalization account.
Create new project...


New Project
Recent
Installed
Visual C++
Windows Desktop
Cross Platform
MFC/ATL
Test
Other
Other Project Types
Online
Not finding what you are looking for?
Open Visual Studio Installer
Sort by: Default
Windows Console Application Visual C++
Dynamic-Link Library (DLL) Visual C++
Static Library Visual C++
Windows Desktop Application Visual C++
Windows Desktop Wizard Visual C++
Search (Ctrl+E)
Type: Visual C++
A project for a command-line .exe application that runs on Windows.
Name: GLFWOpenGL
Location: C:\Users\sachinkumar\source\repos
Solution name: GLFWOpenGL
Browse...
Create directory for solution
Add to Source Control
OK
Cancel


Additional Include Directories
?
...
Evaluated value:
%(AdditionalIncludeDirectories)
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel


Additional Library Directories
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...
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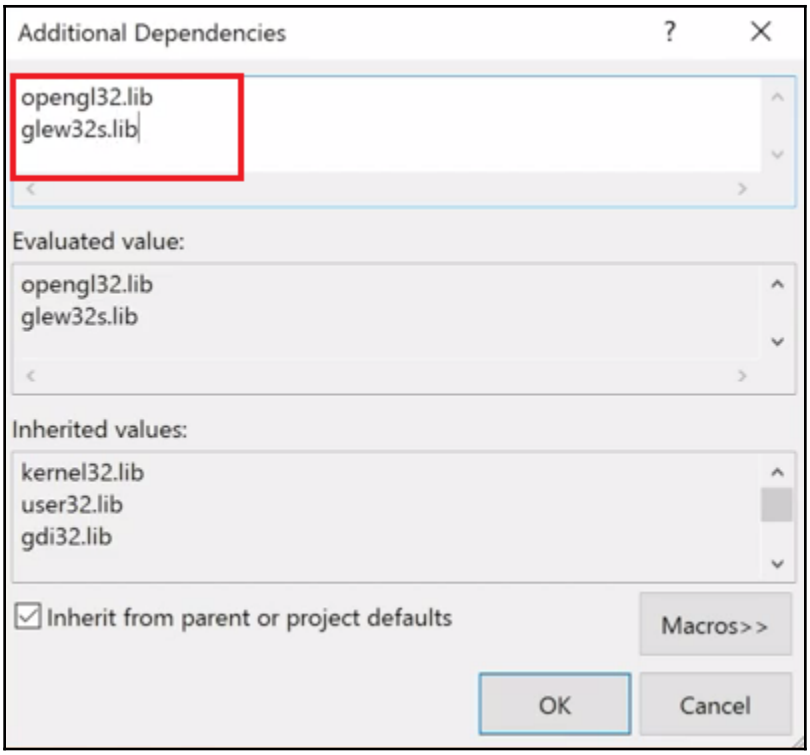
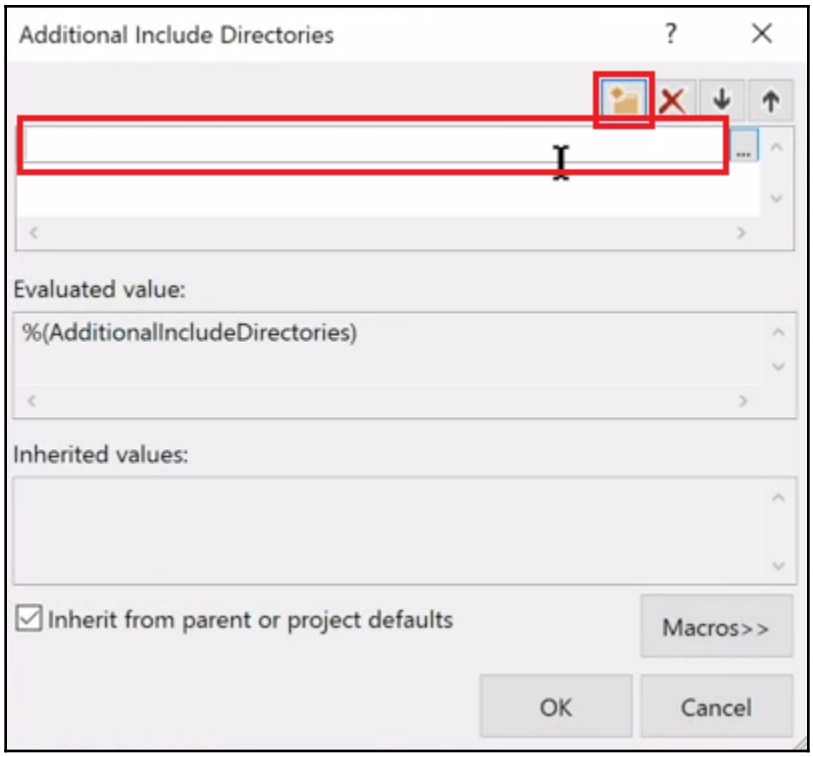
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel


Additional Dependencies
opengl32.lib
glew32s.lib
Evaluated value:
opengl32.lib
glew32s.lib
Inherited values:
kernel32.lib
user32.lib
gdi32.lib
Inherit from parent or project defaults
Macros>>
OK
Cancel


Additional Include Directories
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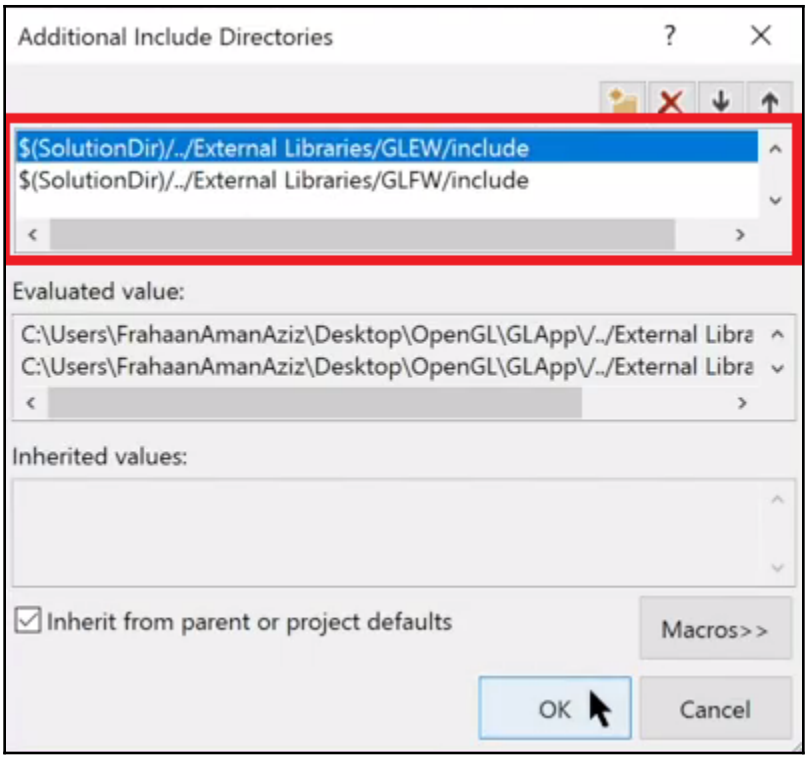
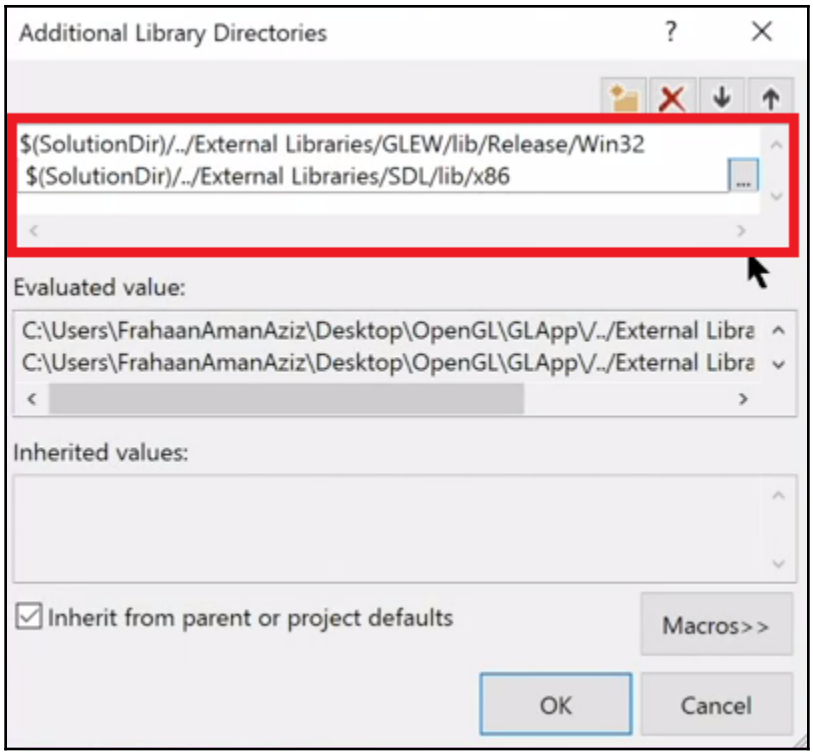
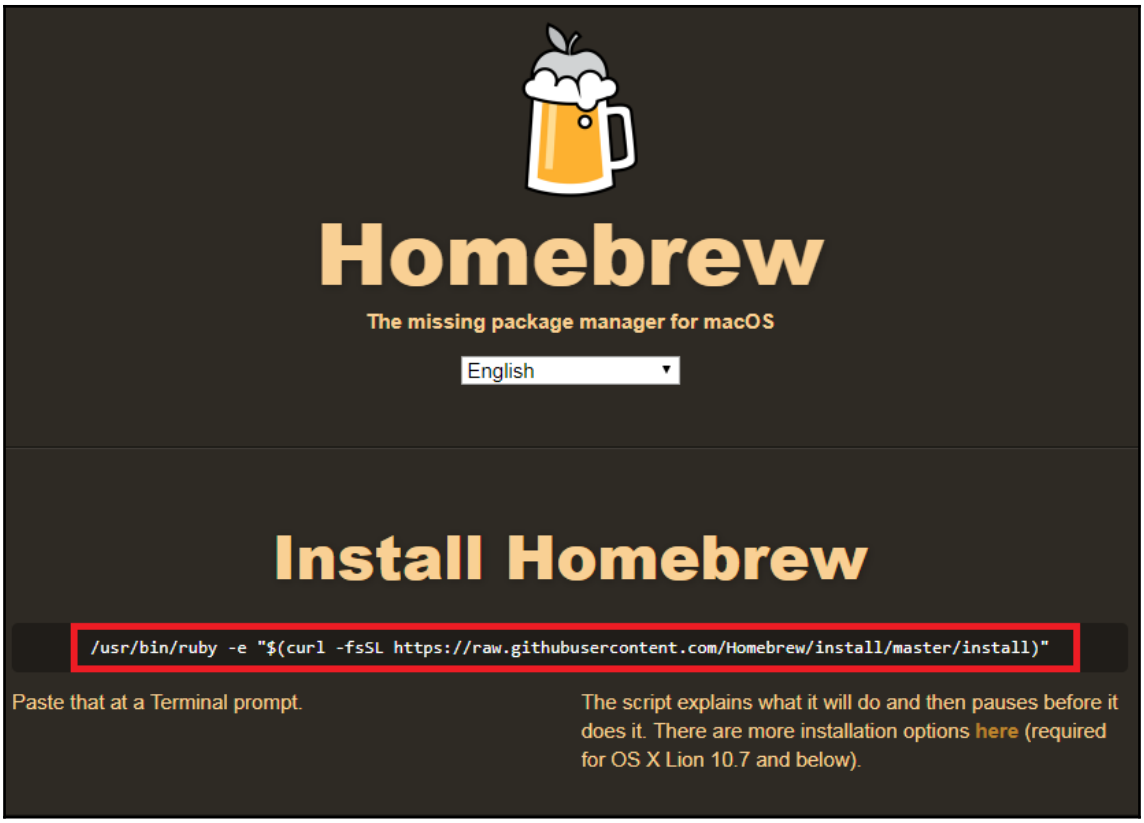
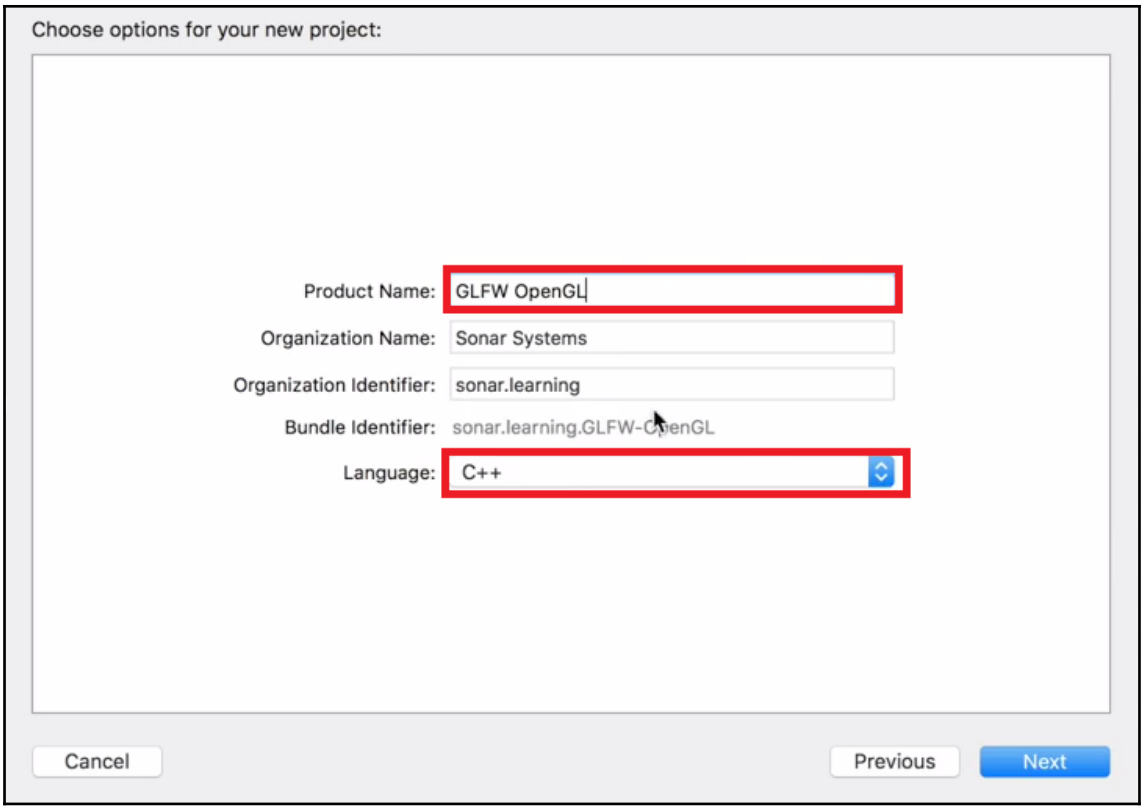
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel


Additional Include Directories
$(SolutionDir)/../External Libraries/GLEW/include
$(SolutionDir)/../External Libraries/GLFW/include
Evaluated value:
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel

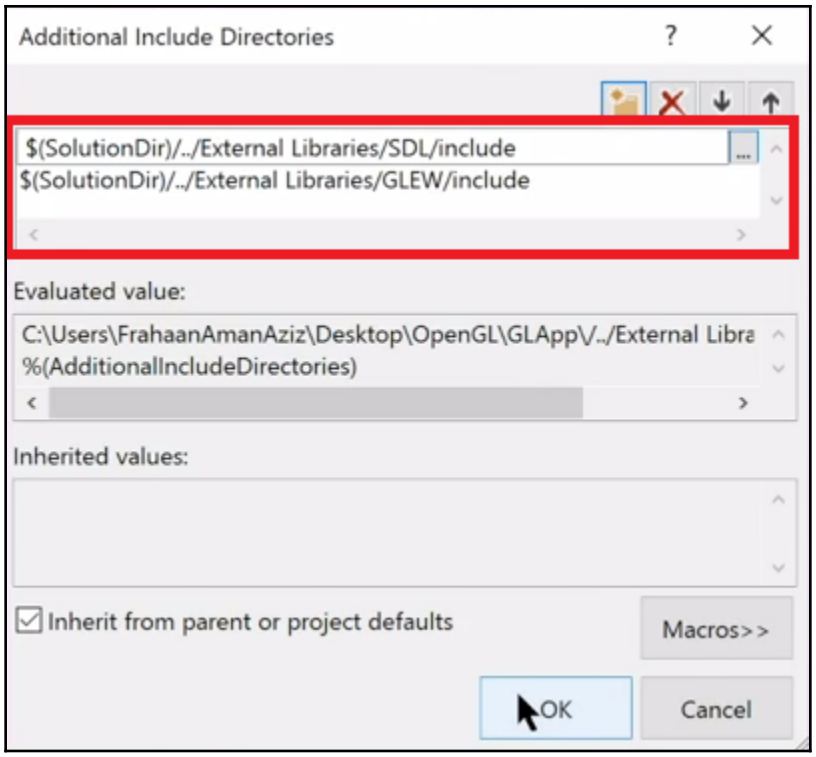

Additional Library Directories
$(SolutionDir)/../External Libraries/GLEW/lib/Release/Win32
$(SolutionDir)/../External Libraries/SDL/lib/x86
Evaluated value:
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel

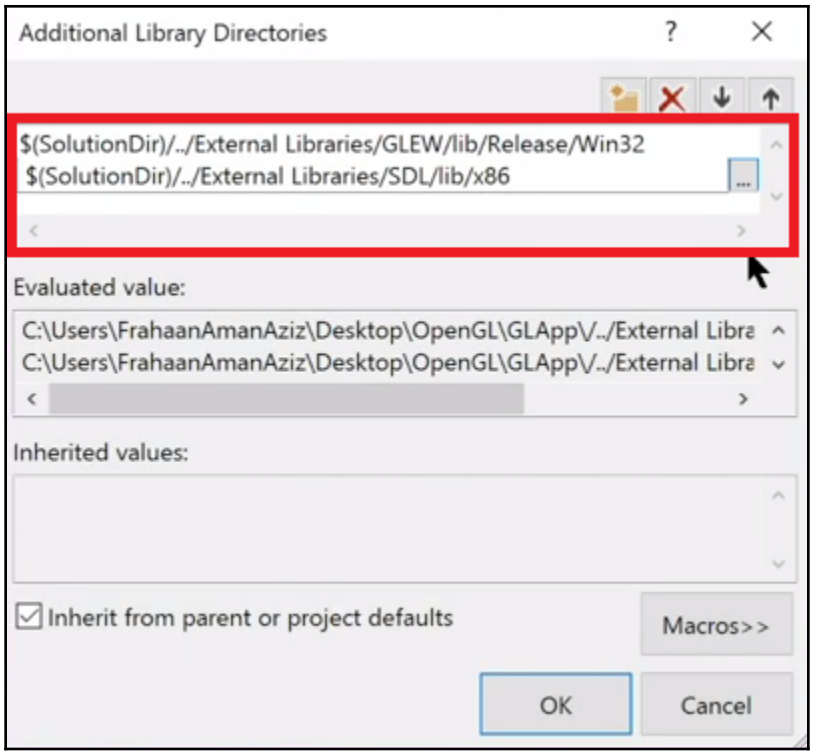

glew32.dll
visualinfo.exe


Homebrew
The missing package manager for macOS
English
Install Homebrew
/usr/bin/ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)"
Paste that at a Terminal prompt.
The script explains what it will do and then pauses before it does it. There are more installation options here (required for OS X Lion 10.7 and below).

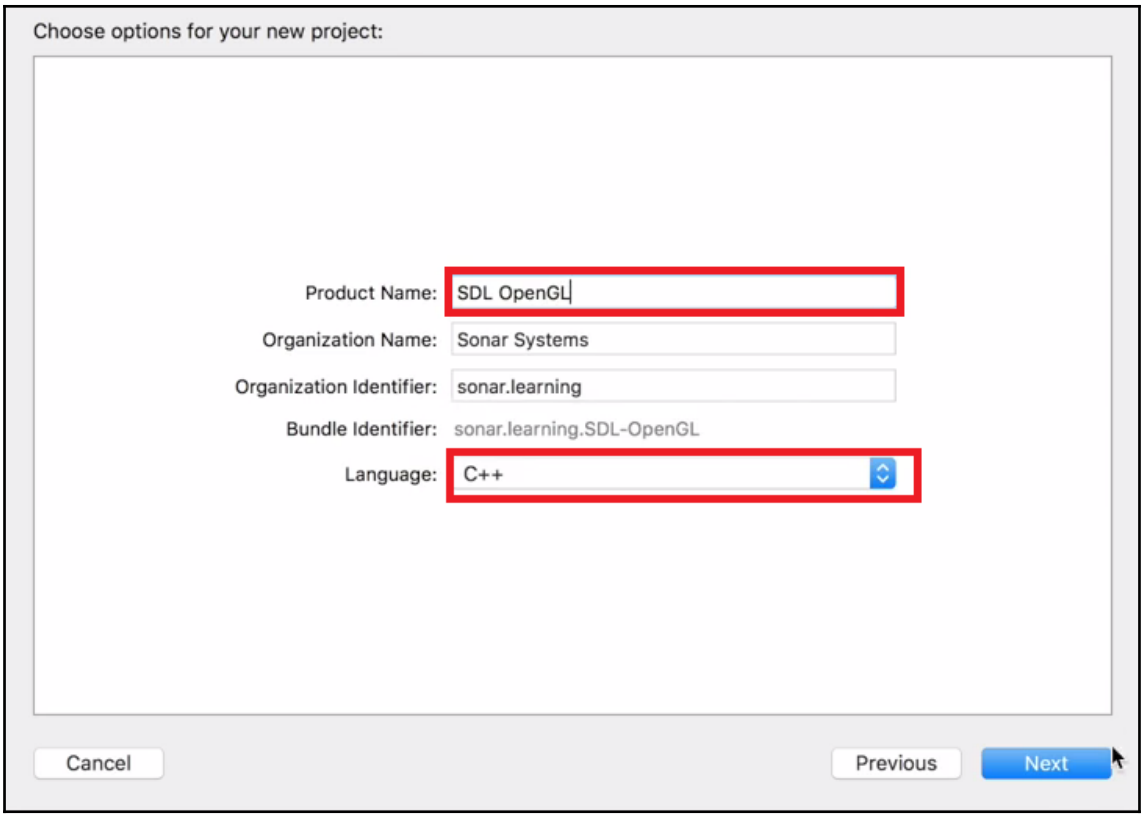

Choose options for your new project:
Product Name:
GLFW OpenGL
Organization Name:
Sonar Systems
Organization Identifier:
sonar.learning
Bundle Identifier:
sonar.learning.GLFW-OpenGL
Language:
C++
Cancel
Previous
Next


Learn OpenGL

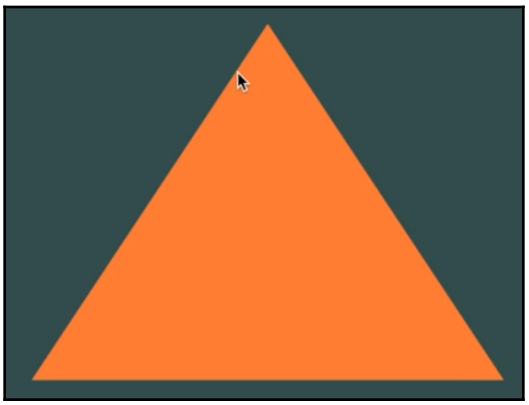

Additional Include Directories
$(SolutionDir)/../External Libraries/SDL/include
$(SolutionDir)/../External Libraries/GLEW/include
Evaluated value:
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
%(AdditionalIncludeDirectories)
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel

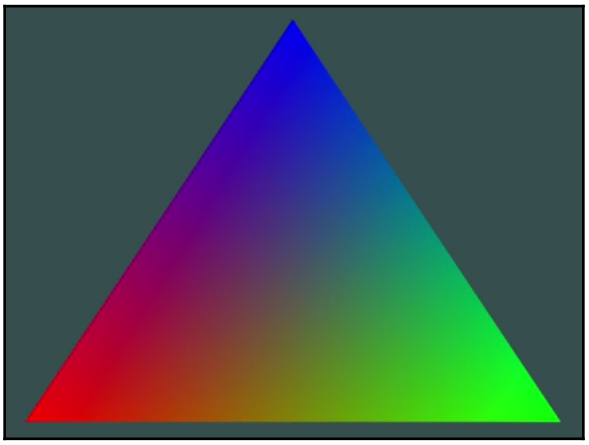

Additional Library Directories
$(SolutionDir)/../External Libraries/GLEW/lib/Release/Win32
$(SolutionDir)/../External Libraries/SDL/lib/x86
Evaluated value:
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
C:\Users\FrahaanAmanAziz\Desktop\OpenGL\GLApp\/../External Libra
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel

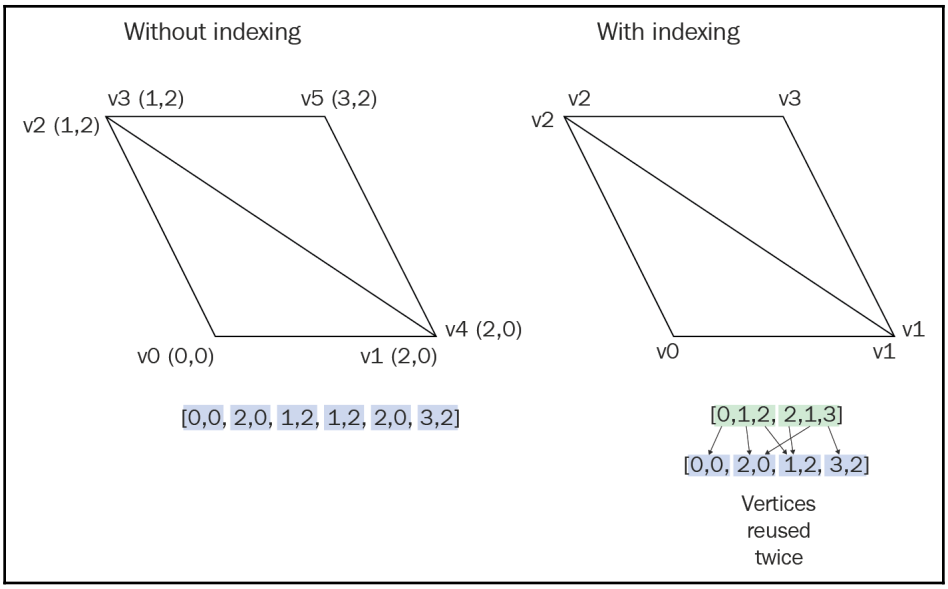

SDL2.dll
SDL2.lib
SDL2main.lib
SDL2test.lib

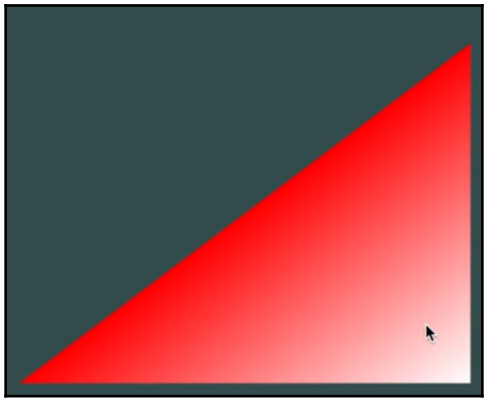

Choose options for your new project:
Product Name:
SDL OpenGL
Organization Name:
Sonar Systems
Organization Identifier:
sonar.learning
Bundle Identifier:
sonar.learning.SDL-OpenGL
Language:
C++
Cancel
Previous
Next

Chapter 2: Drawing Shapes and Applying Textures

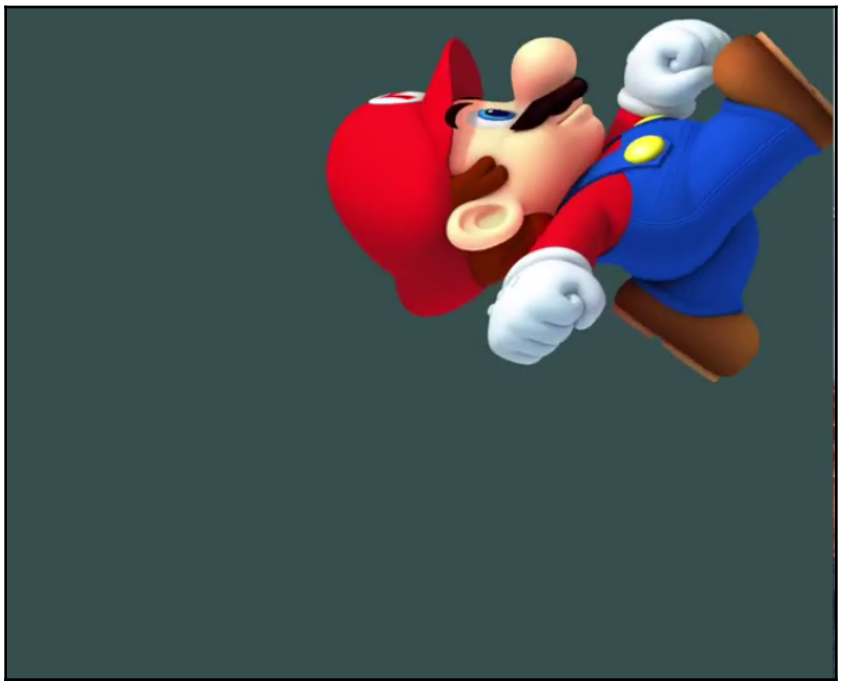


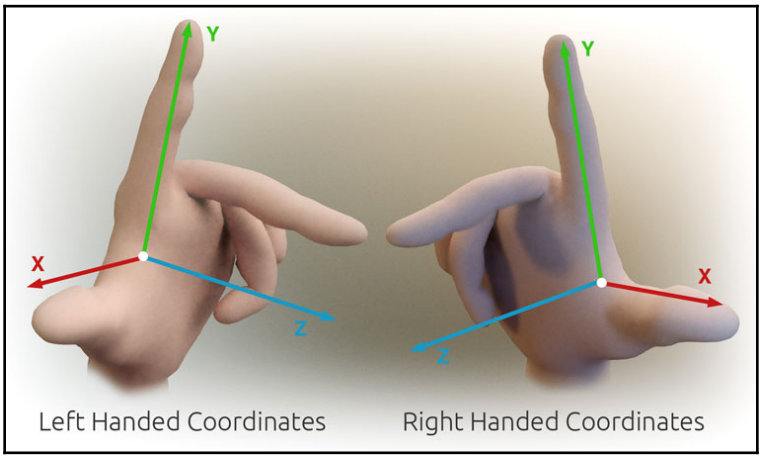


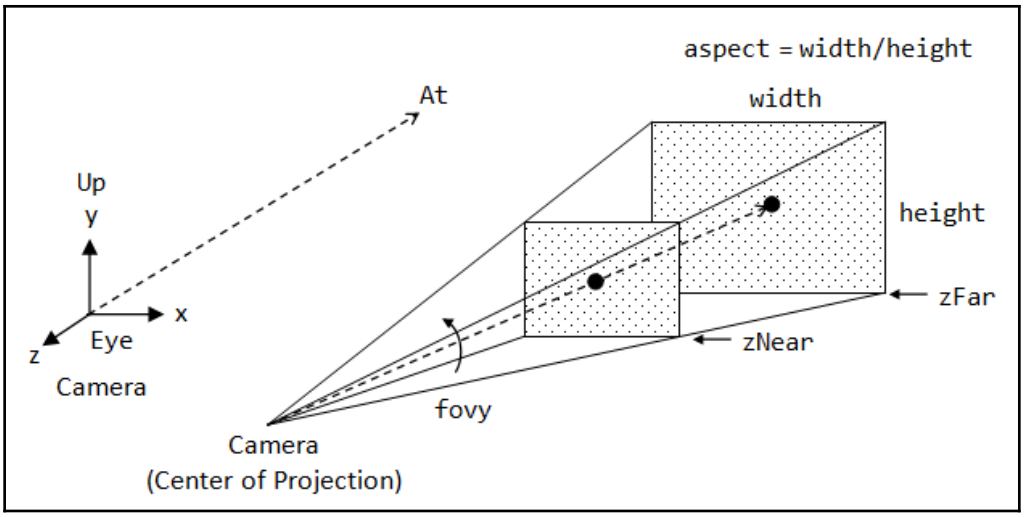

Without indexing
With indexing
v3 (1,2)
v5 (3,2)
v2 (1,2)
v4 (2,0)
v0 (0,0)
v1 (2,0)
[0,0, 2,0, 1,2, 1,2, 2,0, 3,2]
v2
v3
v2
v1
v0
v1
[0,1,2, 2,1,3]
[0,0, 2,0, 1,2, 3,2]
Vertices
reused
twice

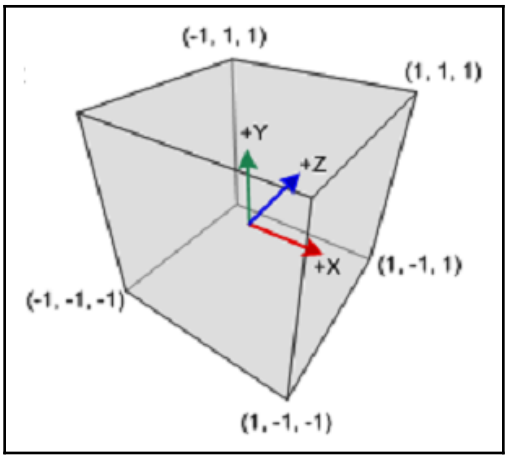


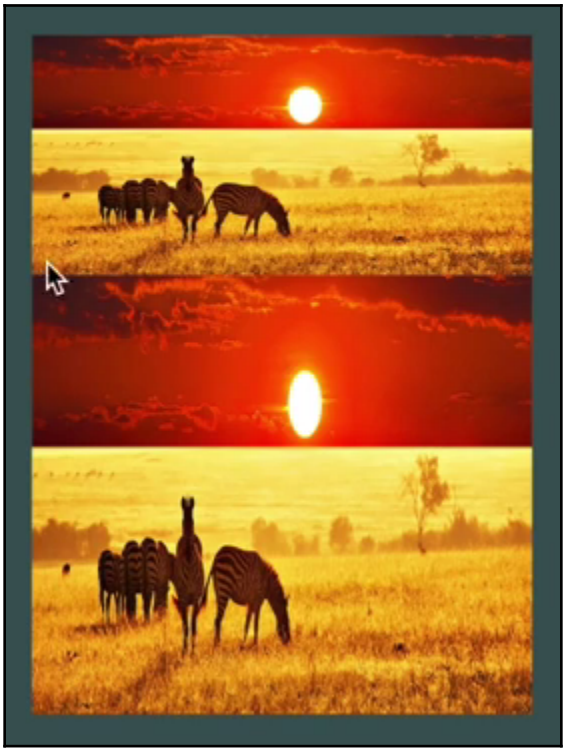
Chapter 3: Transformations, Projections, and Camera

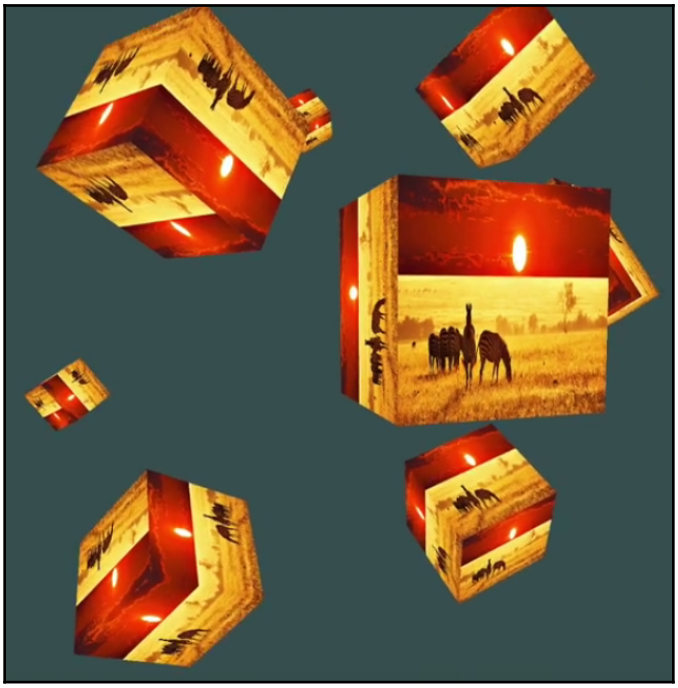




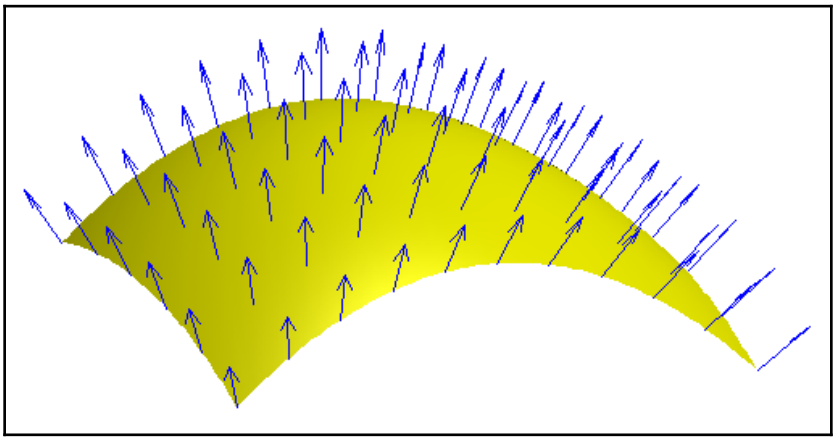

aspect = width/height
At
width
Up
y
height
x
zFar
z
Eye
zNear
Camera
fovy
Camera
(Center of Projection)

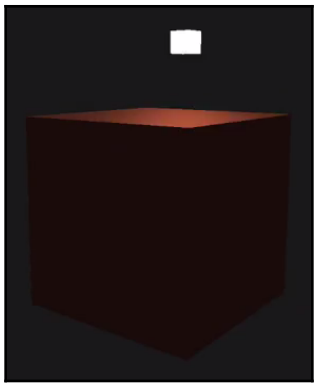

(-1, 1, 1)
(1, 1, 1)
+Y
+Z
+X
(1, -1, 1)
(-1, -1, -1)
(1, -1, -1)

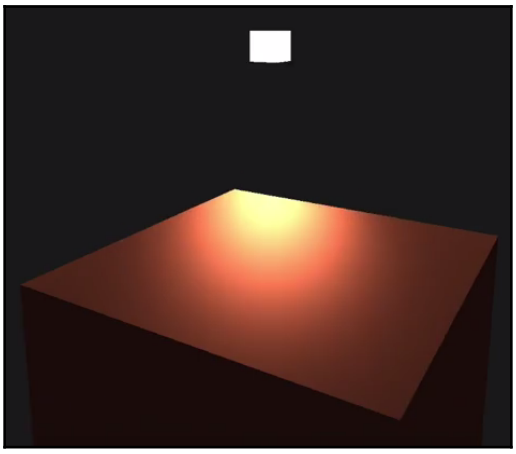


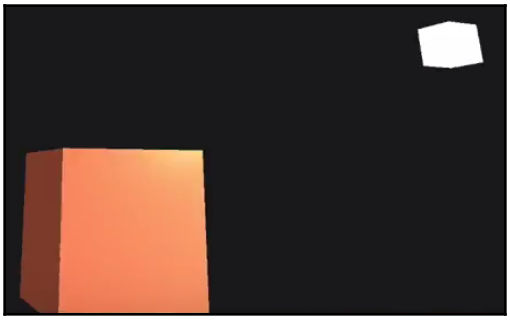


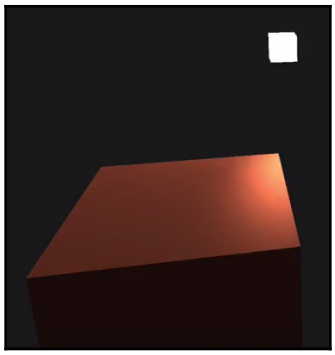
Chapter 4: Effects of lighting, Materials and Lightmaps

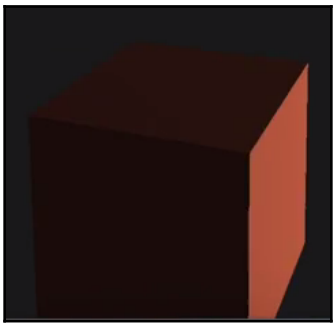


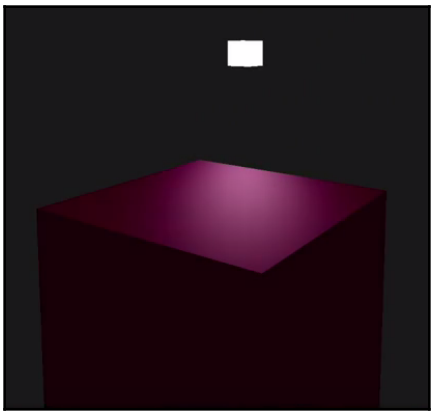


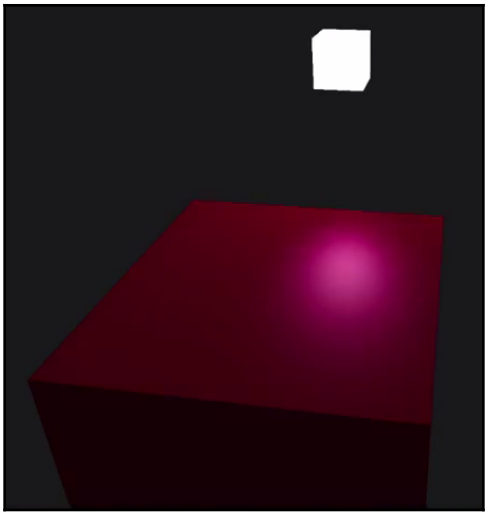




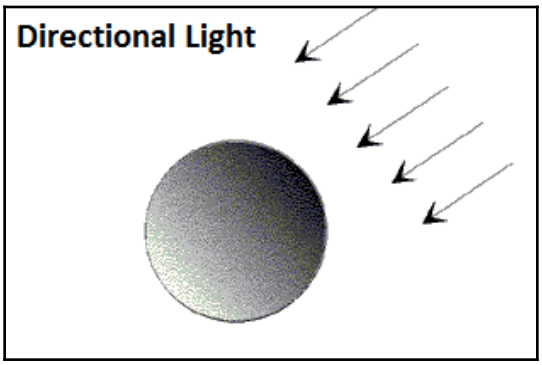


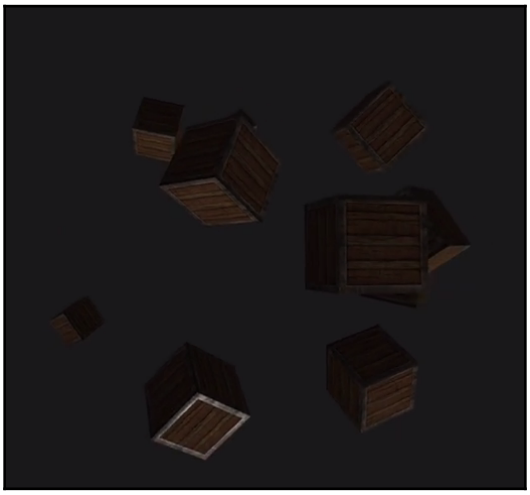


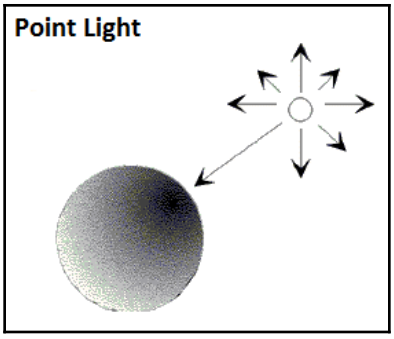


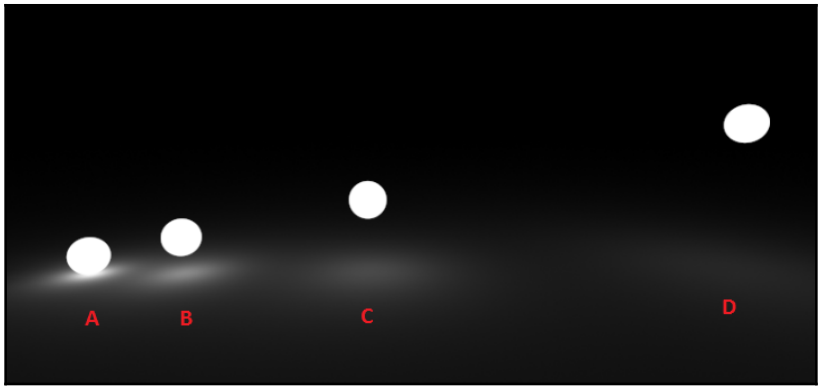


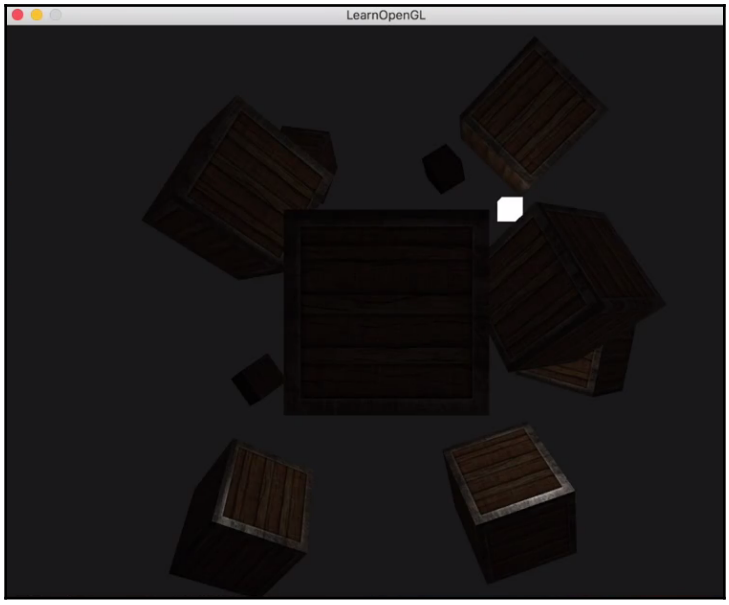
Chapter 5: Types of light sources and combining of lights

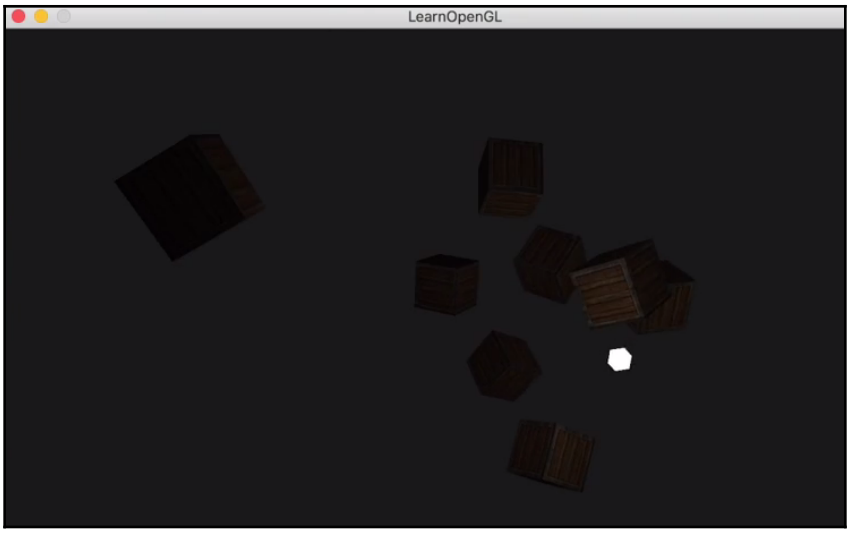


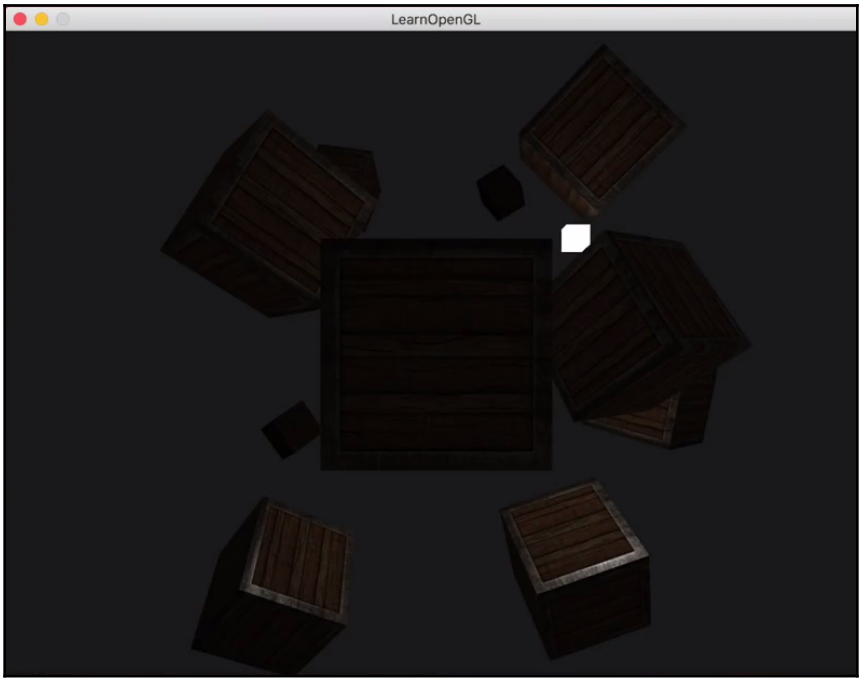


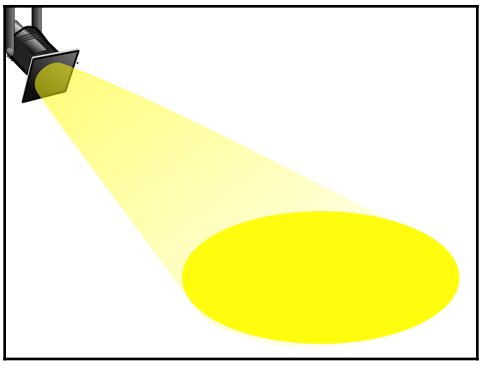


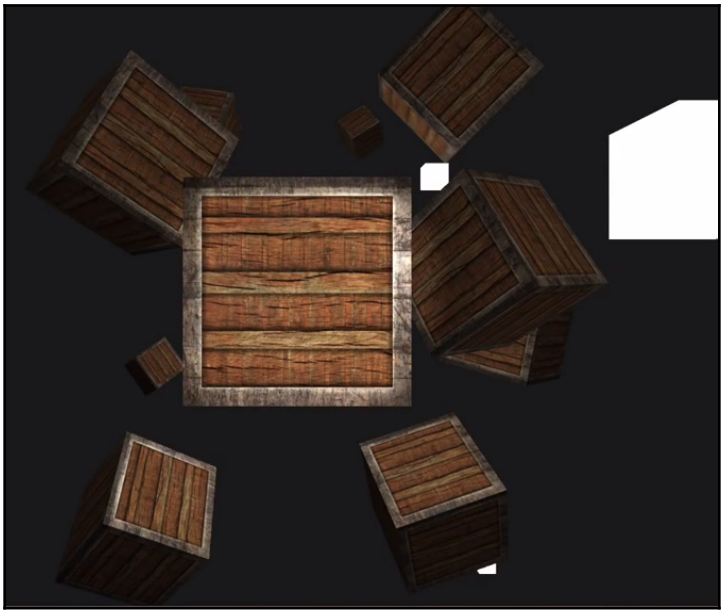

A
B
C
D

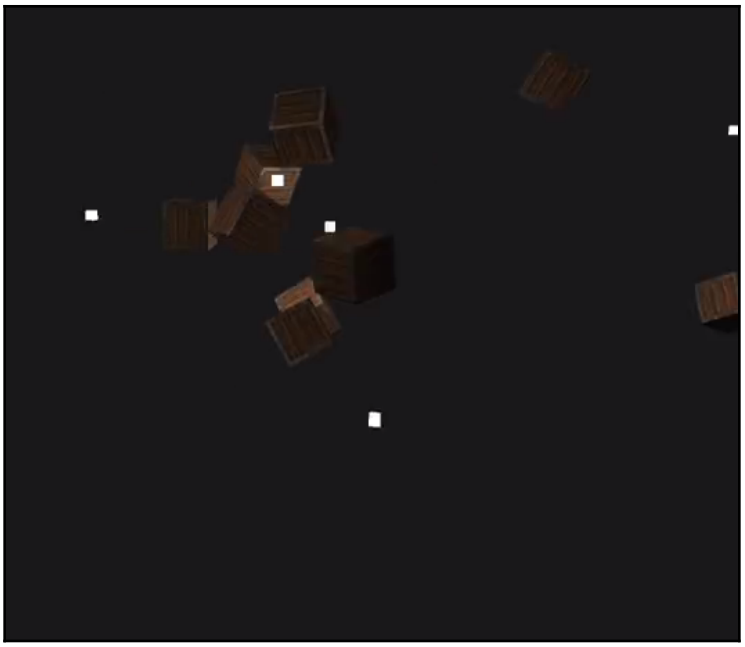

LearnOpenGL

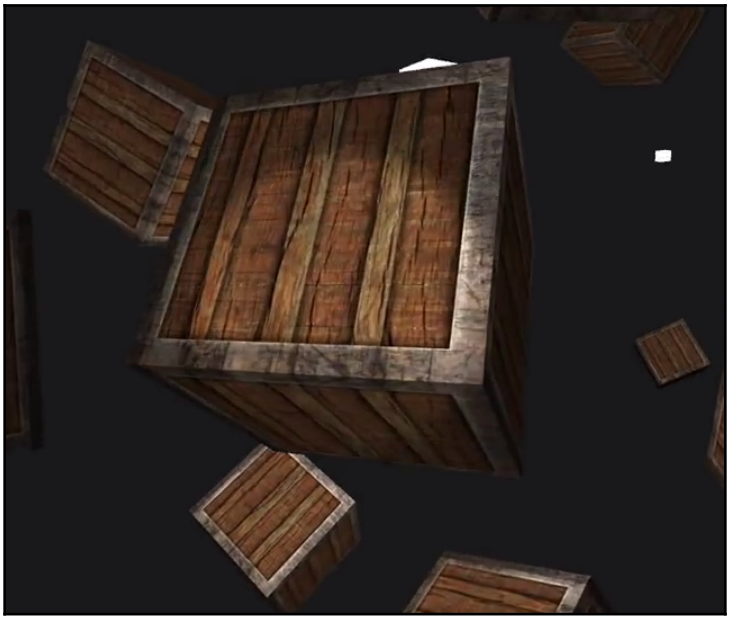

LearnOpenGL


LearnOpenGL



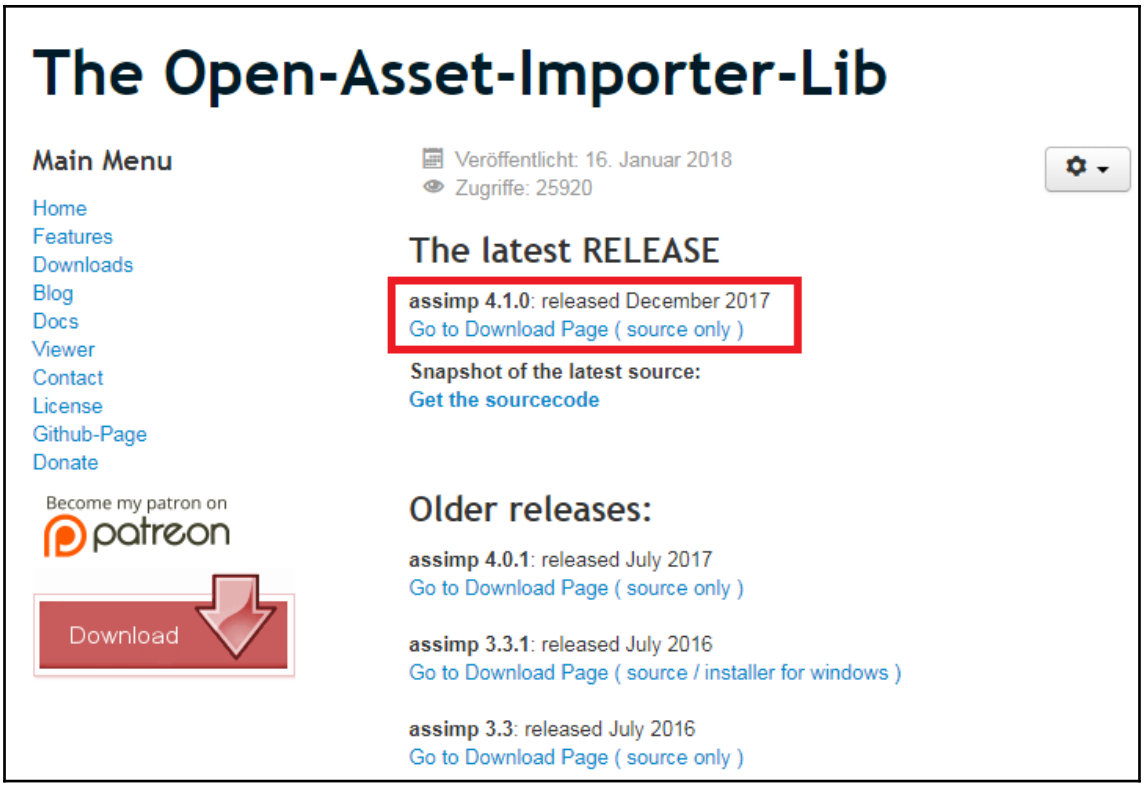






Chapter 6: Implementing a Skybox Using a Cubemap

Chapter 7: Model Loading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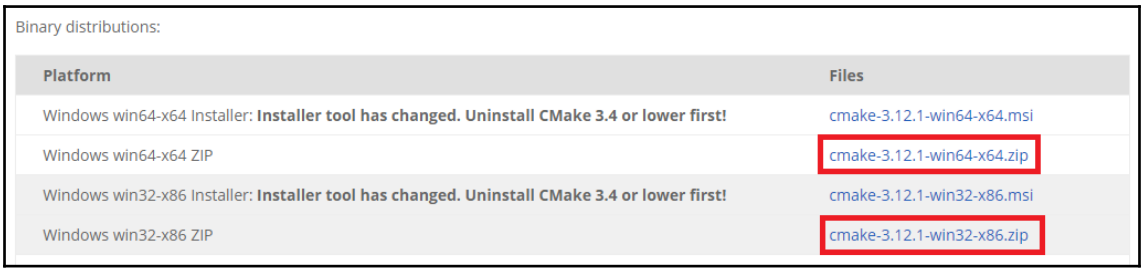
Binary distributions:
Platform
Files
Windows win64-x64 Installer: Installer tool has changed. Uninstall CMake 3.4 or lower first!
cmake-3.12.1-win64-x64.msi
Windows win64-x64 ZIP
cmake-3.12.1-win64-x64.zip
Windows win32-x86 Installer: Installer tool has changed. Uninstall CMake 3.4 or lower first!
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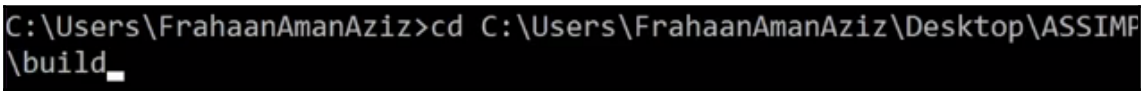
Windows win32-x86 ZIP
cmake-3.12.1-win32-x86.zip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\build

```
C:\Users\FrahaanAmanAziz>cd C:\Users\FrahaanAmanAziz\Desktop\ASSIMP
\build

C:\Users\FrahaanAmanAziz\Desktop\ASSIMP\assimp-3.3.1\build>
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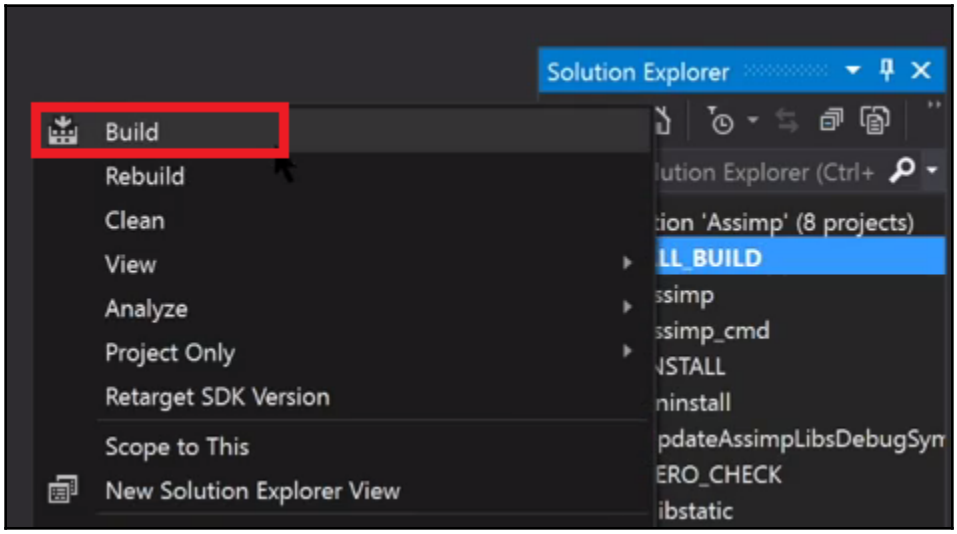
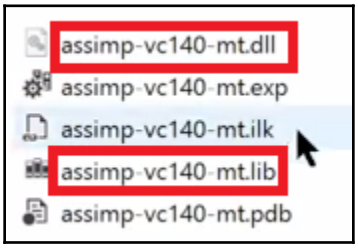
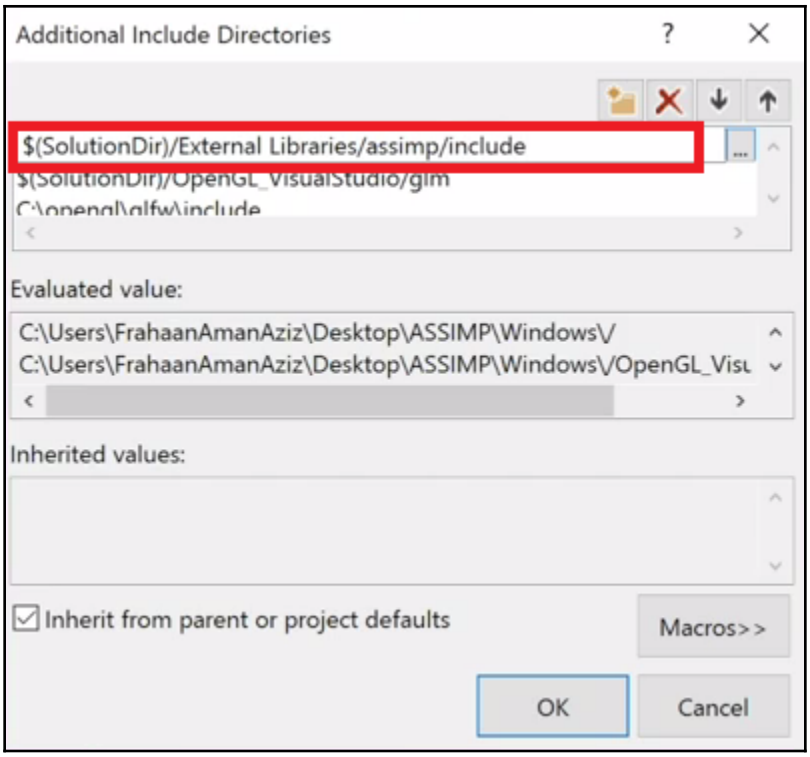
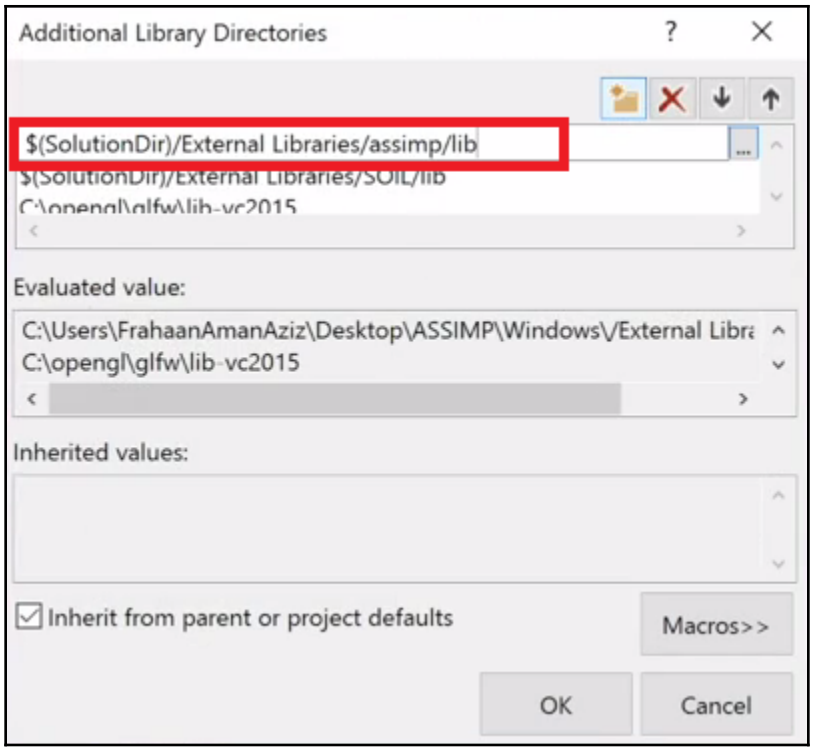





Additional Include Directories
$(SolutionDir)/External Libraries/assimp/include
$(SolutionDir)/OpenGL_VisualStudio/glm
C:\opengl\glfw\include
Evaluated value:
C:\Users\FrahaanAmanAziz\Desktop\ASSIMP\Windows\
C:\Users\FrahaanAmanAziz\Desktop\ASSIMP\Windows\OpenGL_Visu
Inherited values:
Inherit from parent or project defaults
Macros>>
OK
Cancel


Additional Library Directories
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$(SolutionDir)/External Libraries/SOIL/lib
C:\opengl\glfw\lib-vc2015
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Inherited values:
Inherit from parent or project defaults
Macros>>
OK
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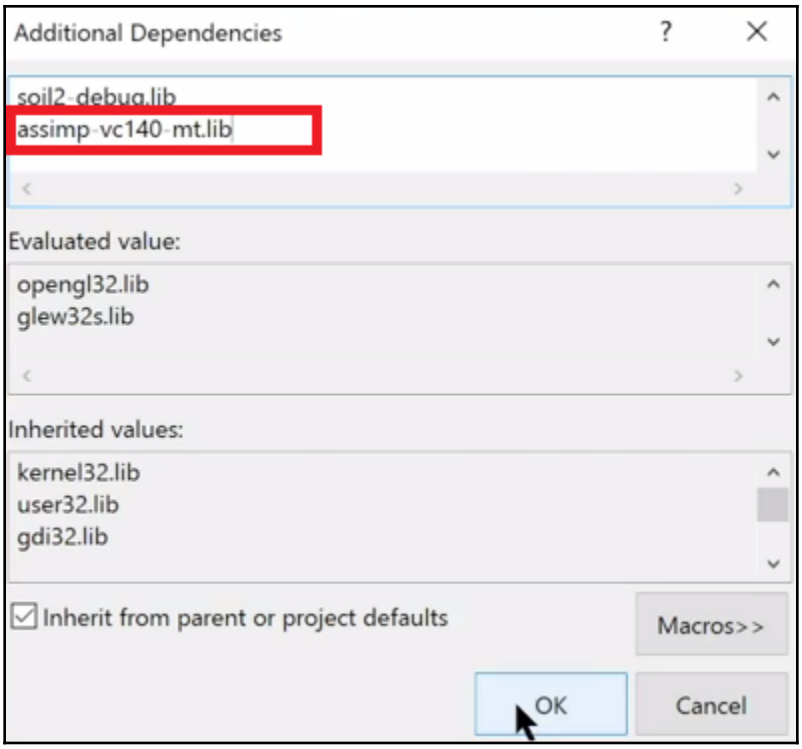
Additional Dependencies
soil2-debug.lib
assimp-vc140-mt.lib
Evaluated value:
opengl32.lib
glew32s.lib
Inherited values:
kernel32.lib
user32.lib
gdi32.lib
Inherit from parent or project defaults
Macros>>
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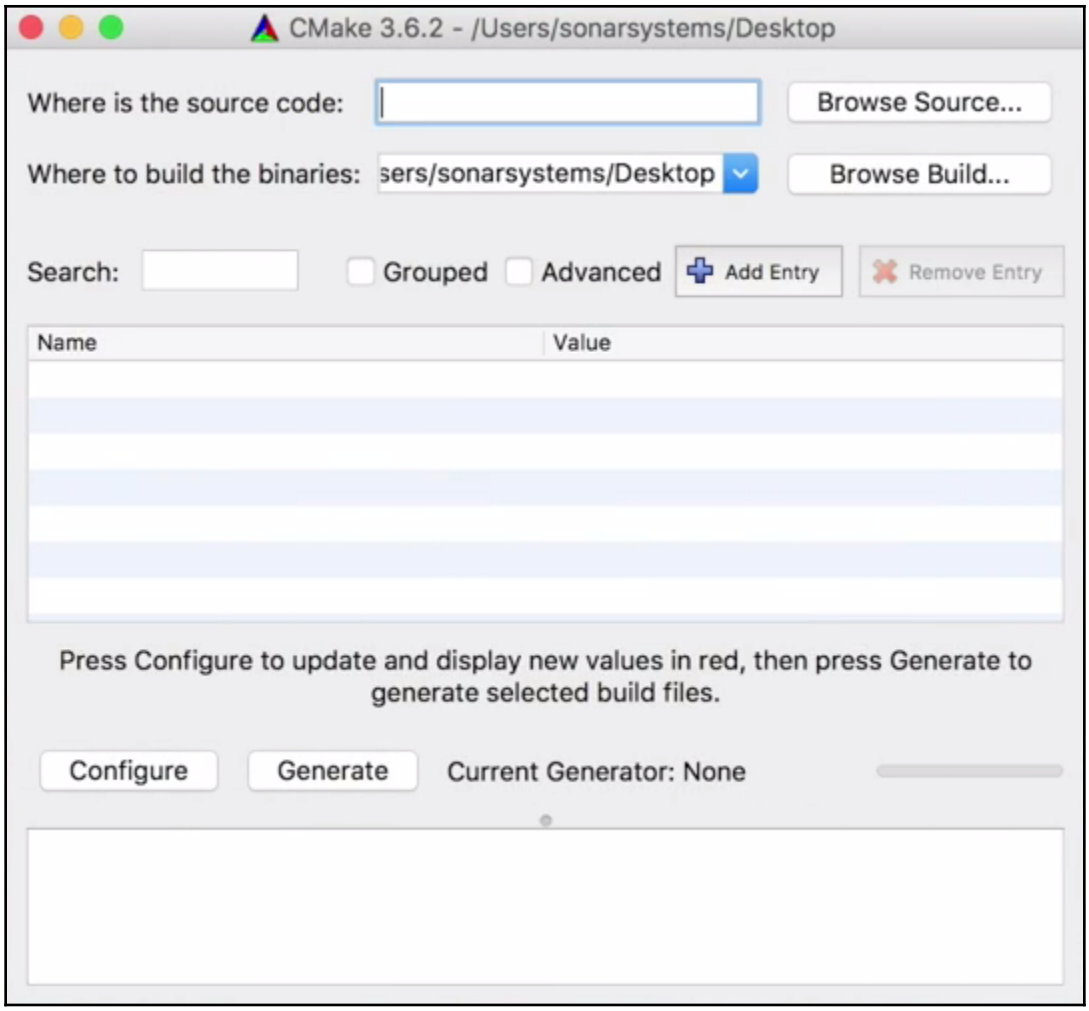
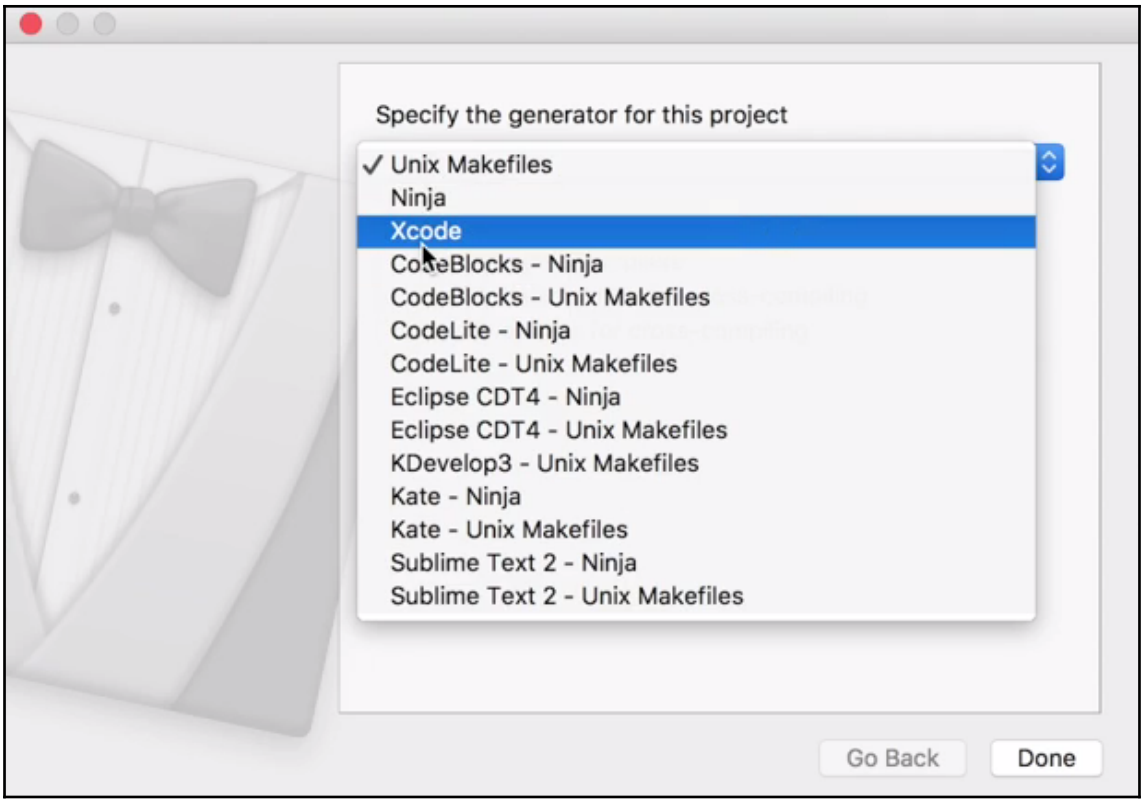

CMake 3.6.2 - /Users/sonarsystems/Desktop
Where is the source code:
Browse Source...
Where to build the binaries:
sers/sonarsystems/Desktop
Browse Build...
Search:
Grouped
Advanced
Add Entry
Remove Entry
Name
Value
Press Configure to update and display new values in red, then press Generate to generate selected build files.
Configure
Generate
Current Generator: None


Specify the generator for this project
Unix Makefiles
Ninja
Xcode
CodeBlocks - Ninja
CodeBlocks - Unix Makefiles
CodeLite - Ninja
CodeLite - Unix Makefiles
Eclipse CDT4 - Ninja
Eclipse CDT4 - Unix Makefiles
KDevelop3 - Unix Makefiles
Kate - Ninja
Kate - Unix Makefiles
Sublime Text 2 - Ninja
Sublime Text 2 - Unix Makefiles
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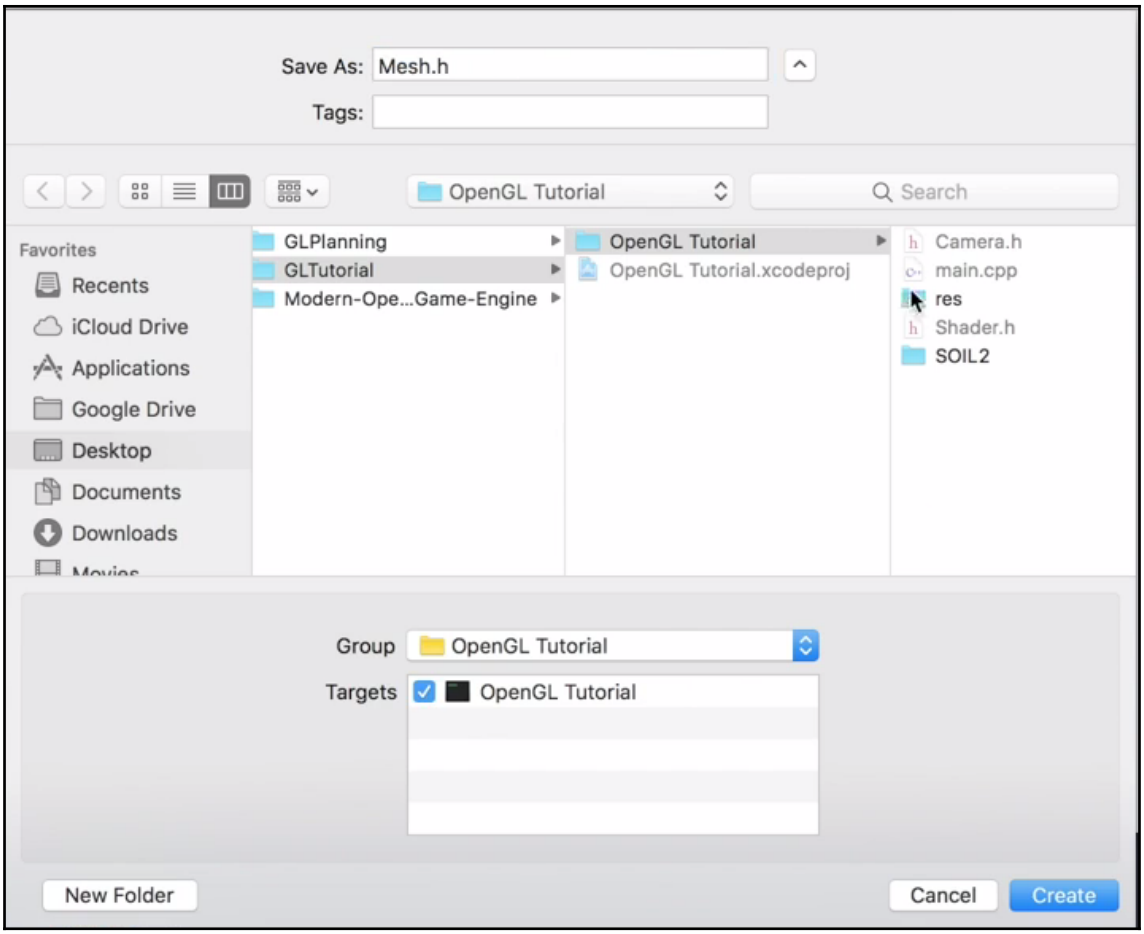
Done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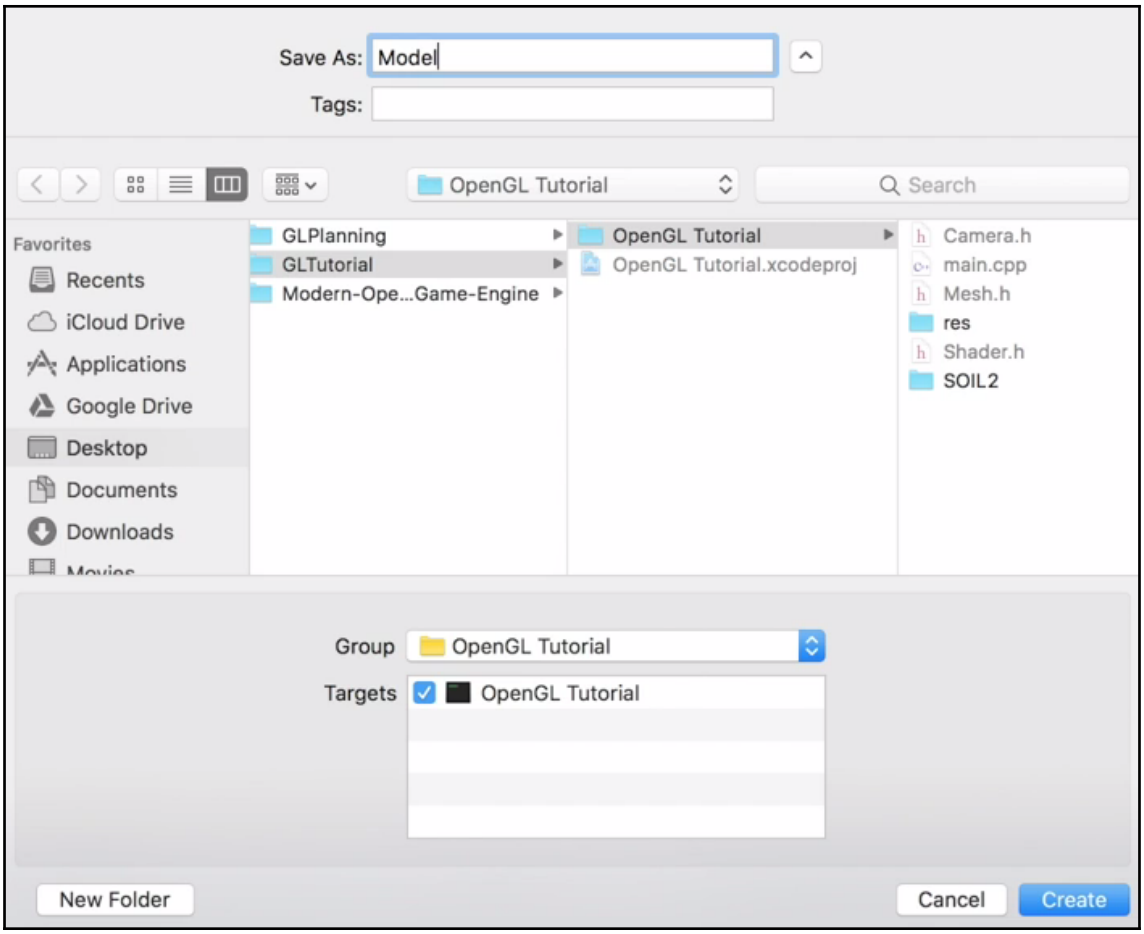
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