

Introduction to OpenGL

Outline

- ▶ What is OpenGL
- ▶ OpenGL version
- ▶ What is GLUT
- ▶ Install OpenGL and GLUT

What is OpenGL?

- ▶ Open Graphics Library (OpenGL) is a cross-language, cross-platform API for rendering 2D and 3D vector graphics.
 - ▶ No window system
 - ▶ No input handling
- ▶ The API is typically used to interact with a graphics processing unit (GPU), to achieve hardware-accelerated rendering.



OpenGL version

- ▶ Legacy OpenGL (1.0 ~ 2.1)
 - ▶ Fixed (function) (rendering) pipeline
 - ▶ Version 2.0 add the OpenGL Shading Language (GLSL)
- ▶ Modern OpenGL (3.0 ~ 4.5)
 - ▶ Programmable (rendering) pipeline
 - ▶ Fixed pipeline functions were declared deprecated
 - ▶ Core (no deprecated API) and compatibility (all)

What is GLUT?

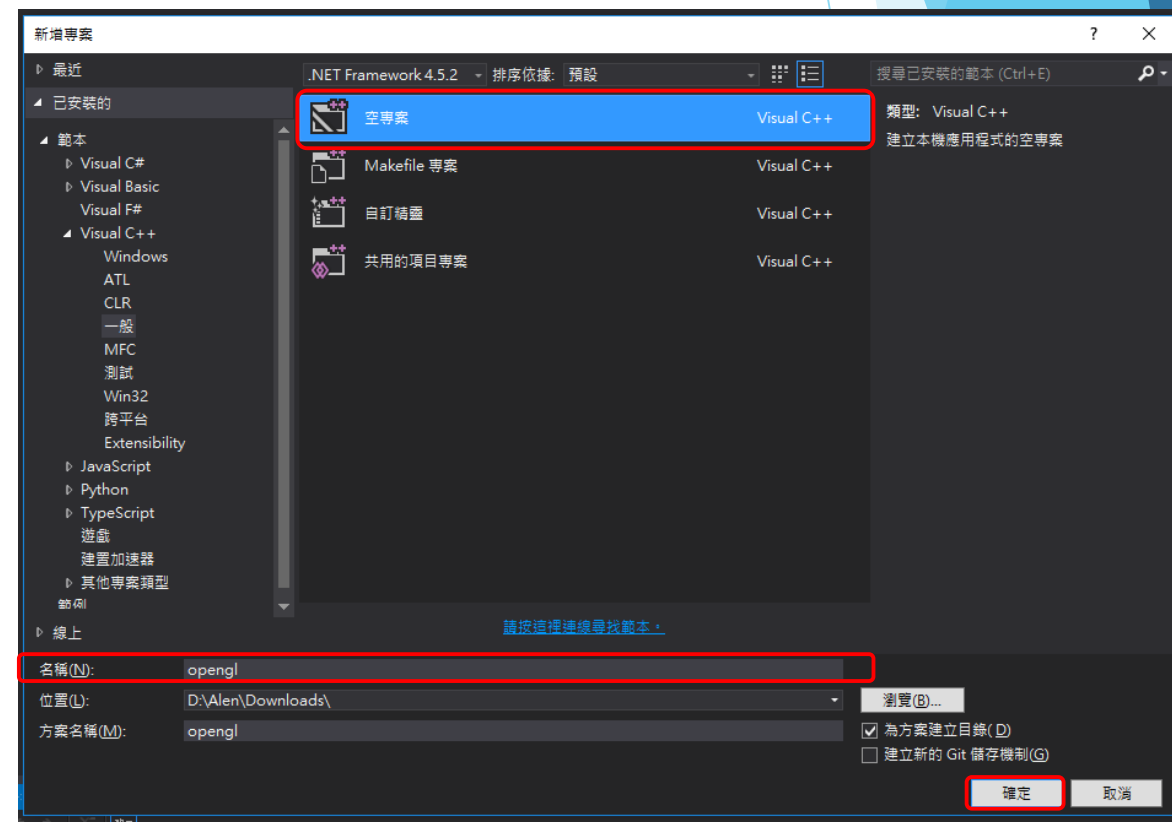
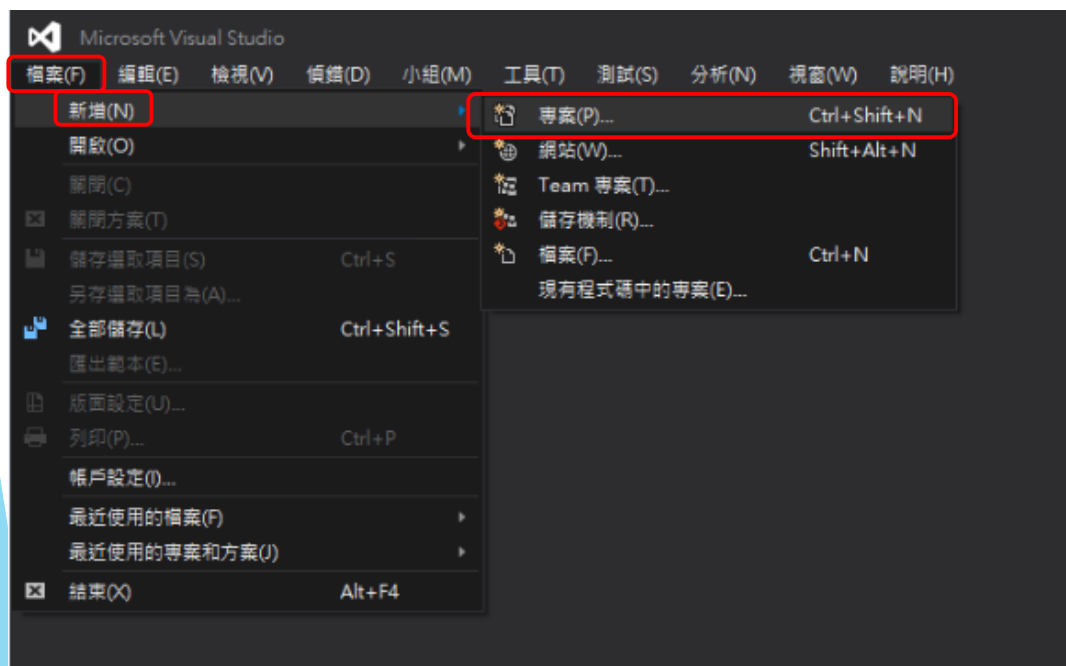
- ▶ OpenGL Utility Toolkit(GLUT) is a window system independent toolkit for writing OpenGL programs.
- ▶ It implements a simple windowing application programming interface (API) for OpenGL.

Install OpenGL and glut - 0

- ▶ Visual studio 2015 or 2017
- ▶ OpenGL 4.6
 - ▶ Make sure your driver is ready
 - ▶ https://www.khronos.org/opengl/wiki/Getting_Started
- ▶ Glut 3.7
 - ▶ Download glut header file, .lib, .dll
 - ▶ <https://www.opengl.org/resources/libraries/glut/glutdlls37beta.zip>

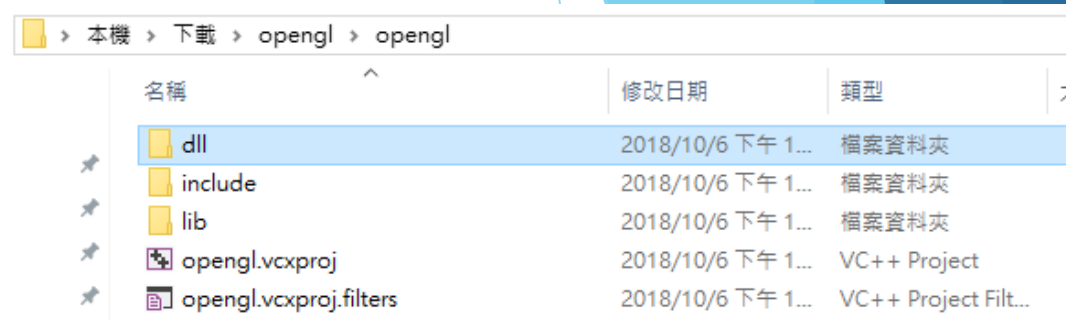
Install OpenGL and glut - 1

1. Open a new visual studio project
2. Select empty project
3. Set any project name you want



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- ▶ Make “include”, “lib”, “dll” directory
- ▶ Put downloaded glut files into corresponding directory
- ▶ ProjectName
 - ▶ ProjectName
 - ▶ include
 - ▶ glut.h
 - ▶ lib
 - ▶ glut.lib
 - ▶ glut32.lib
 - ▶ dll
 - ▶ glut.dll
 - ▶ glut32.dll
 - ▶ ProjectName.sln



名稱	修改日期	類型
dll	2018/10/6 下午 1...	檔案資料夾
include	2018/10/6 下午 1...	檔案資料夾
lib	2018/10/6 下午 1...	檔案資料夾
opengl.vcxproj	2018/10/6 下午 1...	VC++ Project
opengl.vcxproj.filters	2018/10/6 下午 1...	VC++ Project Filt...



名稱	修改日期	類型	大小
glut.dll	1998/8/18 下午 0...	應用程式擴充	166 KB
glut32.dll	1998/8/18 下午 0...	應用程式擴充	166 KB



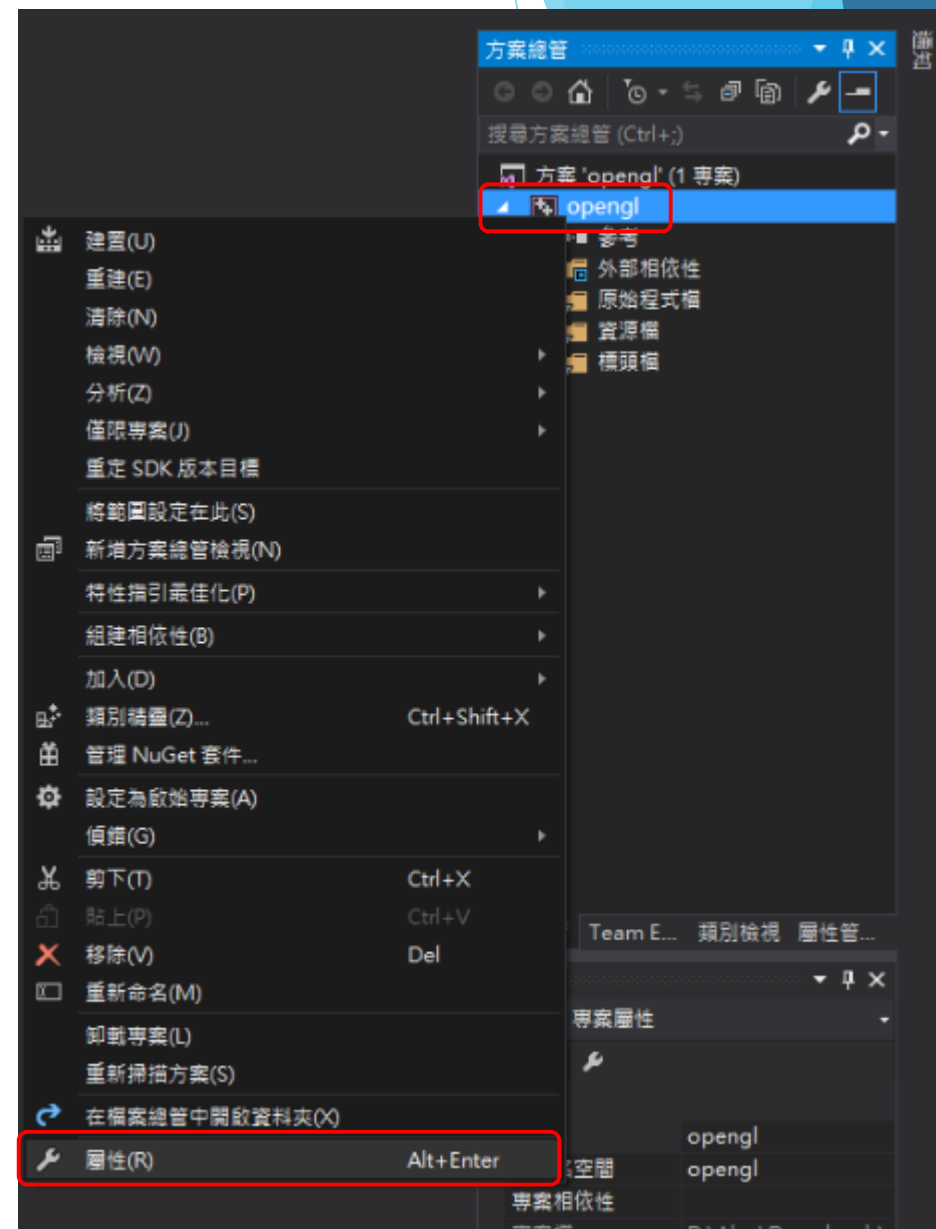
名稱	修改日期	類型	大小
glut.h	1998/8/18 下午 0...	C Header 來源檔案	21 KB



名稱	修改日期	類型	大小
glut.lib	1998/8/18 下午 0...	Object File Library	78 KB
glut32.lib	1998/8/18 下午 0...	Object File Library	79 KB

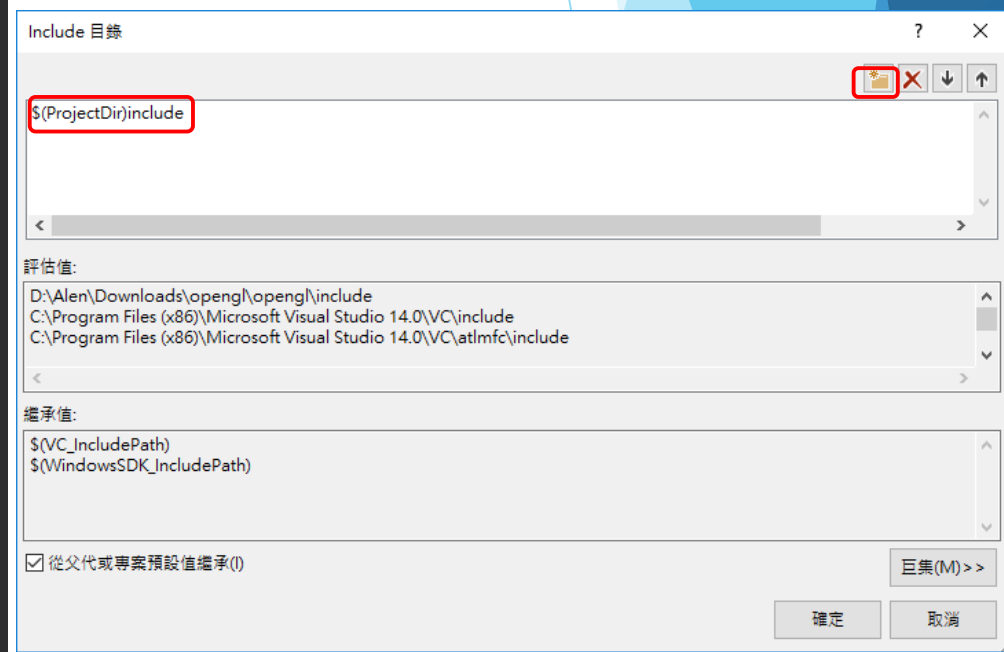
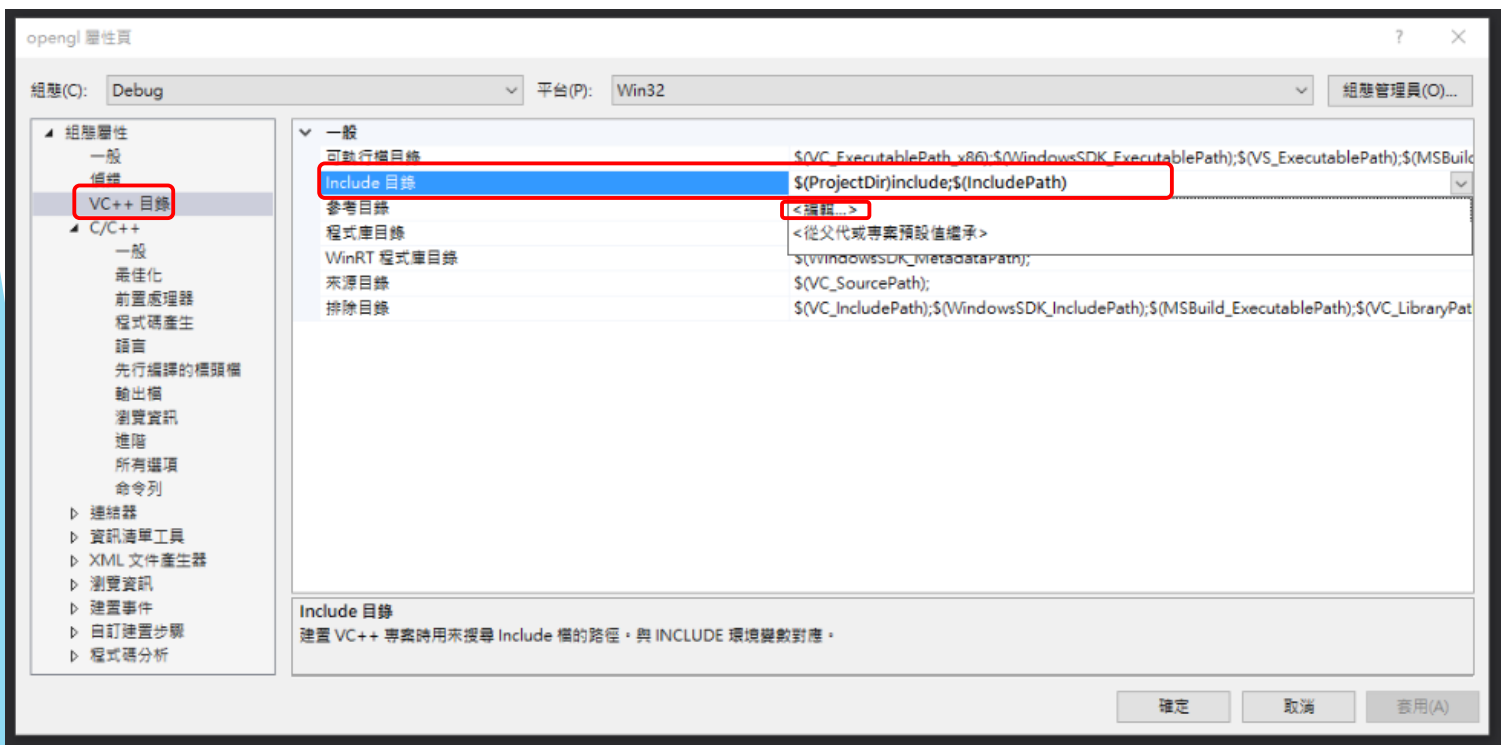
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- ▶ Right click “ProjectName”
- ▶ Click “property”



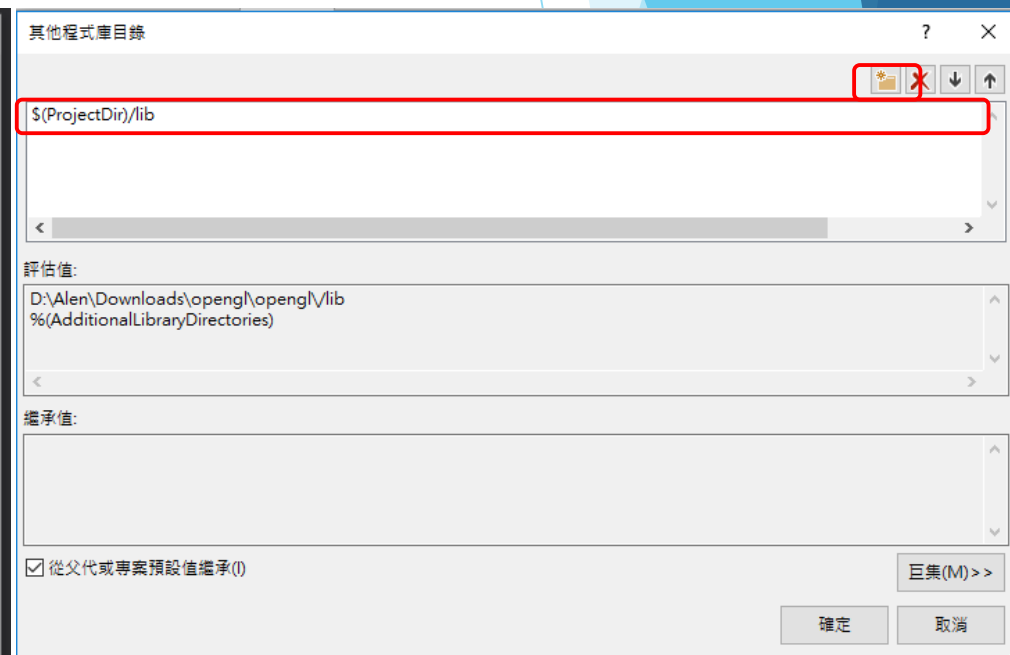
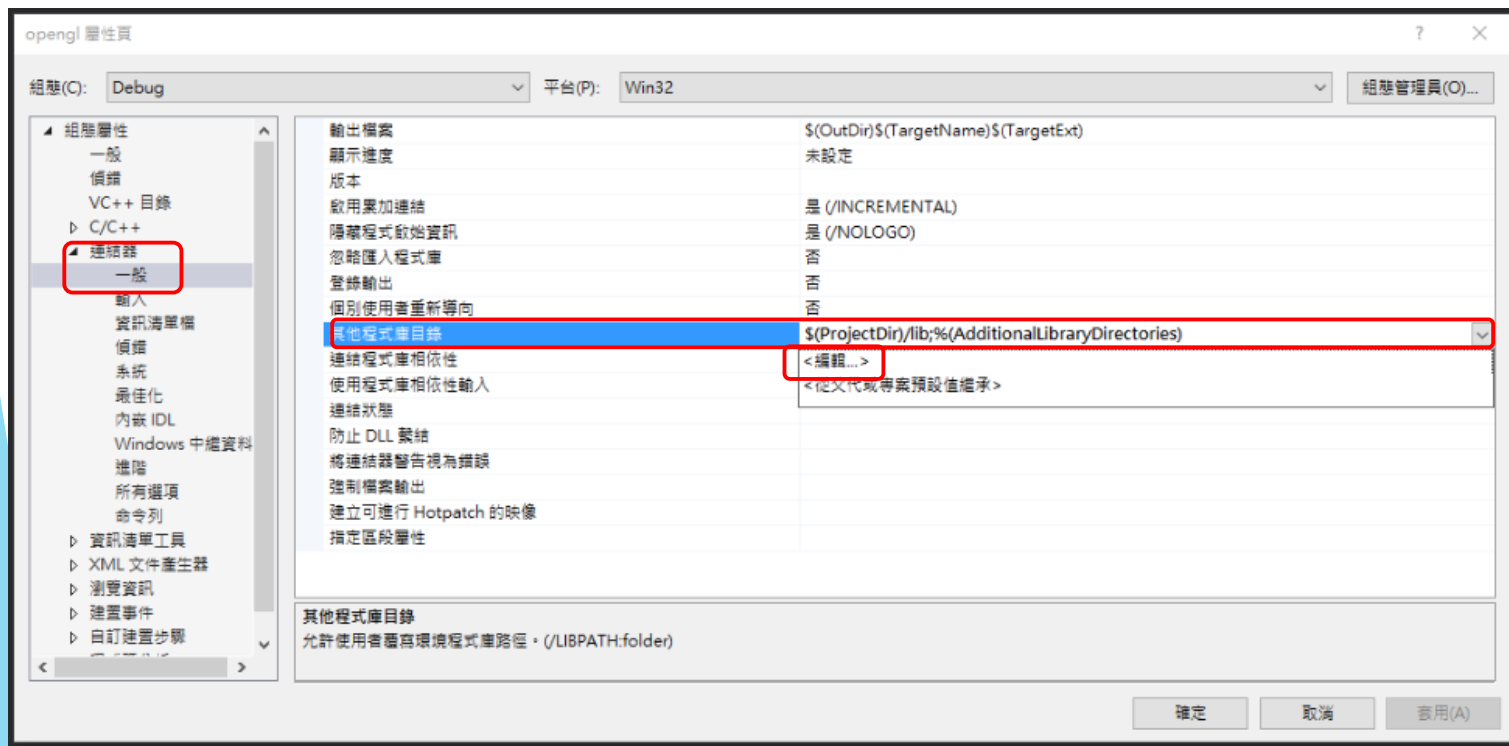
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- ▶ Click “VC++directory”
- ▶ Set “include directory” into “\$(ProjectDir)include”



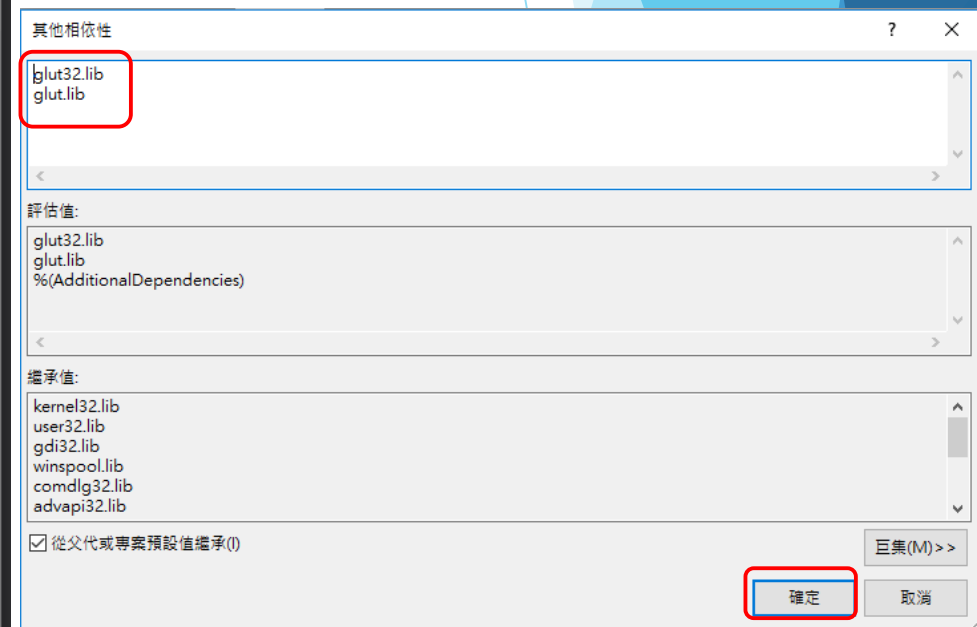
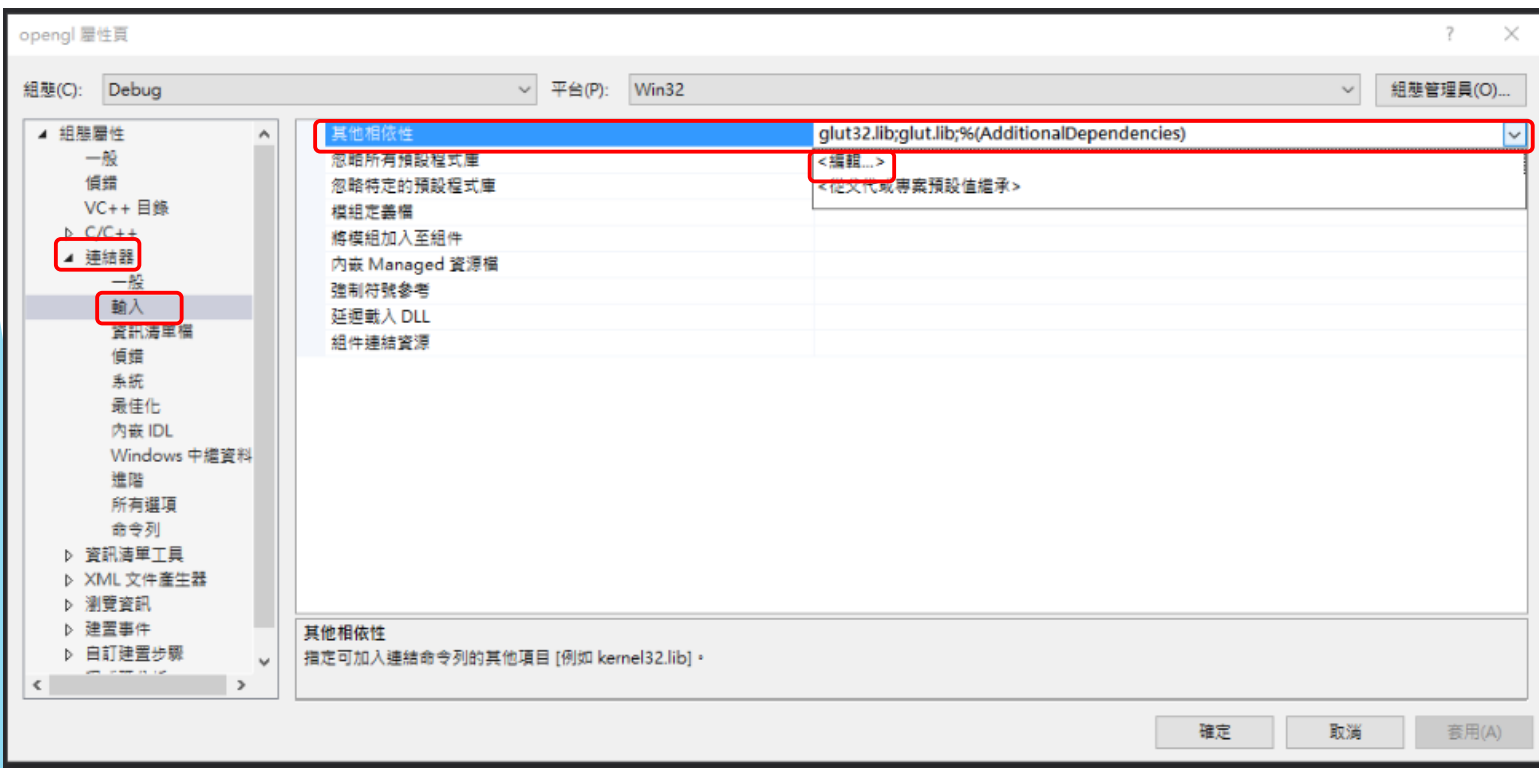
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- ▶ Click “linker”
- ▶ Click “general”
- ▶ set “additional library directories” into “\$(Project)lib”



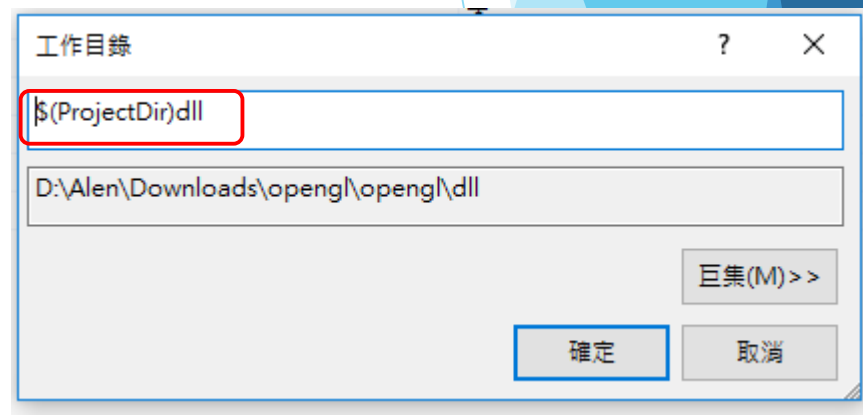
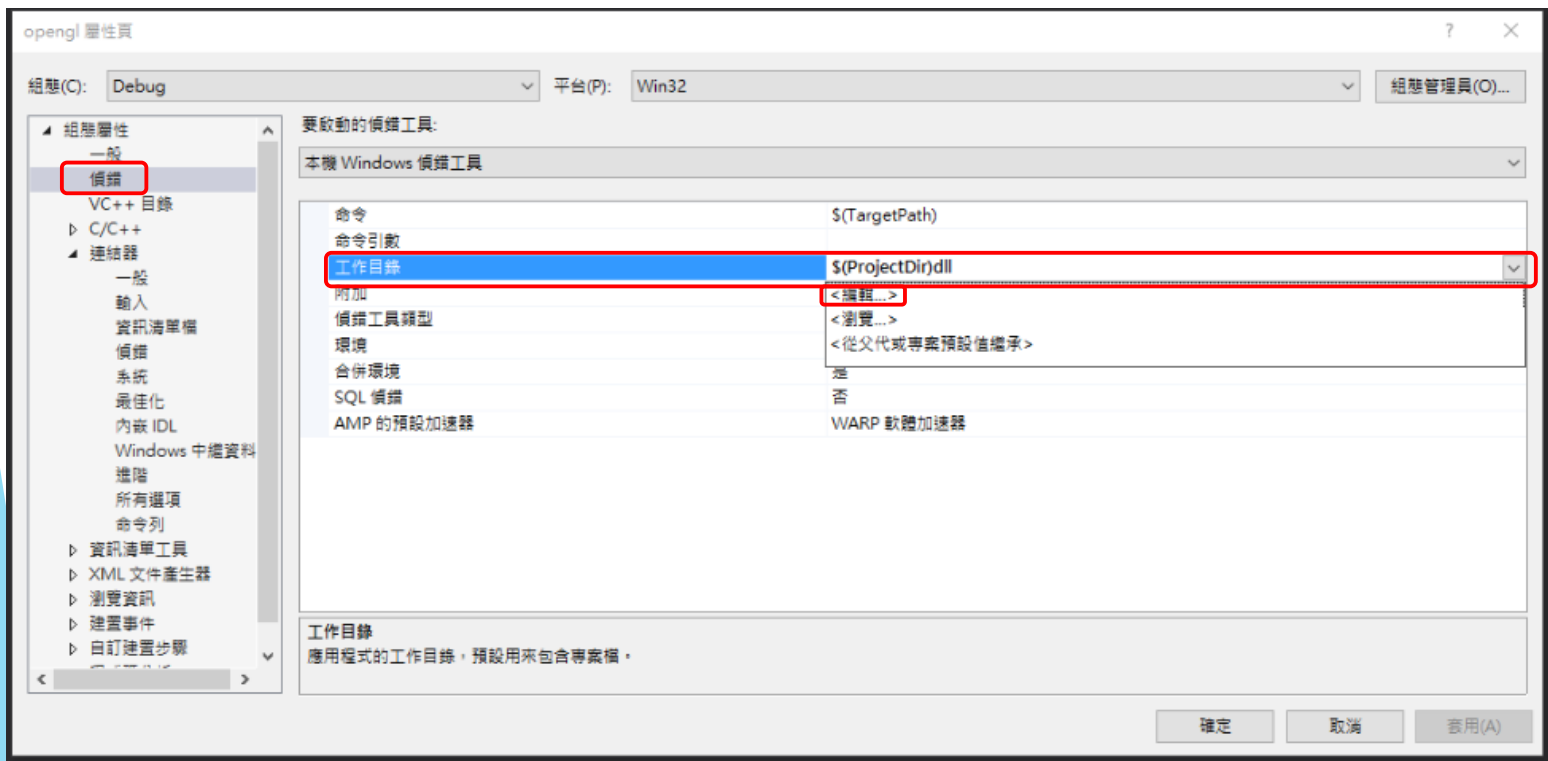
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- ▶ Click “linker”
- ▶ Click “input”
- ▶ Set “additional dependencies” into “glut.lib;glut32.lib;”



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- ▶ Click “debugging”
- ▶ Set “working directory” into “\$(ProjectDir)dlI”



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► Simple test code

```
1  #include "glut.h"
2
3  void display();
4
5  int width = 400, height = 400;
6
7  int main(int argc, char** argv)
8  {
9      glutInit(&argc, argv);
10     glutInitWindowSize(width, height);
11     glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB);
12     glutCreateWindow("WindowName");
13
14     glutDisplayFunc(display);
15     glutMainLoop();
16
17     return 0;
18 }
19
20 void display()
21 {
22     glClearColor(0.0f, 0.0f, 0.0f, 0.0f);
23     glClear(GL_COLOR_BUFFER_BIT);
24
25     glViewport(0, 0, width, height);
26
27     glMatrixMode(GL_PROJECTION);
28     glLoadIdentity();
29     gluPerspective(45, width / (GLfloat)height, 0.1, 1000);
30
31     glMatrixMode(GL_MODELVIEW);
32     glLoadIdentity();
33     gluLookAt(0.0f, 0.0f, 10.0f, 0.0f, 0.0f, 0.0f, 1.0f, 0.0f);
34     glutSolidTeapot(1);
35
36     glutSwapBuffers();
37 }
```

