

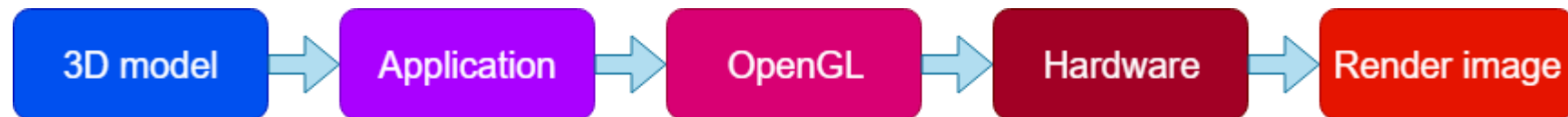
Introduction to OpenGL

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

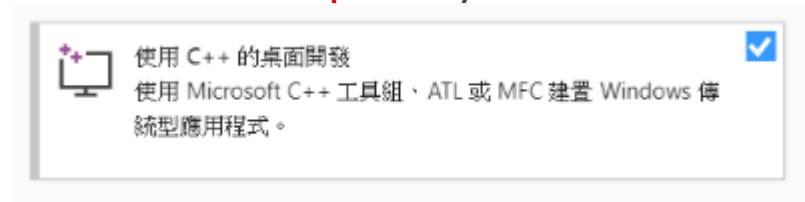
- Legacy OpenGL (1.0 ~ 2.1)
 - Fixed (function) (rendering) pipeline
 - Version 2.0 add the OpenGL Shading Language (GLSL)
- Modern OpenGL (3.0 ~ 4.5)
 - Programmable (rendering) pipeline
 - Fixed pipeline functions were declared deprecated
 - Core (no deprecated API) and compatibility (all)

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

- Install Visual Studio (version: ~2017 or 2019) (**Must install C++ Desktop Tool**)
- 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>



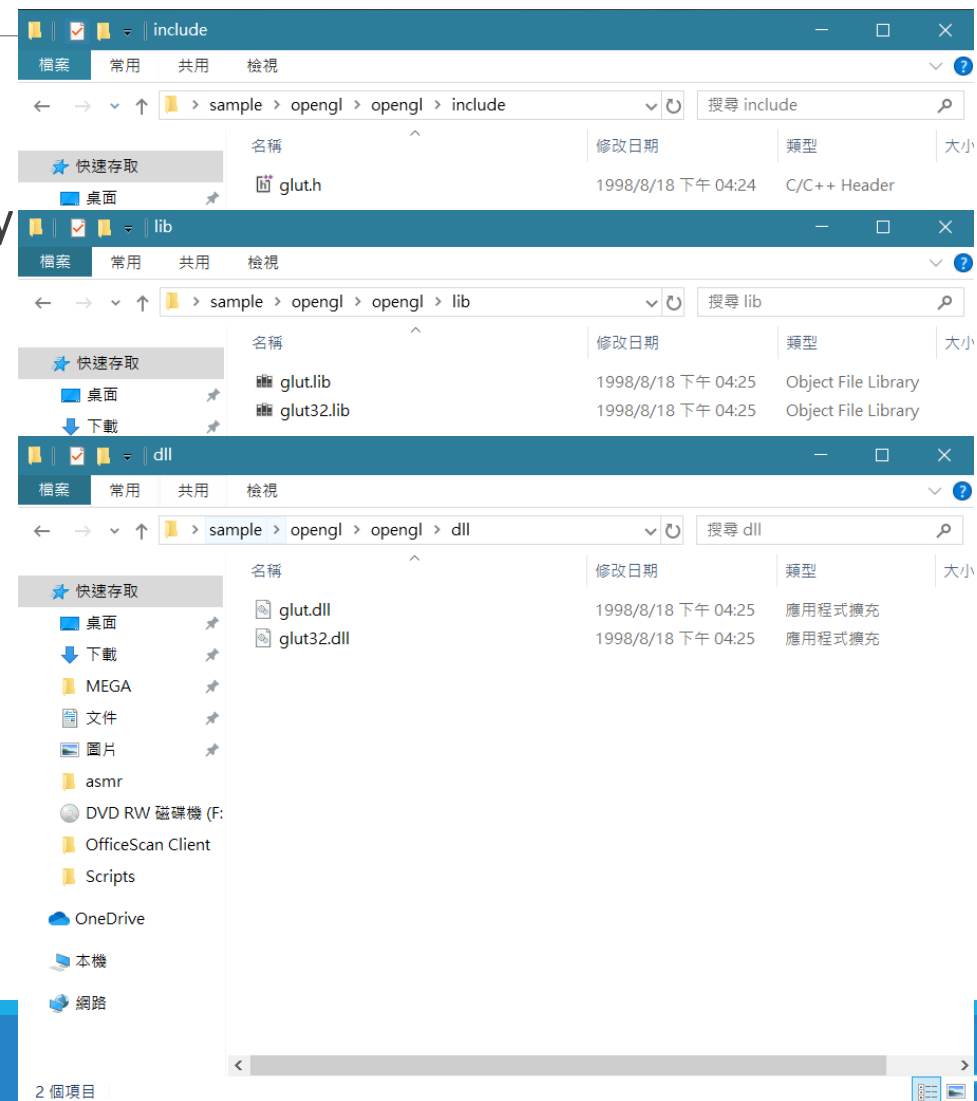
Install OpenGL and GLUT - 1

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



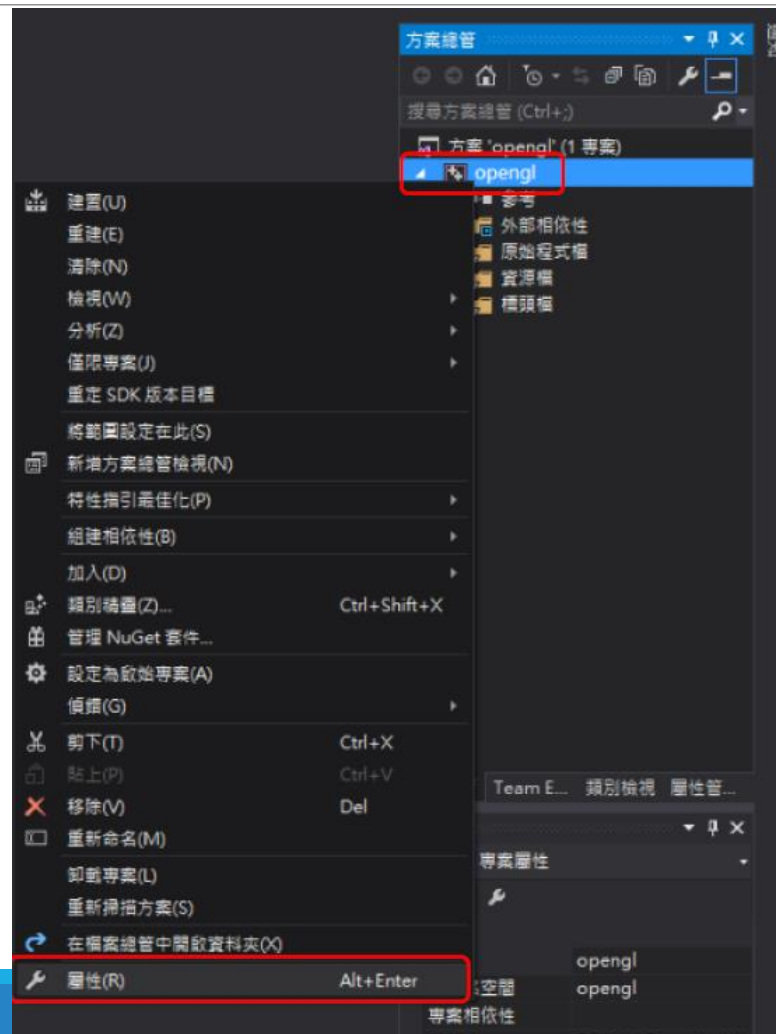
Install OpenGL and GLUT - 2

- 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



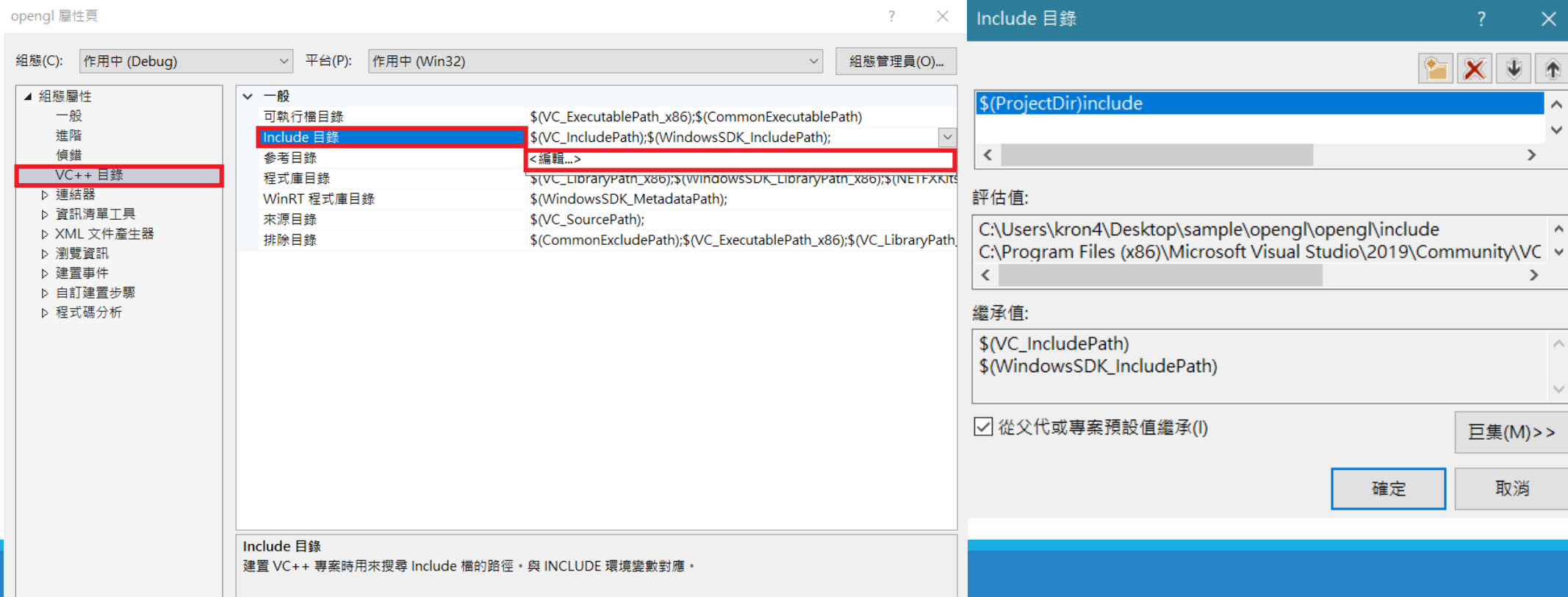
Install OpenGL and GLUT - 3

- Right click “ProjectName”
- Click “property”



Install OpenGL and GLUT - 4

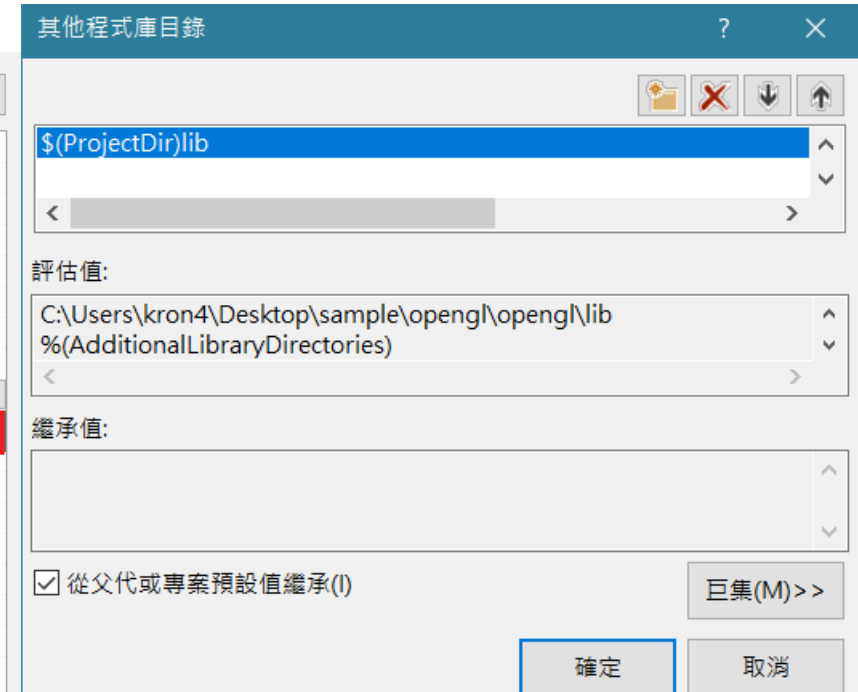
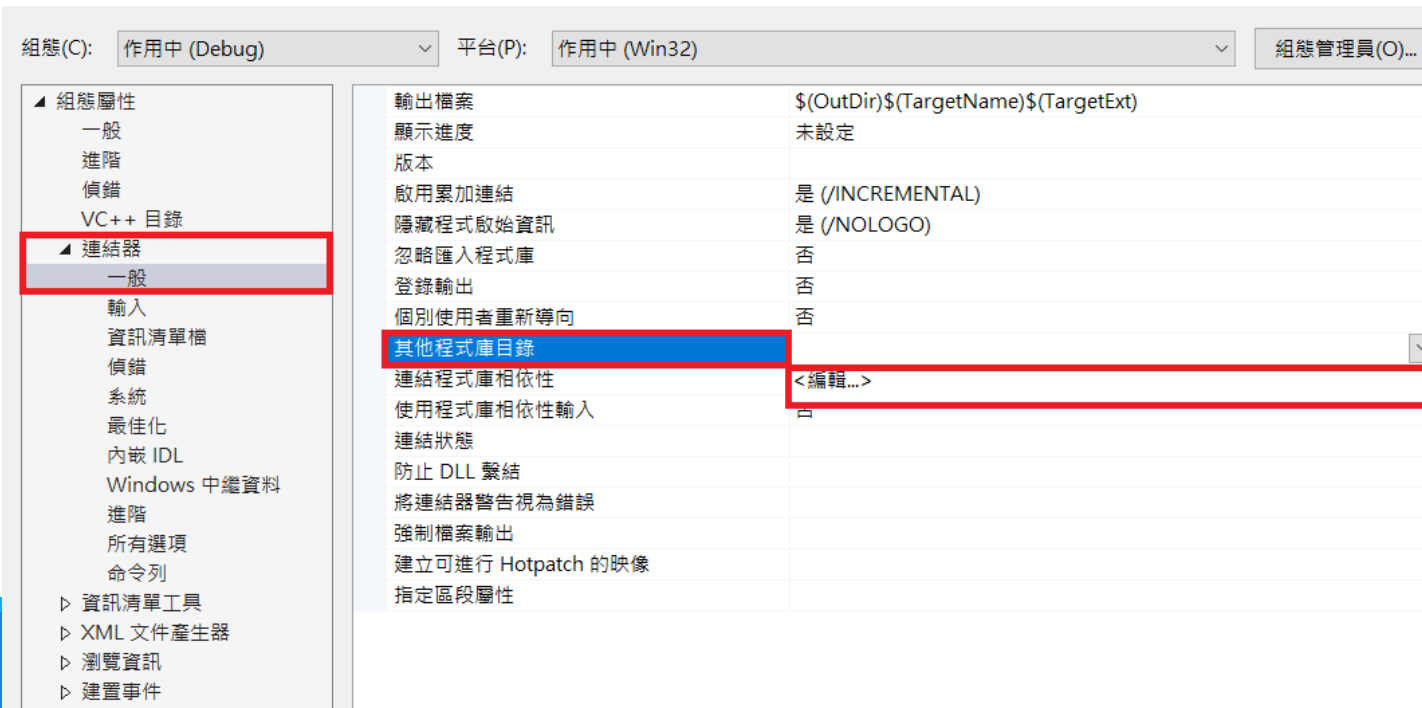
- Click “VC++ directory”
- Set “include directory” into “\$(ProjectDir)include”



Install OpenGL and GLUT - 5

- Click “linker”
- Click “general”
- Set “additional library directories” into “\$(ProjectDir)lib”

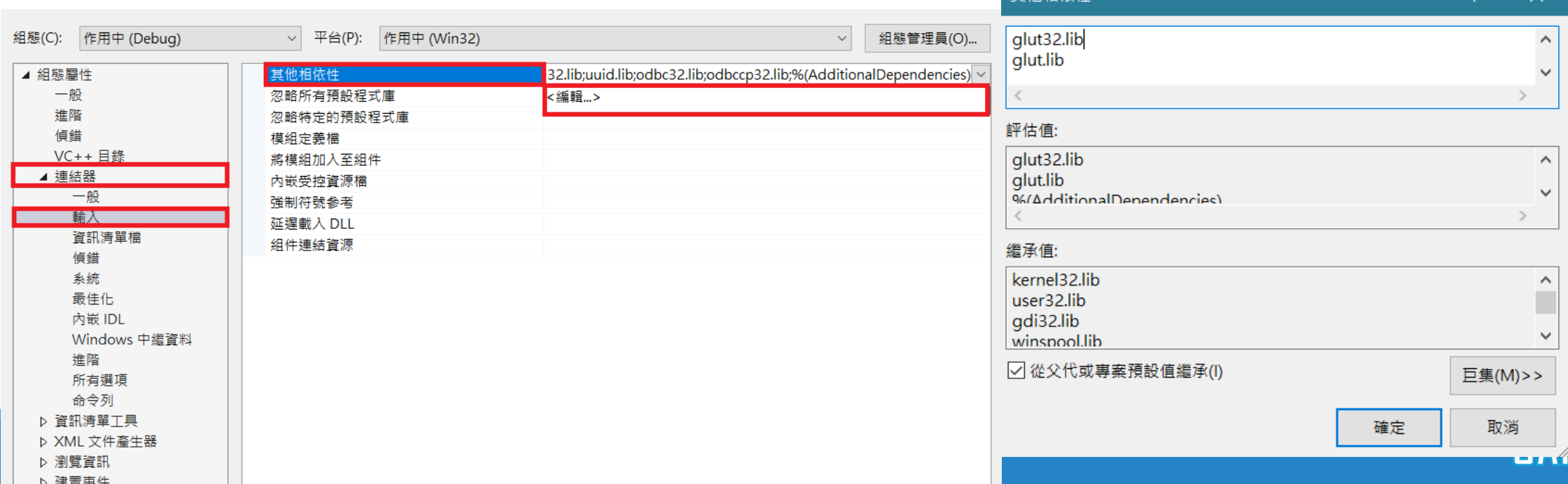
opengl 屬性頁



Install OpenGL and GLUT - 6

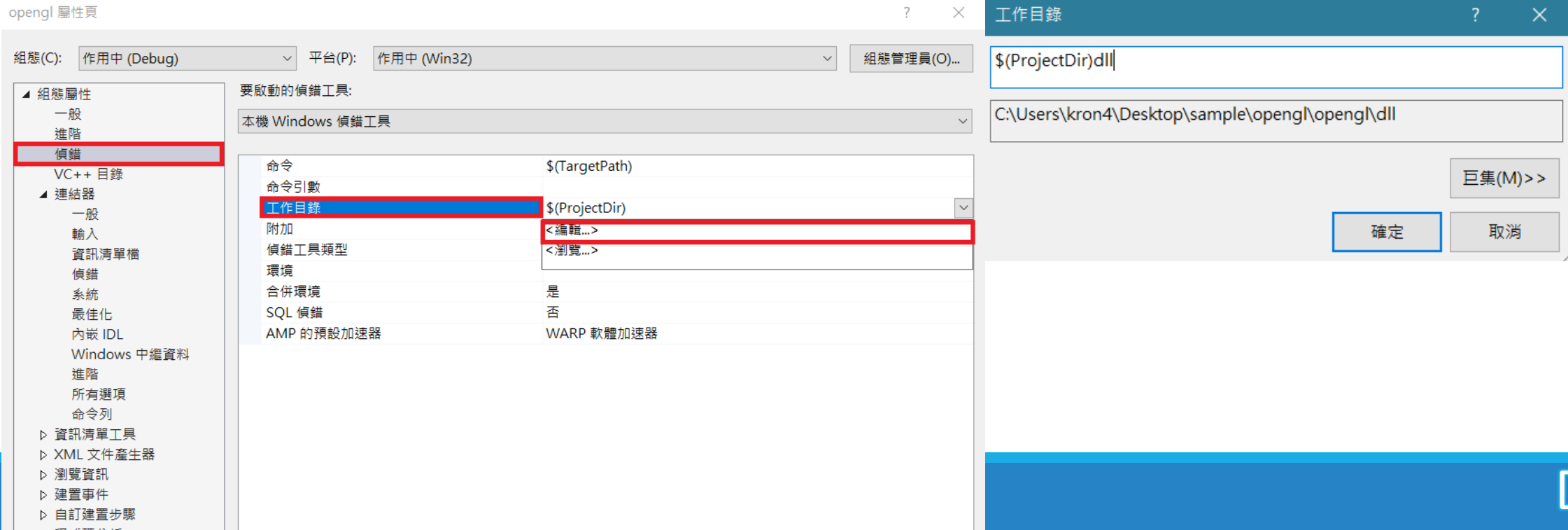
- Click “linker”
- Click “input”
- Set “additional dependencies” into “glut32.lib;glut.lib”

opengl 屬性頁



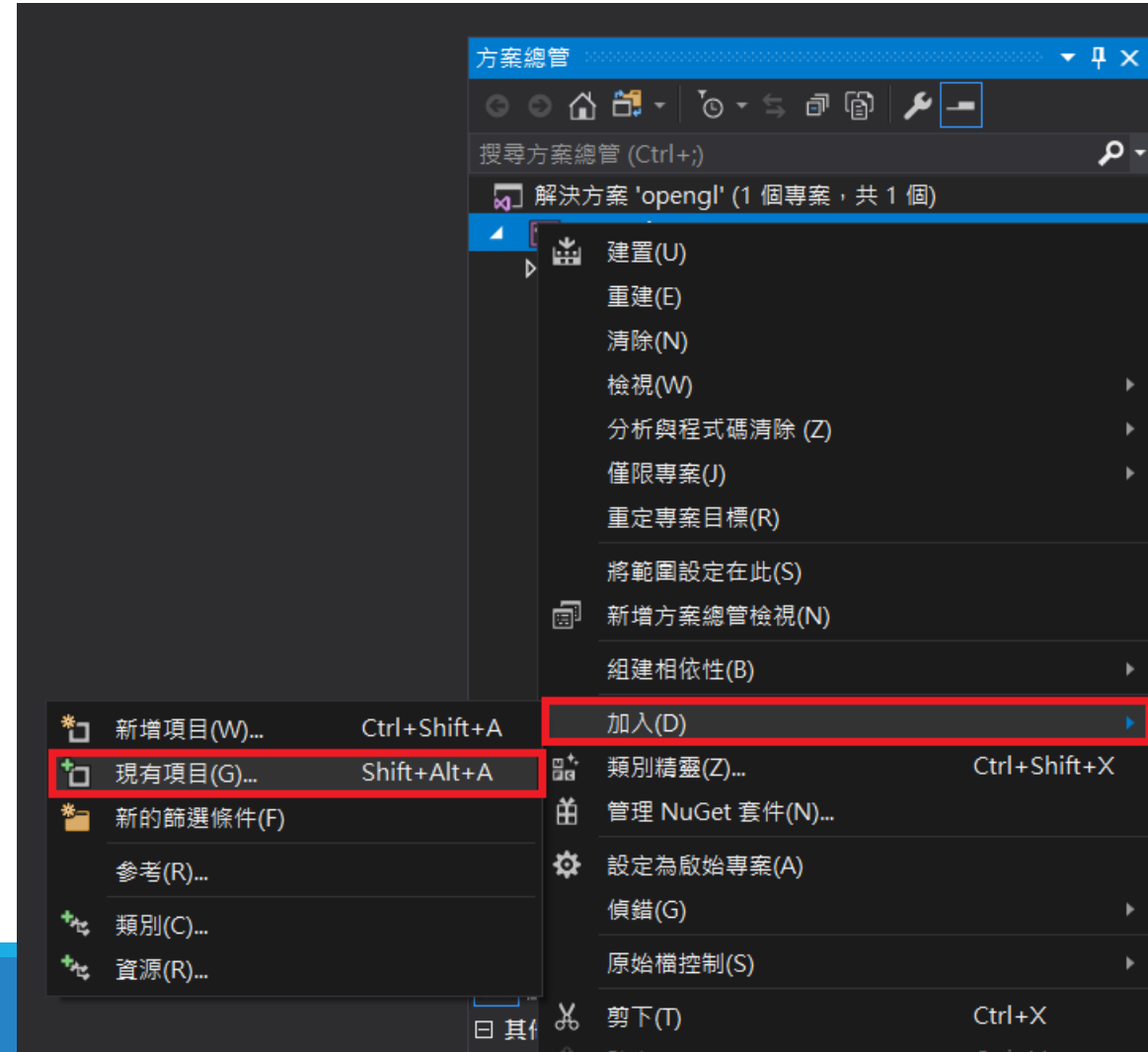
Install OpenGL and GLUT - 7

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

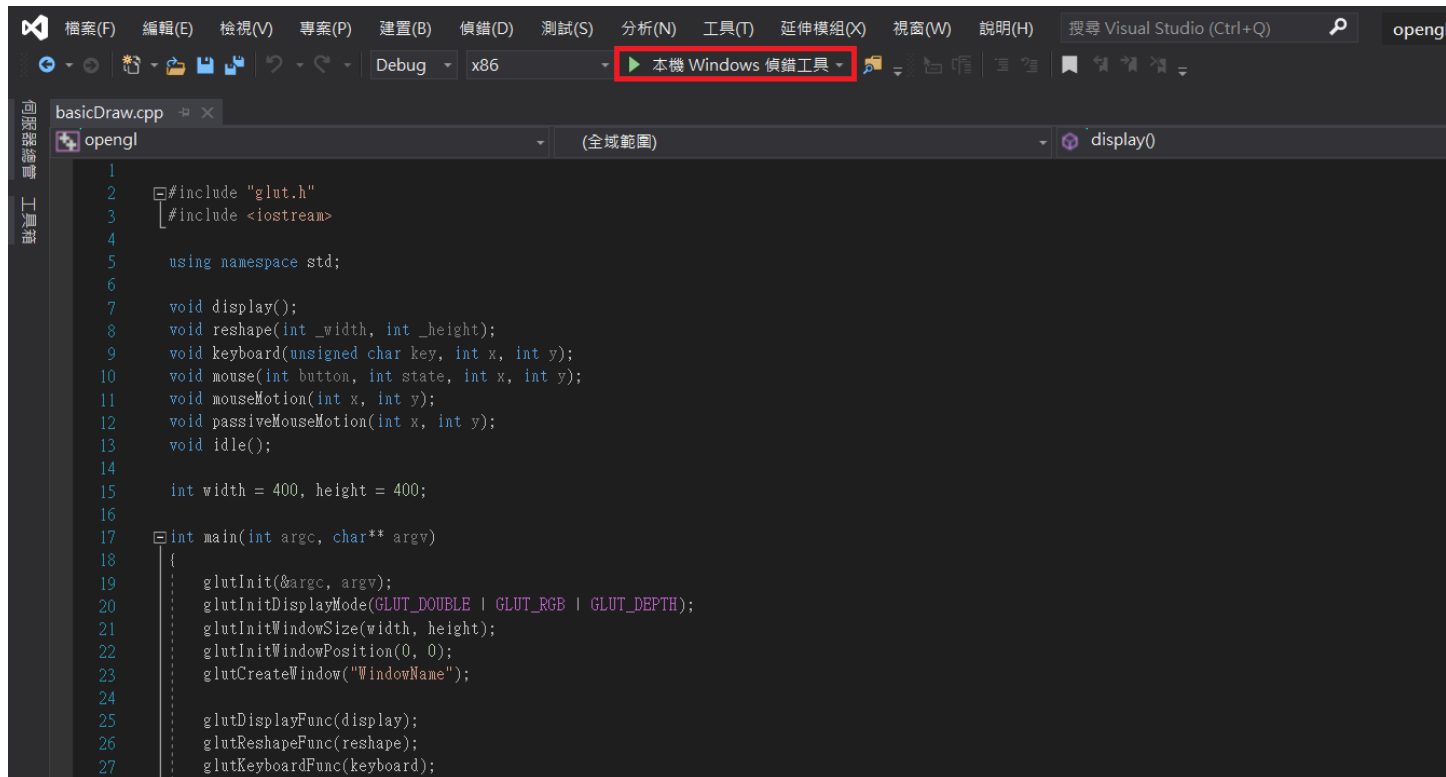


Install OpenGL and GLUT - 8

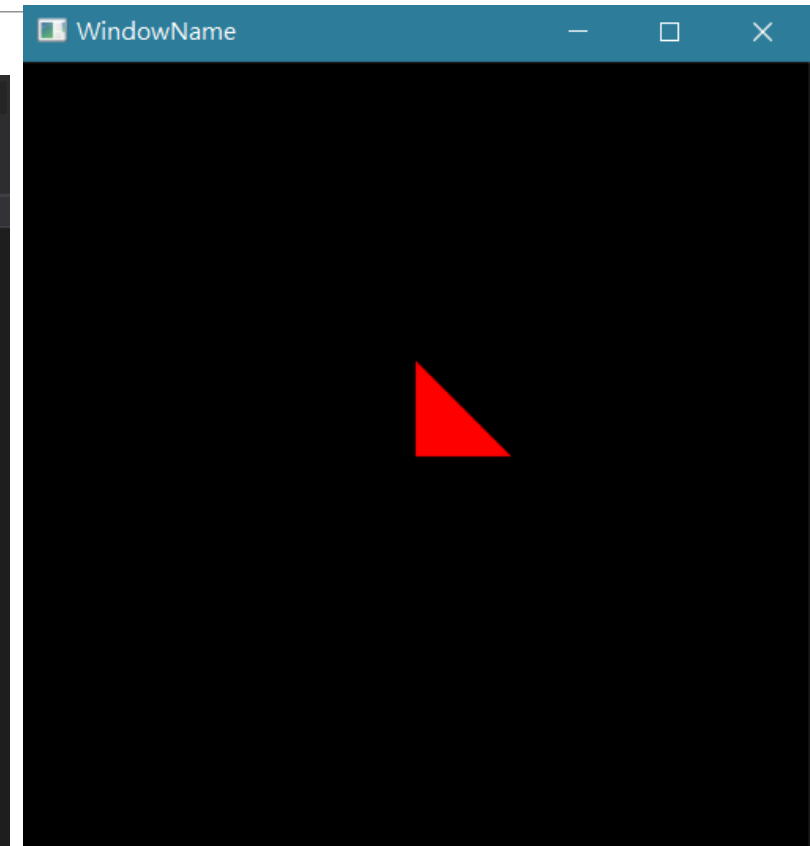
- Right click “ProjectName”
- Click “add”
- Click “existing item”
- Choose “basicDraw.cpp”



Install OpenGL and GLUT - 9



```
1 #include "glut.h"
2 #include <iostream>
3
4 using namespace std;
5
6 void display();
7 void reshape(int _width, int _height);
8 void keyboard(unsigned char key, int x, int y);
9 void mouse(int button, int state, int x, int y);
10 void mouseMotion(int x, int y);
11 void passiveMouseMotion(int x, int y);
12 void idle();
13
14 int width = 400, height = 400;
15
16 int main(int argc, char** argv)
17 {
18     glutInit(&argc, argv);
19     glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB | GLUT_DEPTH);
20     glutInitWindowSize(width, height);
21     glutInitWindowPosition(0, 0);
22     glutCreateWindow("WindowName");
23
24     glutDisplayFunc(display);
25     glutReshapeFunc(reshape);
26     glutKeyboardFunc(keyboard);
27 }
```



Exception

- When you run the code and get error message like this,
you can try “not to set additional dependencies” in “Install OpenGL and GLUT – 6” step.

