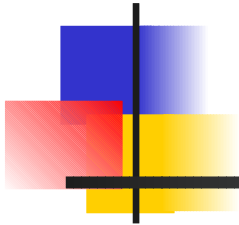


# Creating and using Libraries in C++

---



Week 16



Yang-Cheng Chang  
Yuan-Ze University  
[yczhang@saturn.yzu.edu.tw](mailto:yczhang@saturn.yzu.edu.tw)



# Libraries

---

- A library is a collection of subprograms used to develop software.
  - Allows code and data to be reused, shared and changed in a modular fashion.
  - Linking: A linker resolves the references between executables and libraries.

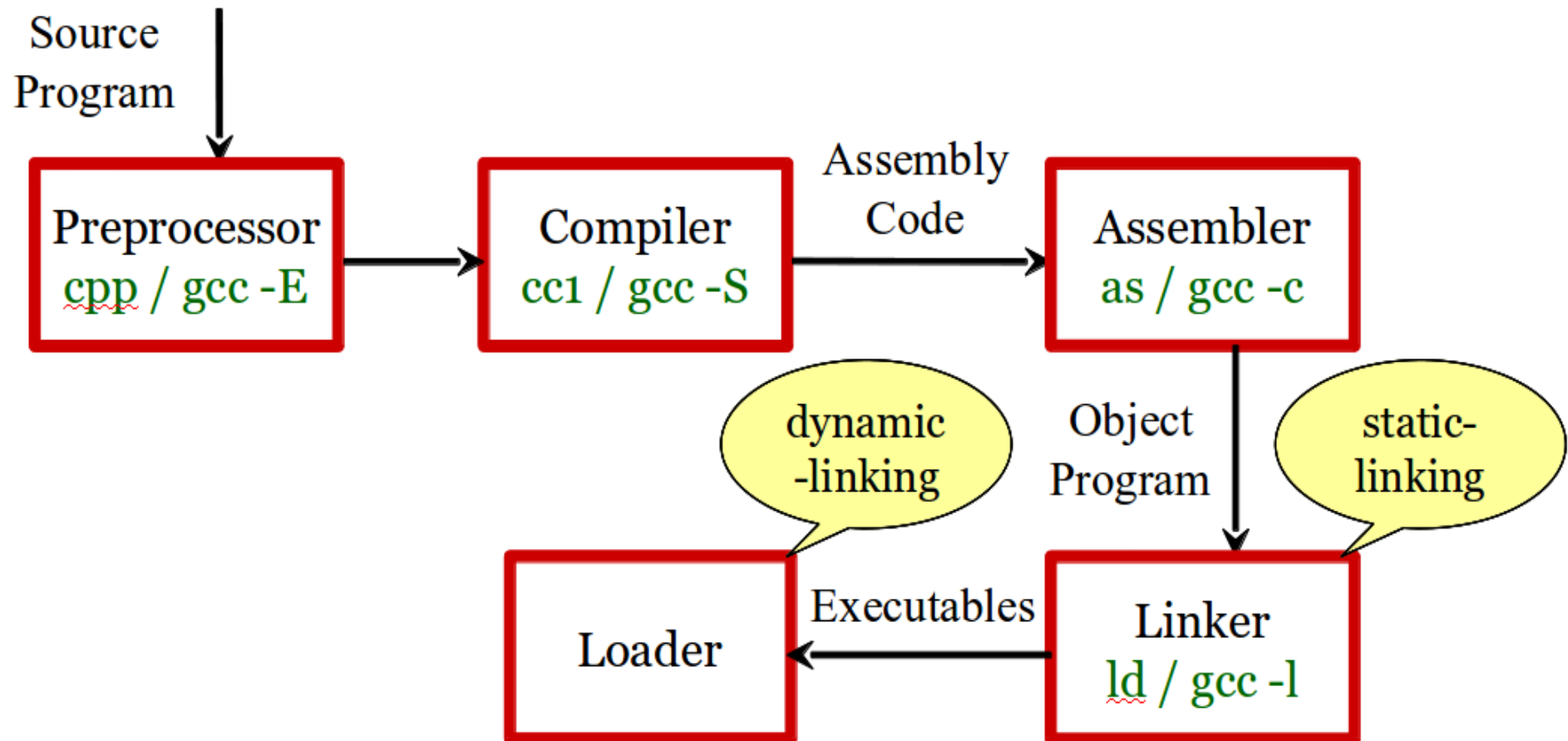


# Categories of Libraries (by linking time)

---

- Static linking libraries
- Dynamic linking libraries
  - Run-Time Environment libraries
  - Programming Language libraries

# From Source to Execution





# Static Linking Libraries

---

- The code segments will be copy to each executables.
- Pros:
  - Easy to use; no dependency problem after compilation.
- Cons:
  - The executable size will be larger.
  - Require re-linking when libraries changed.



# Dynamic Linking Libraries (1/2)

---

- Allow multiple processes to share the same code segment.
- Pros:
  - Greater flexibility
  - Possible support for plugins.
- Cons:
  - Slow application at start time.
  - Dependent on the libraries when execution.



# Dynamic Linking Libraries (2/2)

---

- The references can be resolved either at:
  - Load-time
  - Run-time
- UNIX Platform
  - “shared-object”: \*.so
- Windows Platform
  - “dynamic-linking library”: \*.dll



# Location of Libraries

---

## ■ UNIX Platform

- /lib: runtime environment libraries
- /usr/lib: for program development

## ■ Windows Platform

- C:\WINDOWS\system32\
  - The libraries for program development will be accompanied with compiler, like: Visual C++.





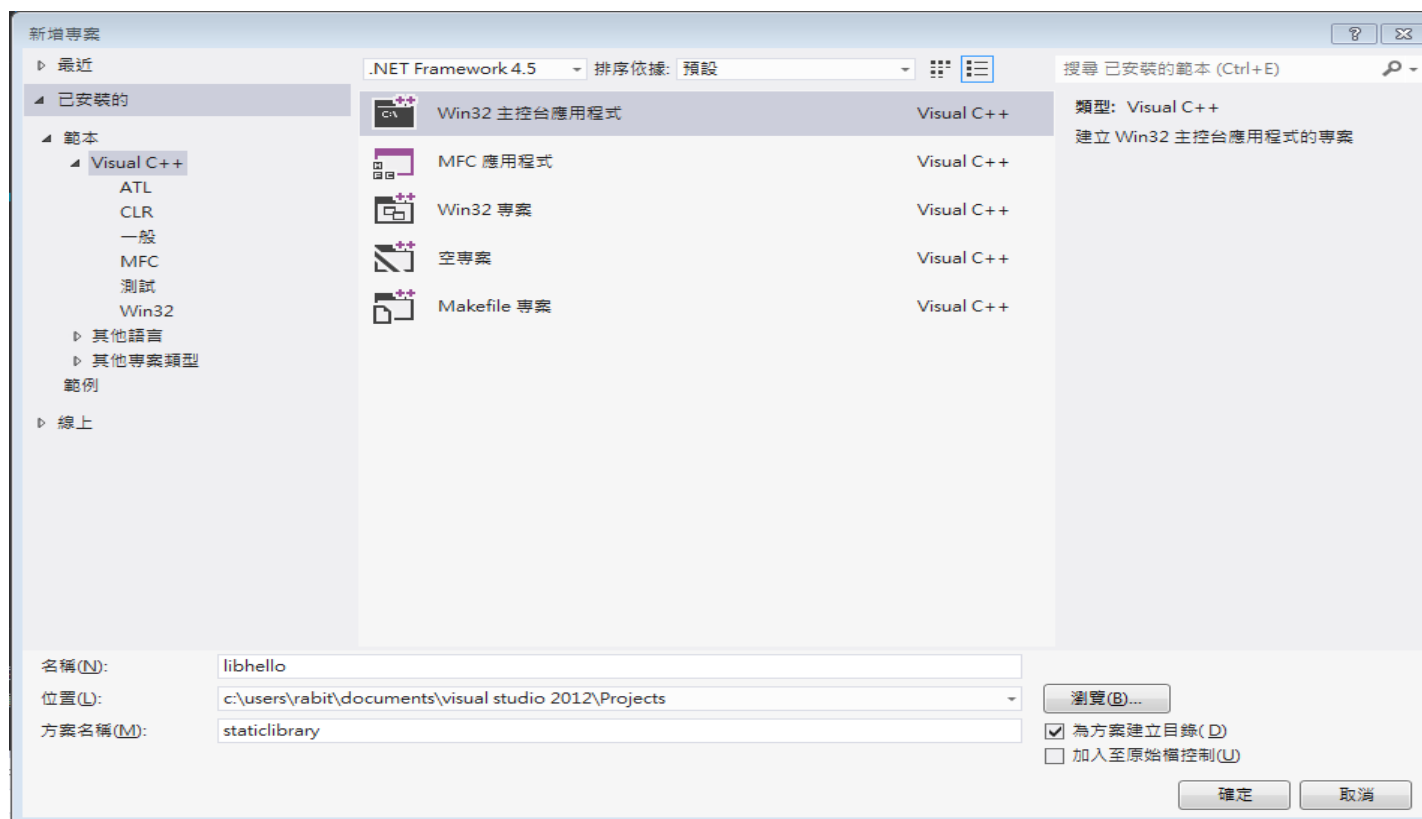
# 函式庫的散佈型式

---

- 原始碼 + 標頭檔
  - 檔案內容：.cpp .h
- 靜態函式庫 + 標頭檔
  - 檔案內容：.lib .h (windows)  
.a .h (unix)
- 動態函式庫 + 標頭檔
  - 檔案內容：.dll .h(windows)  
.so .h (unix)

# 如何建靜態立函式庫 (1)

- 新增專案
  - 選擇『Win32 主控台應用程式』
  - 名稱: libhello
  - 方案名稱: staticlibrary



# 如何建靜態立函式庫 (2)

- Win32 應用程式精靈
  - 應用程式類型：靜態函式庫
  - 其他選項：取消『先行編譯標頭檔』





# 如何建靜態立函式庫 (3)

- 加入標頭檔 : `hello.h`
- 加入原始程式檔 : `hello.cpp`

`hello.h`

```
#ifndef HELLO_H
#define HELLO_H
#include <iostream>
using namespace std;
void sayHello();
#endif
```

`hello.cpp`

```
#include "hello.h"

void sayHello()
{
    cout << "hello!" << endl;
}
```



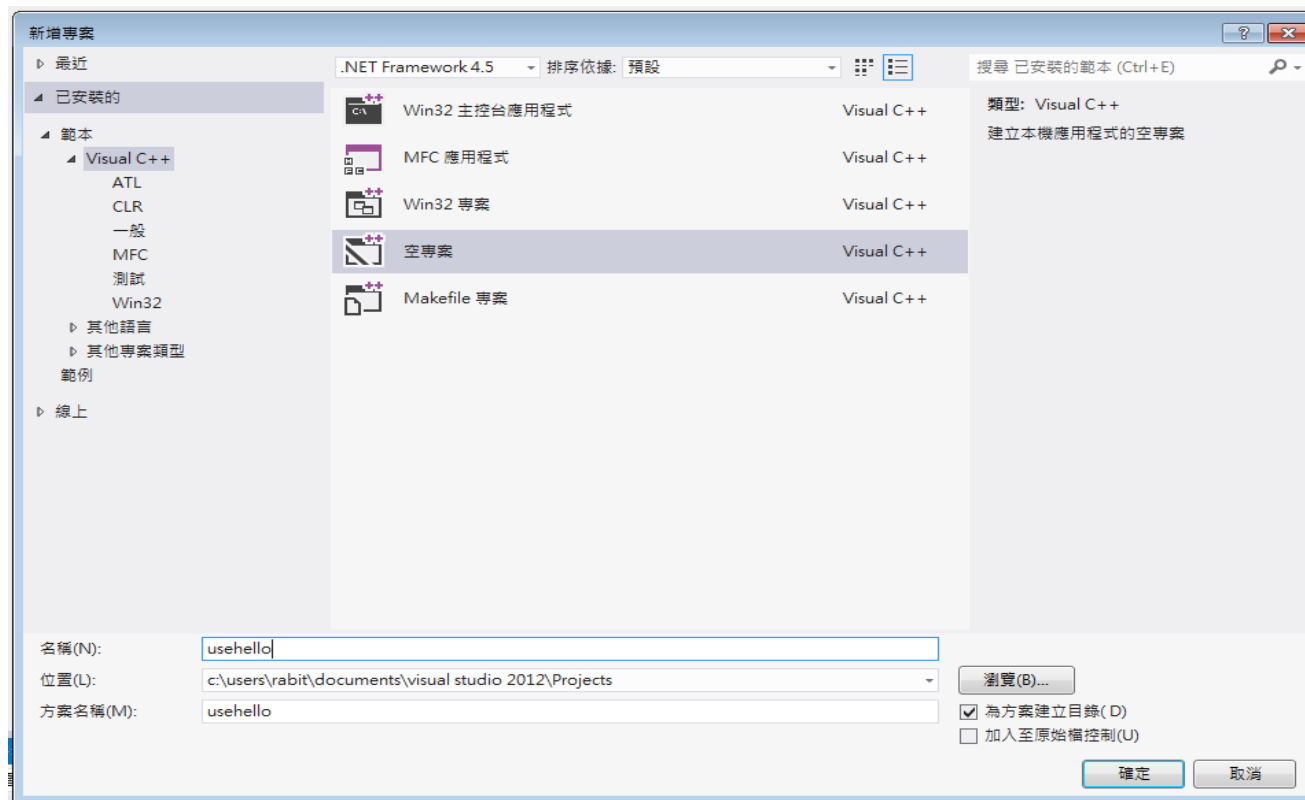
# 如何建靜態立函式庫 (4)

---

- 提供給其他程式使用時所需要的檔案
  - 標頭檔 `hello.h`  
路徑：`staticlibrary\libhello`
  - 靜態函式庫 `libhello.lib`  
路徑：`staticlibrary\Debug`

# 如何使用靜態函式庫 (1)

- 新增專案
  - 選擇『空專案』
  - 名稱: usehello
  - 方案名稱: usehello





## 如何使用靜態函式庫 (2)

---

- 加入原始程式檔：usehello.cpp

```
#include <hello.h>

int main()
{
    sayHello();
    system("pause");
    return 0;
}
```



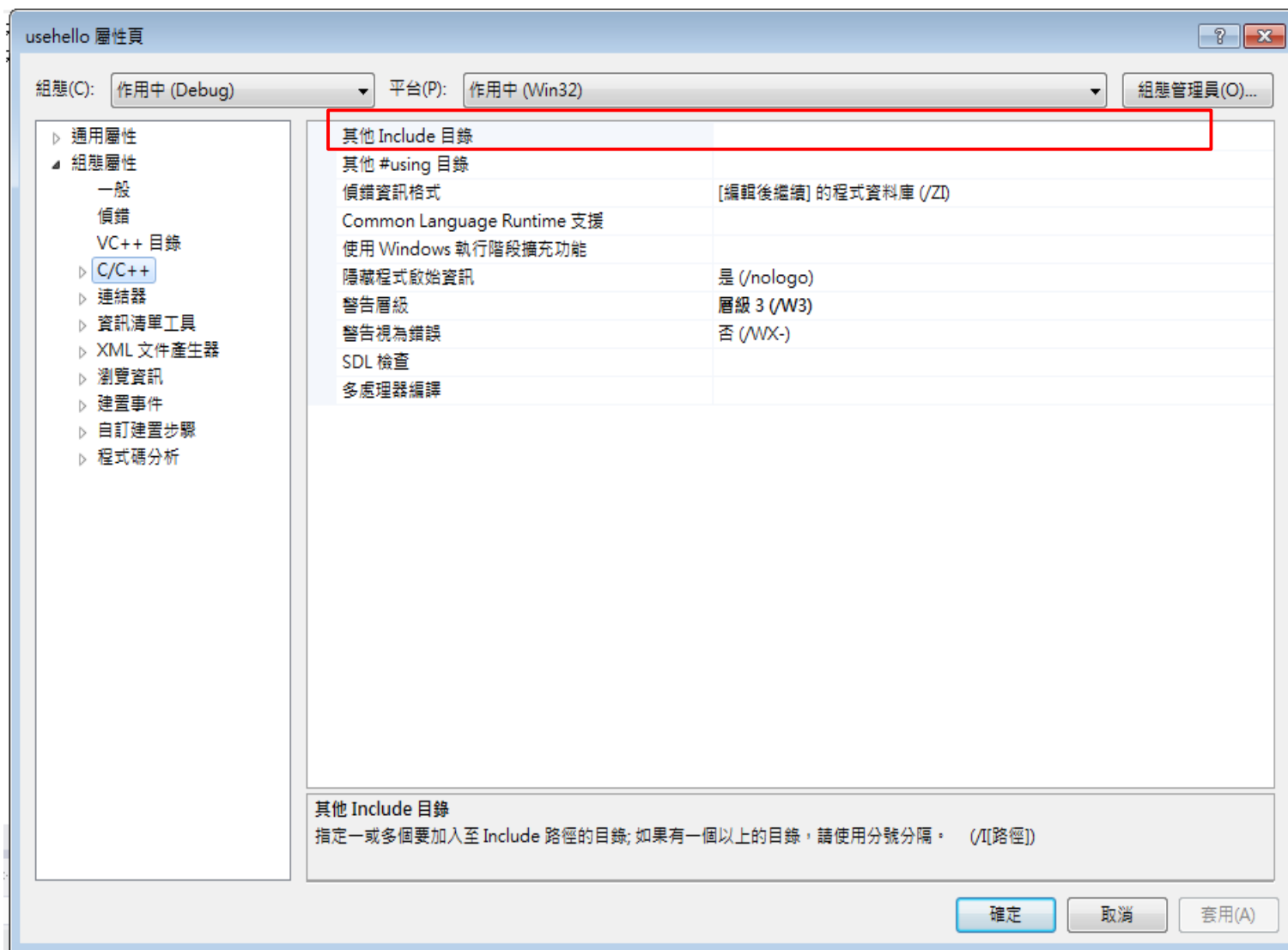
# 如何使用靜態函式庫 (3)

---

- 加入函式庫標頭檔 (hello.h) 所在的路徑
  - 方案總管 → 在 usehello 按右鍵
  - 選擇最下方的選項：屬性
  - 選擇『組態屬性 > C/C++ > 一般』
    - 在其他 Include 目錄加入 hello.h 所在的路徑

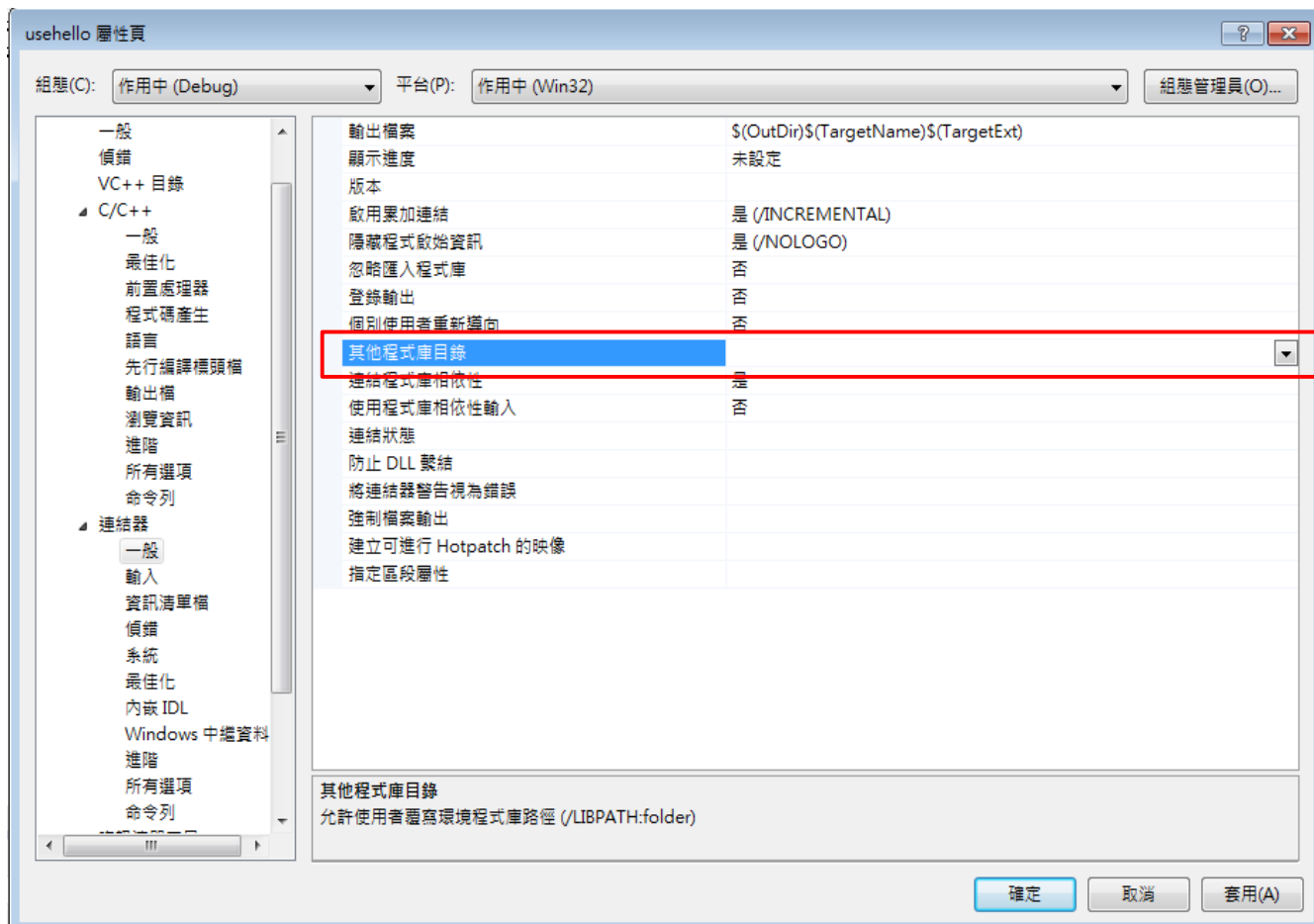


# 如何使用靜態函式庫 (3)



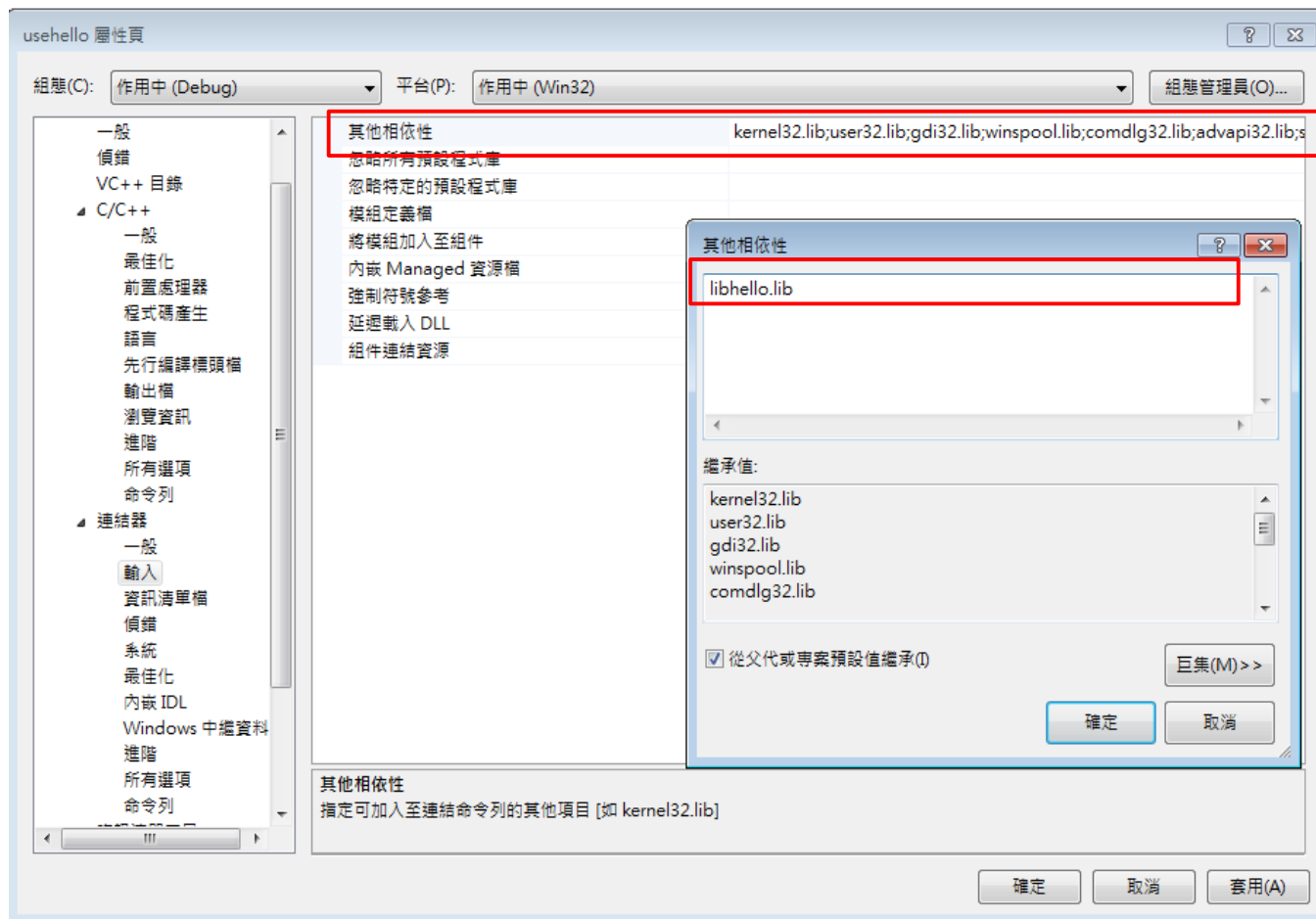
# 如何使用靜態函式庫 (4)

- 選擇『組態屬性 > 連結器 > 一般』
- 在其他程式目錄加入靜態函式庫 (libhello.lib) 路徑



# 如何使用靜態函式庫 (5)

- 選擇『組態屬性 > 連結器 > 輸入』
- 在其他相依性加入靜態函式庫名稱 (libhello.lib)





# Assignment

---

- Write a function to count the occurrence of words in a given text file(IHaveADream.txt)
  - Sort the word list by the word occurrence in a descending order, and show the list in following format

102 the
41 and
38 a
33 we

- Ignore the following characters ,!."?;- and the given prepositions(prepositions.txt)
- Treat lower case letters the same as upper case letters



# Assignment

---

- You should create a shared library, and implement this function in the library
- You should create a normal project, and write a program to use the function which has been implemented in the shared library