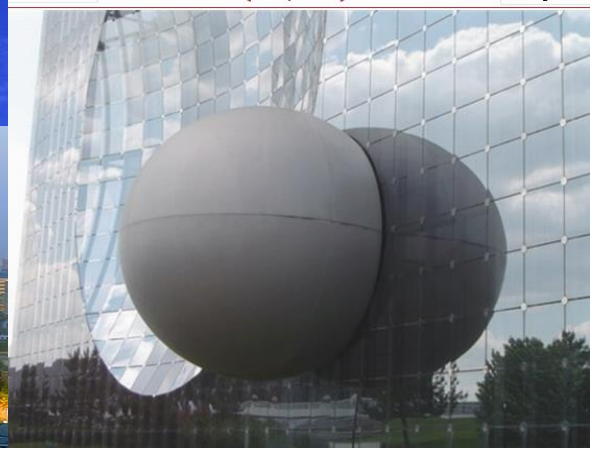


Computer Programming

Sino-European Institute of Aviation Engineering

Module 1
Introduction

Outline

- Course Group / Computer Science
- Objective
- Course Administration
- Basic Knowledge
- Reference

Course Group/Computer Science

- Computer programming
- Database & design
- Real-time & embedded systems
- Validation & verification

Objective

- Introduction to program design and specification
- Programs as state transformers: assignments, states and transitions
- Building data types : types and types constructors
- Building sequential programs: sequential composition
- Building iterative programs: conditional and iteration
- Structuring programs: functions, procedures and modules

Course Administration

- **Course hours : 32 Credits: 2**
  - Teaching hours: 26 hours
  - TP hours : 6 hours
- **Grading Policies : 100**

Homework: 15%

TP：10%
Projects：15%

Final exam: 60%

Basic Knowledge

- Computer System
- Overview of Programs and Algorithms
- Overview of Program Language
- How to do programming?

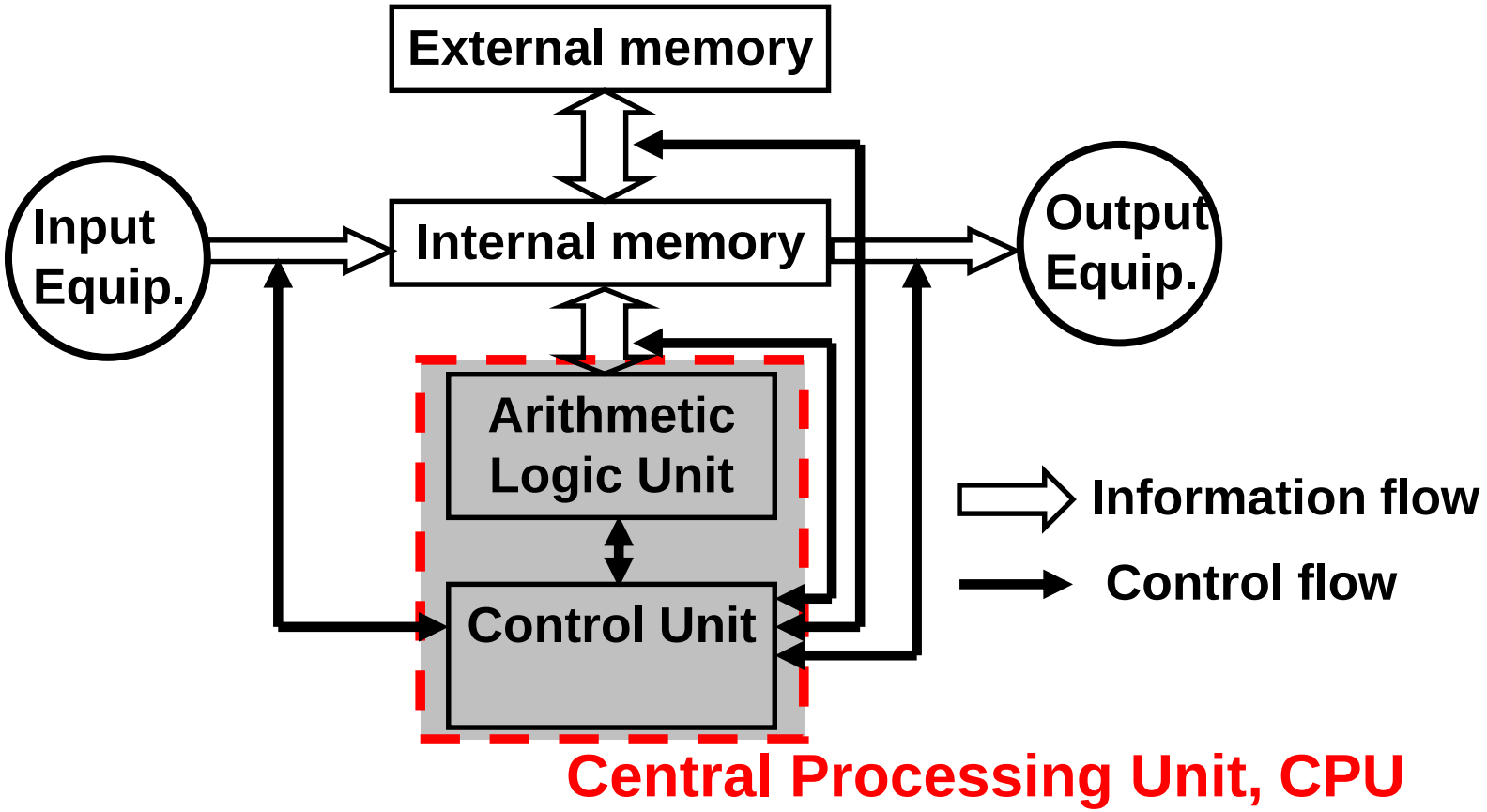
Computer System

- What's Computer System?

Computer system { Hardware, Software

Computer System

- Basic structure of computer hardware



Overview of Programs and Algorithms

- What's Program?

statements

Program ->A list of computer instructions

Program = Data Structure + Algorithm + Language

Program Design

Software { program, data, document } ⟷ programming language

A set of programs

A set of Characters and rules Can be interpreted by Computer

Overview of Programs and Algorithms

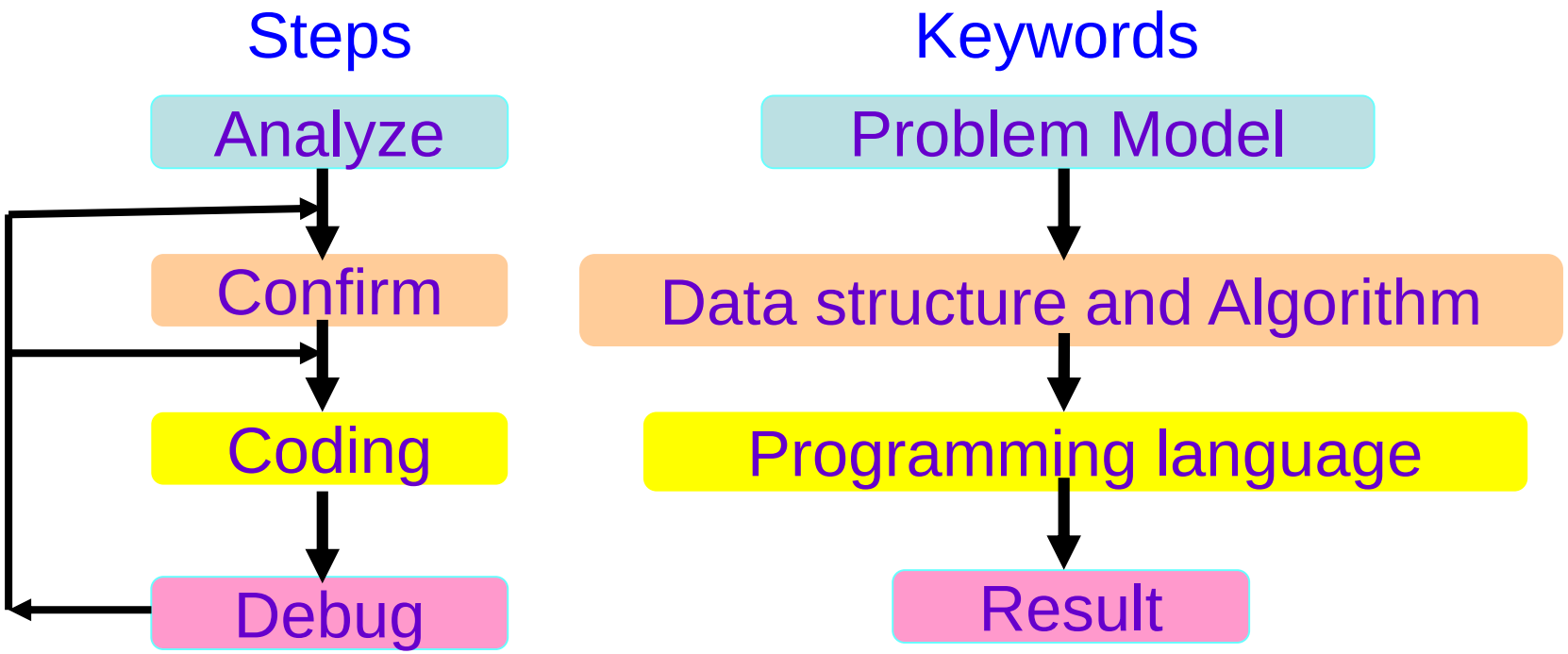
- Program design-> How to solve the problem

algorithmic design + coding

e.g How to calculate the area of a swimming pool?

Overview of Programs and Algorithms

- Four steps program design



Overview of Programs and Algorithms

- What is Algorithm

-> A strategy for solving a problem

(a list of steps)

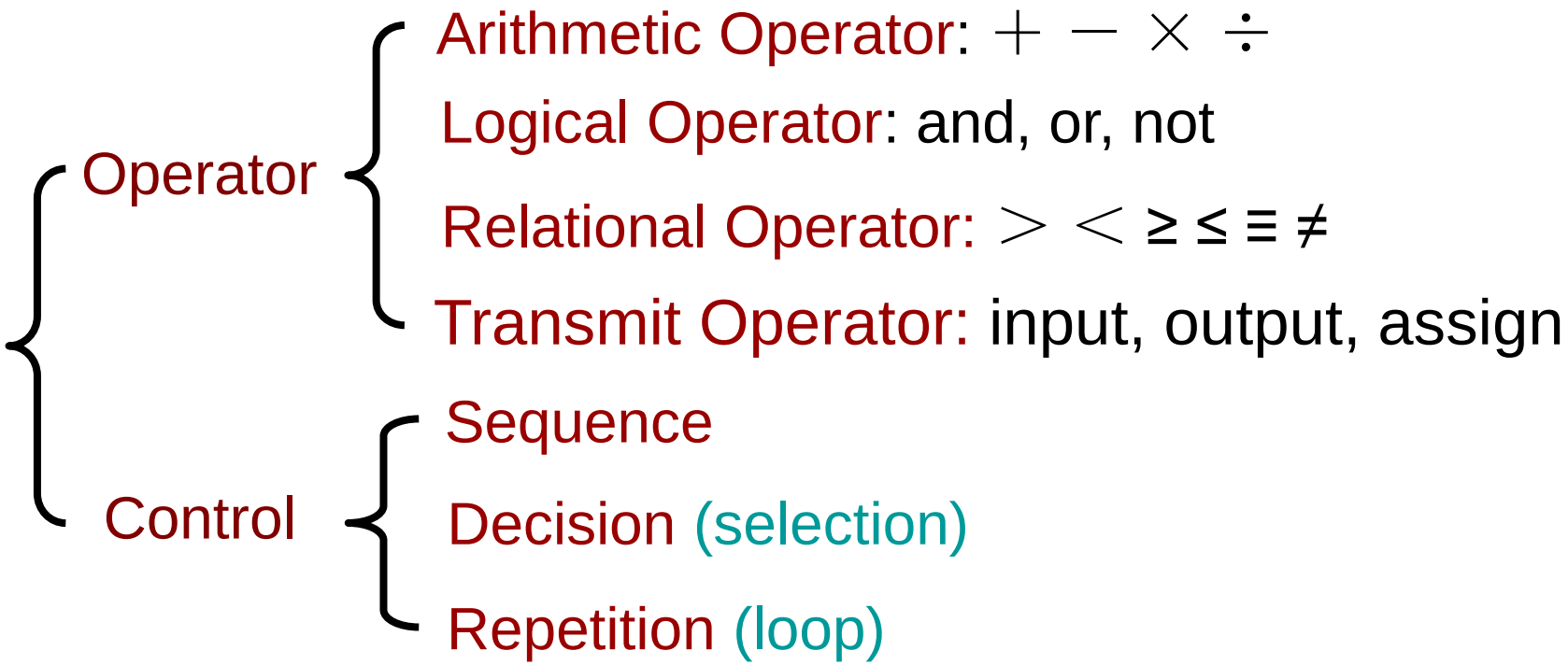
Algorithm must be:

1. Clearly and unambiguously defined.
2. Effective, in the sense that its steps are executable.
3. Finite, in the sense that it terminates after a bounded number of steps

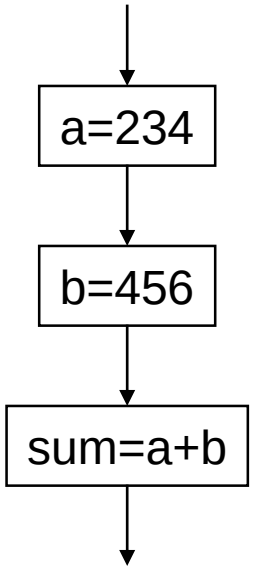
e.g: $Y = \sum_{n=1}^{100} n$

Overview of Programs and Algorithms

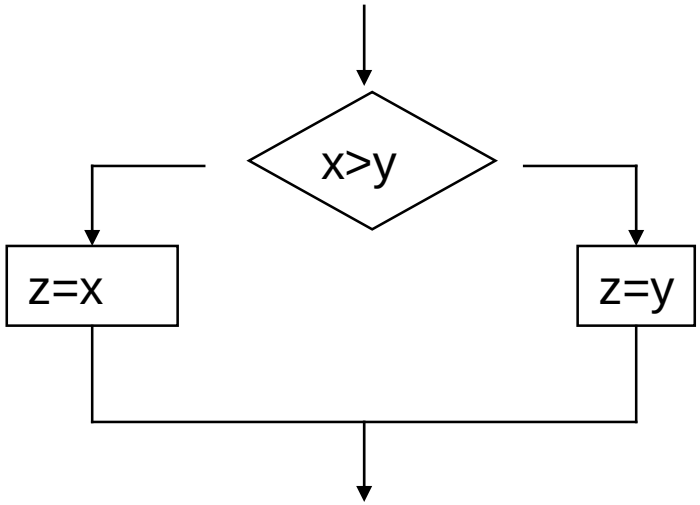
- Essential factors: Operator + Control



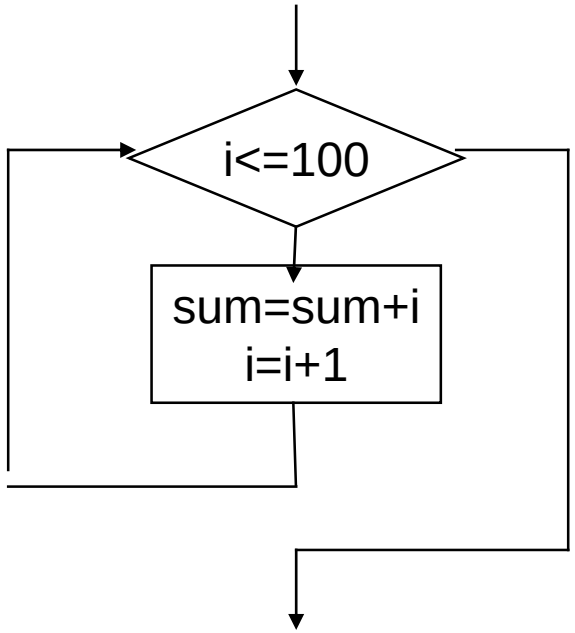
Overview of Programs and Algorithms



Sequence



Selection



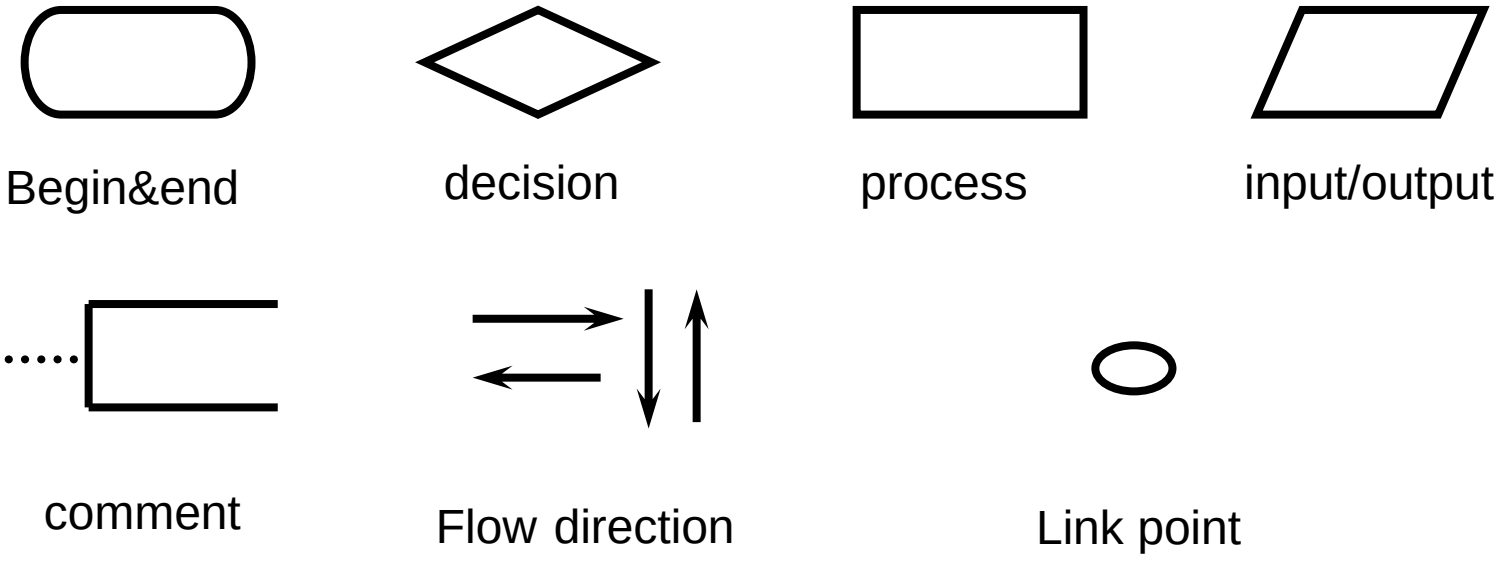
Loop

Overview of Programs and Algorithms

- Some Presenting Forms
  - Human Language
  - Flowchart
  - Pseudo-code

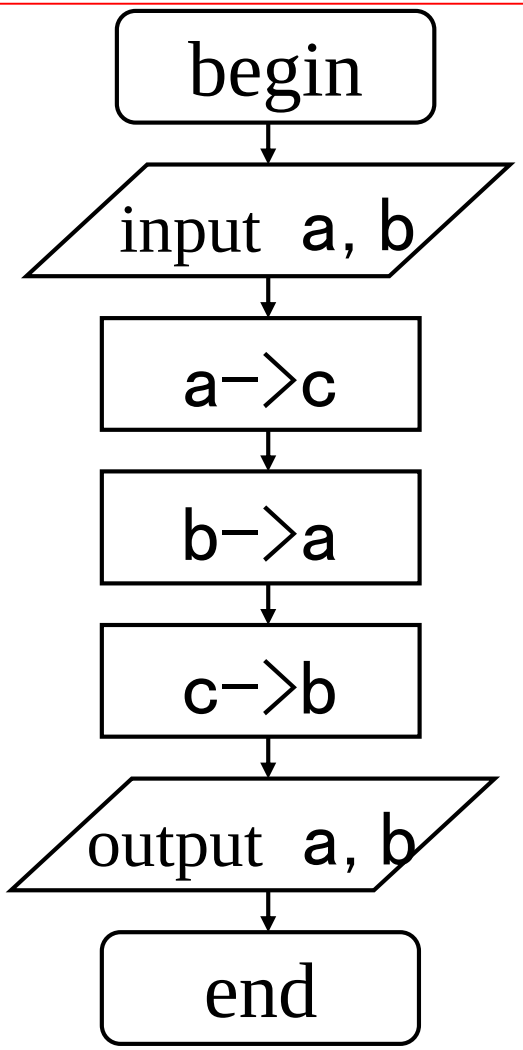
Overview of Programs and Algorithms

- Symbols in Flowchart Provided by ANSI (American National Standard Institute)



Overview of Programs and Algorithms

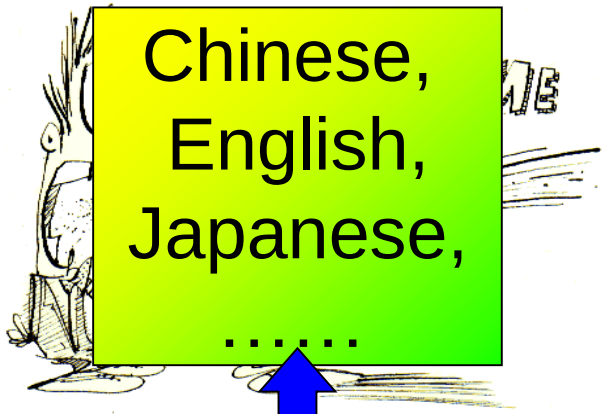
- Swapping two variables



Overview of Programs Language

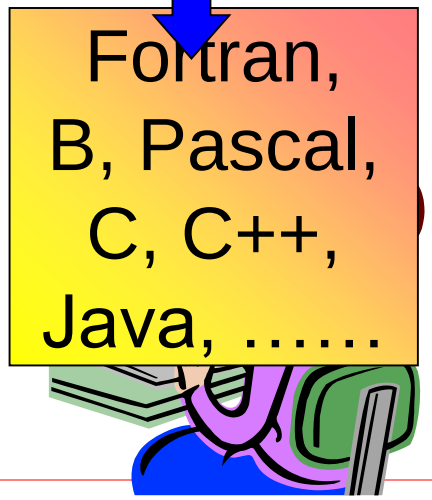
- Natural Language
  - Human & Human Communicatior

Grammar (语法) → Meaning (意思)



- Programming Language
  - Human & Computer Communication

Syntax (语法) → Semantics (语义)



- *A set of Characters and rules*
- Strict rules
- *Can be interpreted by Computer*

Overview of Programs Language

- Syntax
  - Expression: 2 + 3 * 4
  - Variable definition: int i;
  - Statement: the basic execution unit of the program
  - Function definition and calling

Overview of Programs Language

- Implementations of 1+1 in 5 languages

  - **Machine language**

```
10111000
00000001
00000000
00000101
00000001
00000000
```

  - **Assembly language**

```
MOV AX, 1
ADD AX, 1
```

  - **Basic language**

```
PRINT 1+1
```

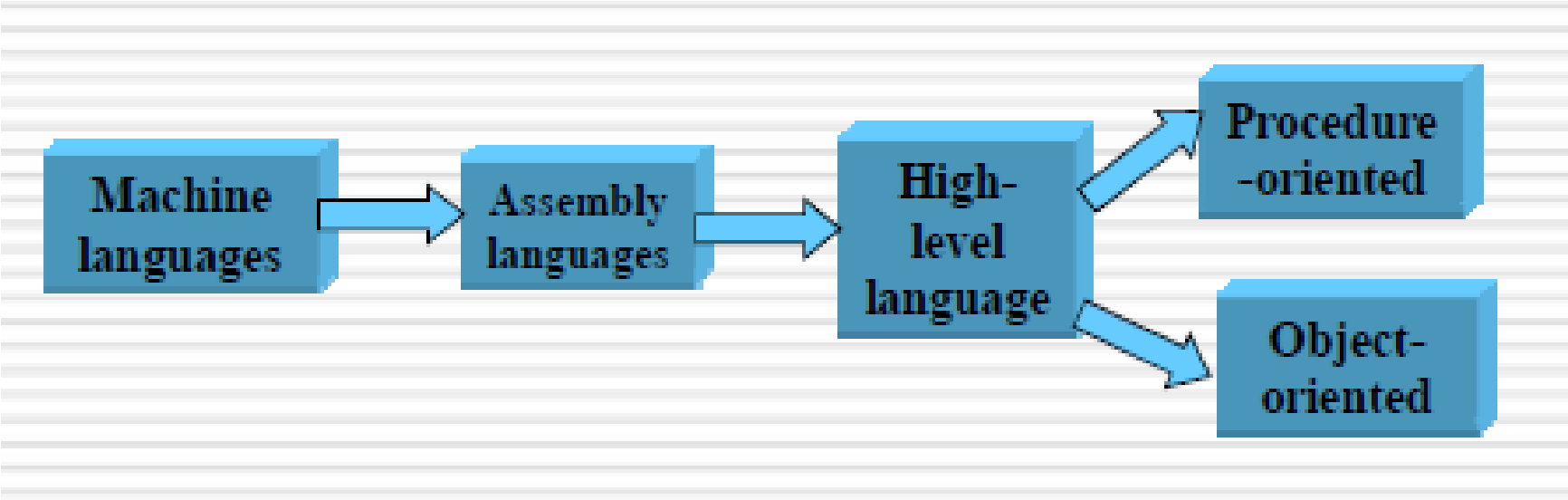
  - **C language**

```
#include <stdio.h>
  main( )
  {
        printf("%d\n", 1+1);
  }
```

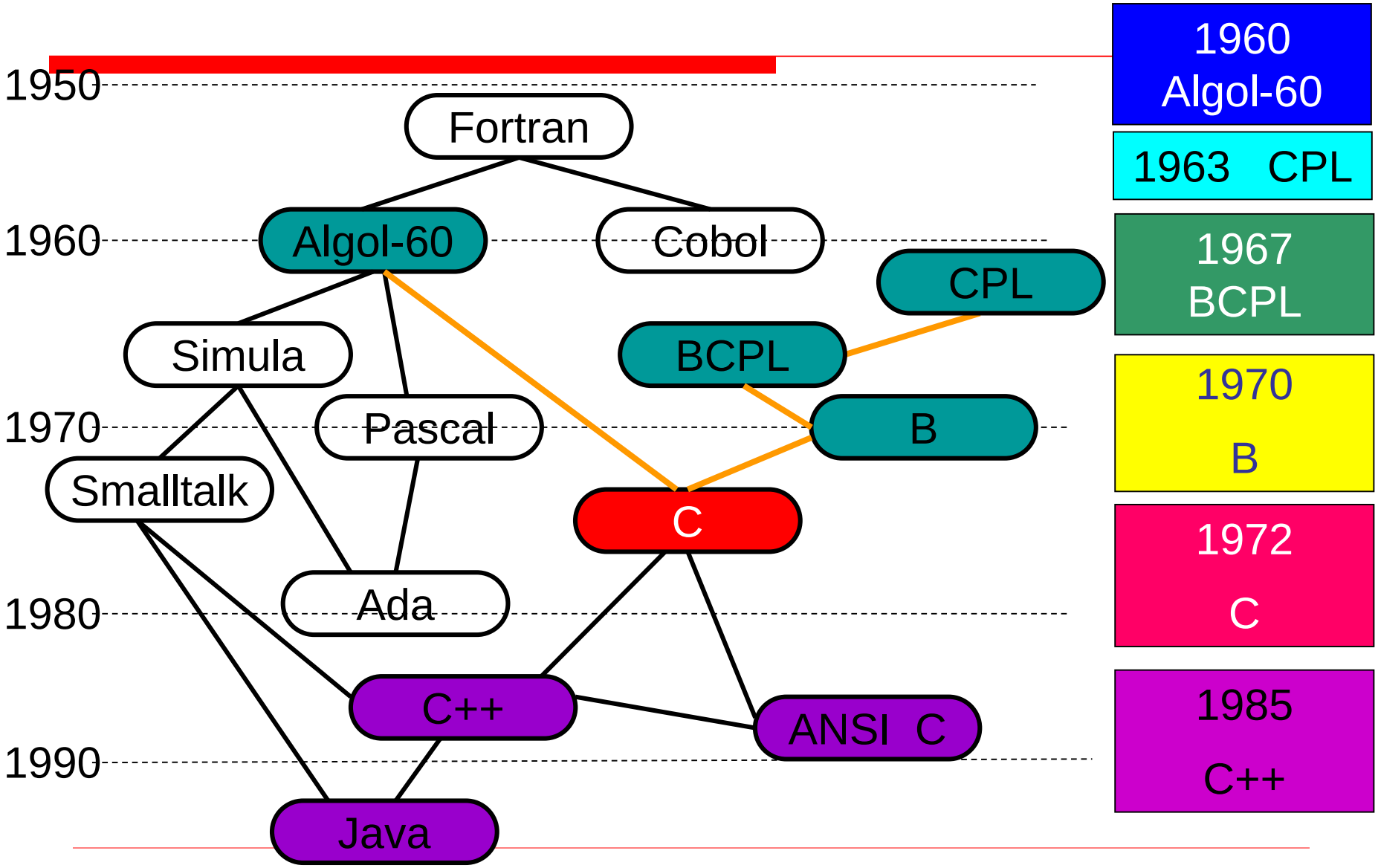
  - **C++ language**

```
  #include <iostream>
  main()
{
        std::cout << 1 + 1;
  }
```

Overview of Programs Language



The development of Programming language



Overview of Programs Language

- What is C?

Operating systems, Compiler, Drivers…

a *general-purpose* computer programming language

characters, syntax, structure, control statement, data type, operators…

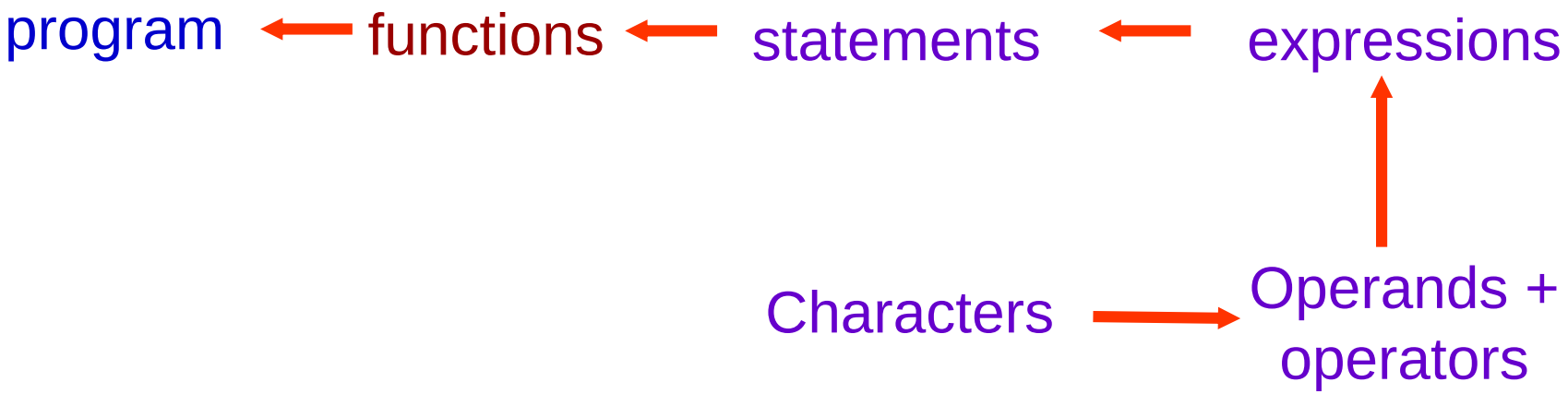
Overview of Programs Language

Characteristics of C

- Small size
- C is modular
- Loose typing
- Structured language
- Low level programming readily available
- C has a very powerful set of operators
- C is the basis for C++ and Java
- C efficient on most machines

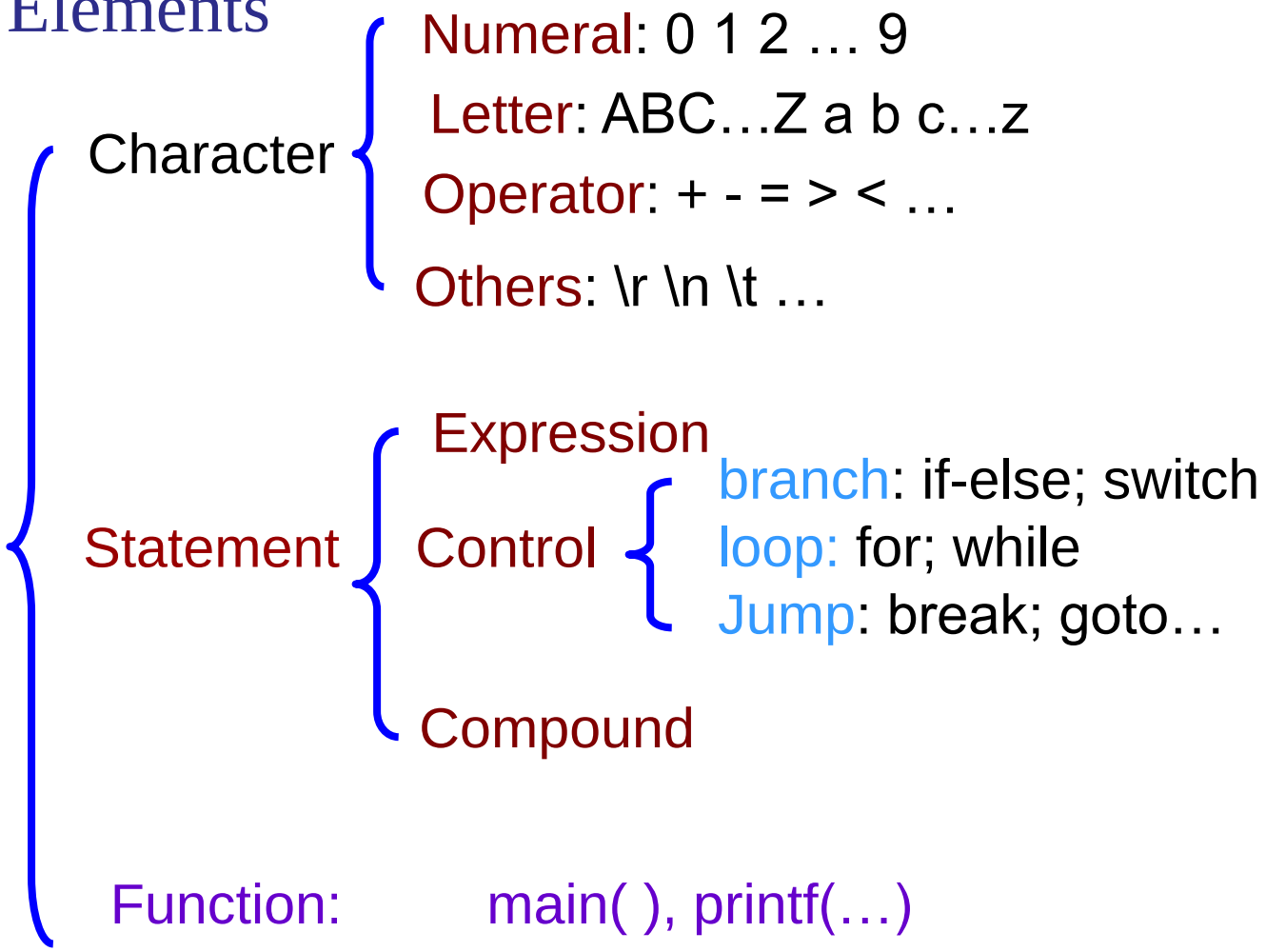
Overview of Programs Language

- C Program Structure



Overview of Programs Language

- Essential Elements



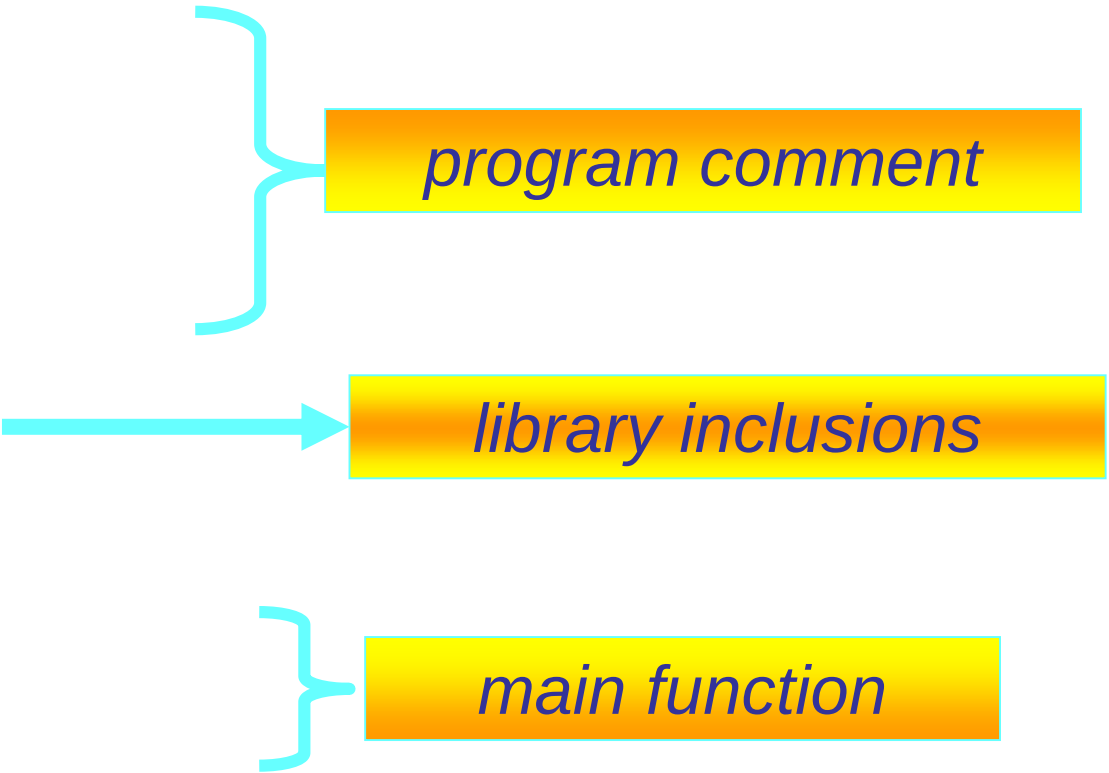
Overview of Programs Language

- The first program： Print the words: "\Hello, world"
  - Create the program text
  - Compile it successfully
  - Run it
  - Get the output

- **The program is stored as *a text file* named hello.c**
- **.c identifies the file as a C program.**

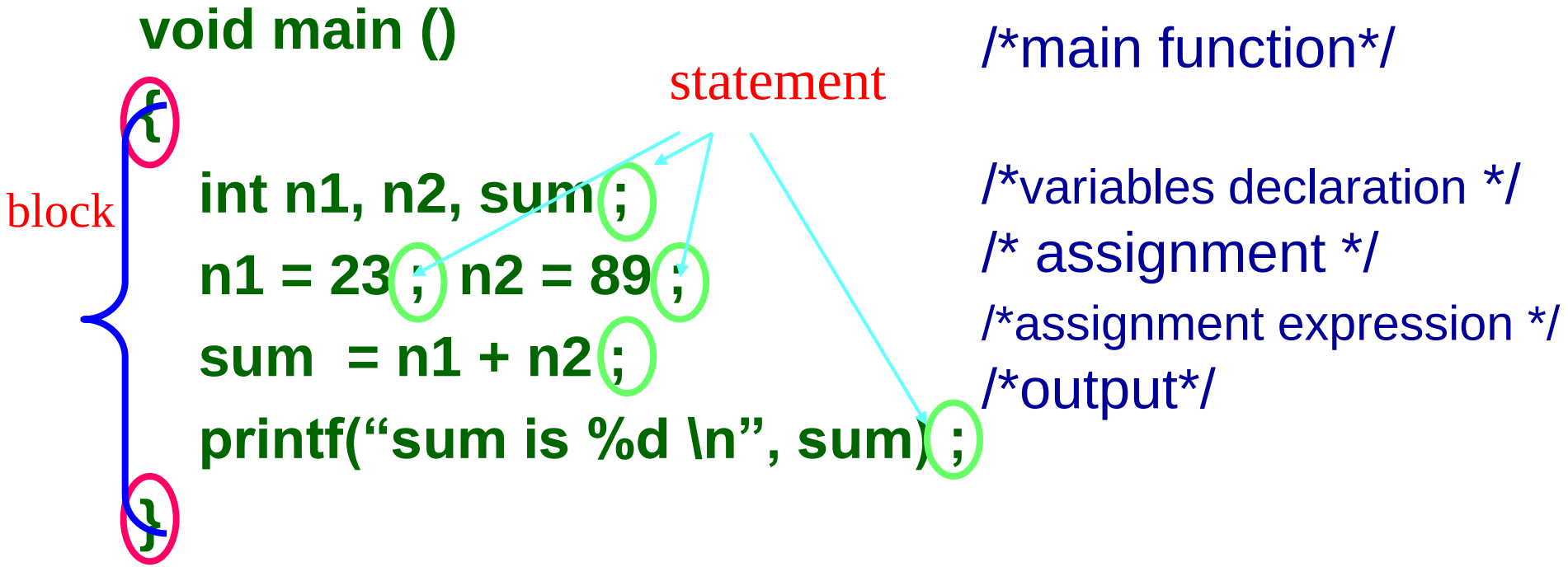
Overview of Programs Language

```
/* File: hello.c
  This program prints
  the message “Hello,
  world.” on the screen.
 */

#include <stdio.h>

void main ()
{
     printf (“Hello, world.\n”);
}
```



Overview of Programs Language

e.g sum = n1 + n2, How to get sum?



Overview of Programs Language

Identifiers

- the names for variables,data types, functions, file, arrays,pointers in program.
- Must be different from **keywords**.
- Create an identifier by specifying it in the declaration of a variable, type, or function.
- Once declared, the identifier can be used in later program statements to refer to the associated value.

Overview of Programs Language

- How to define Identifier
  - ***Letters&_ :***
    - **_ a b c d e f g h i j k l m n o p q r s t u v w x y z**
    - **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z**
  - ***Numeral:***
    - **0 1 2 3 4 5 6 7 8 9**

Rule:

The first character of an identifier must be a *Letters* or _

n1 sum total hello ✓

Fun.n 1test -string1 ✗

Keywords In C

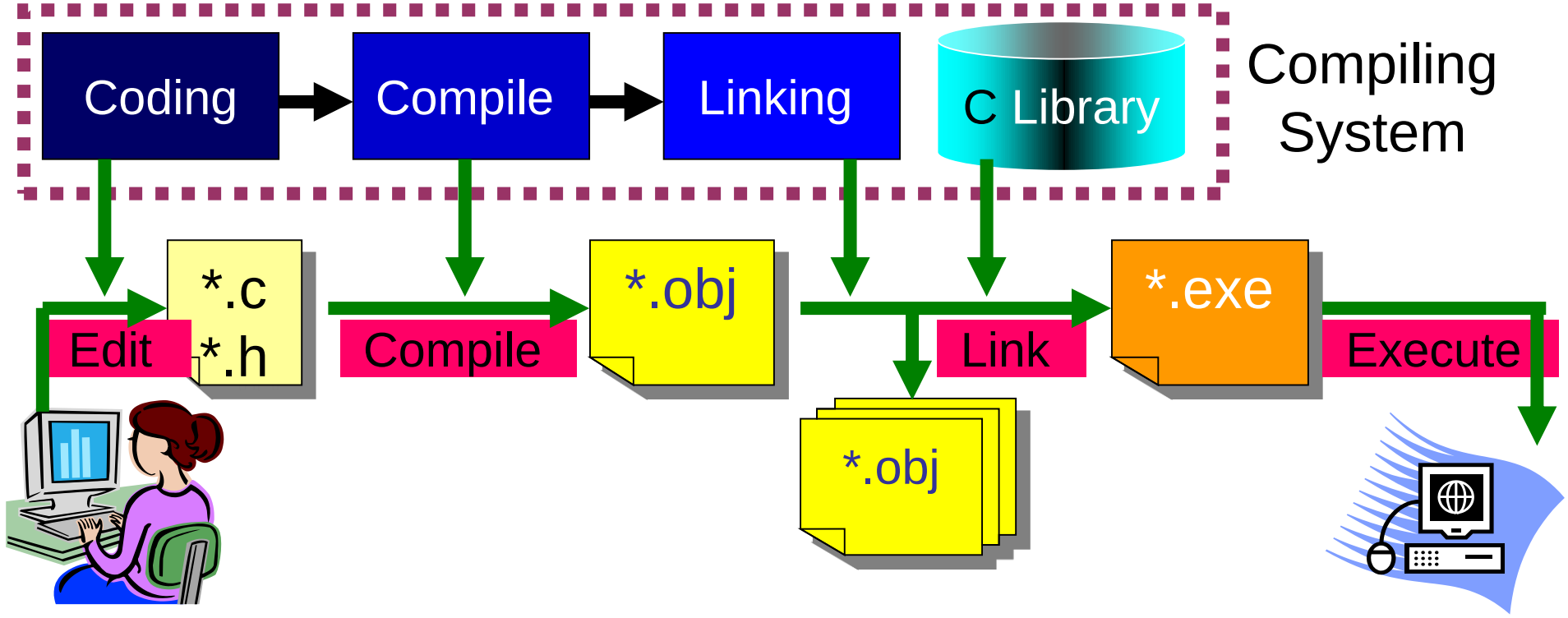
reserved words (32)

auto break case char const
continue default do double else
enum extern float for goto
if int long register return
short signed sizeof static struct
switch typedef union unsigned void
volatile while

Don’t use keywords as identifier!

How to do programming?

- Programming Process:



How to do programming?

- Programming Environment for C

Integrated Development Environment:

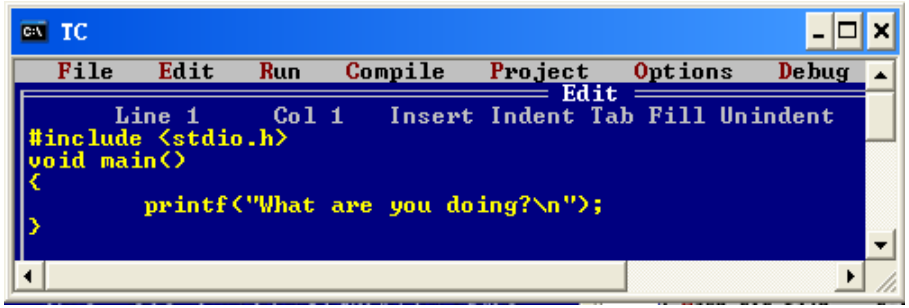
Turbo C 2.0、Turbo C++ 3.0、Visual C++

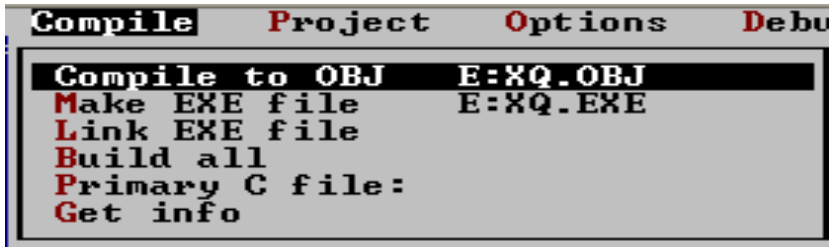
Visual Studio 2005 、Visual Studio 2010…

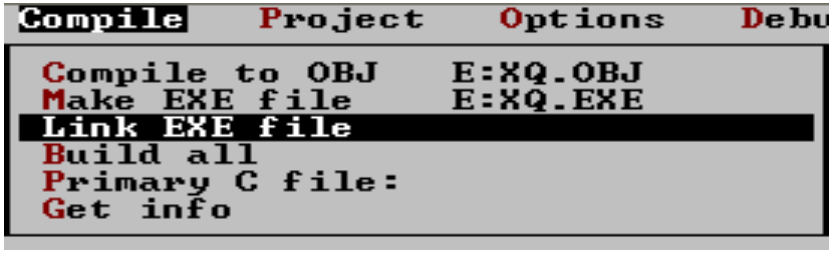
Turbo C

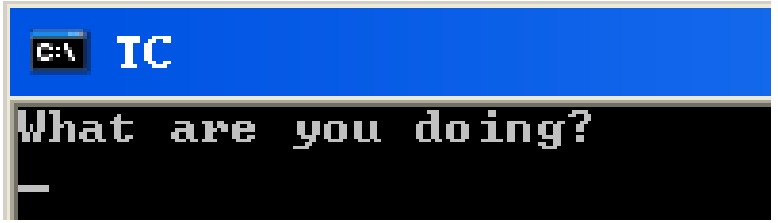
Turbo C

step1: coding
step2: compile *.c ,get *.objfile
step3: linking *.obj and lib function and other files
step4: run *.exe



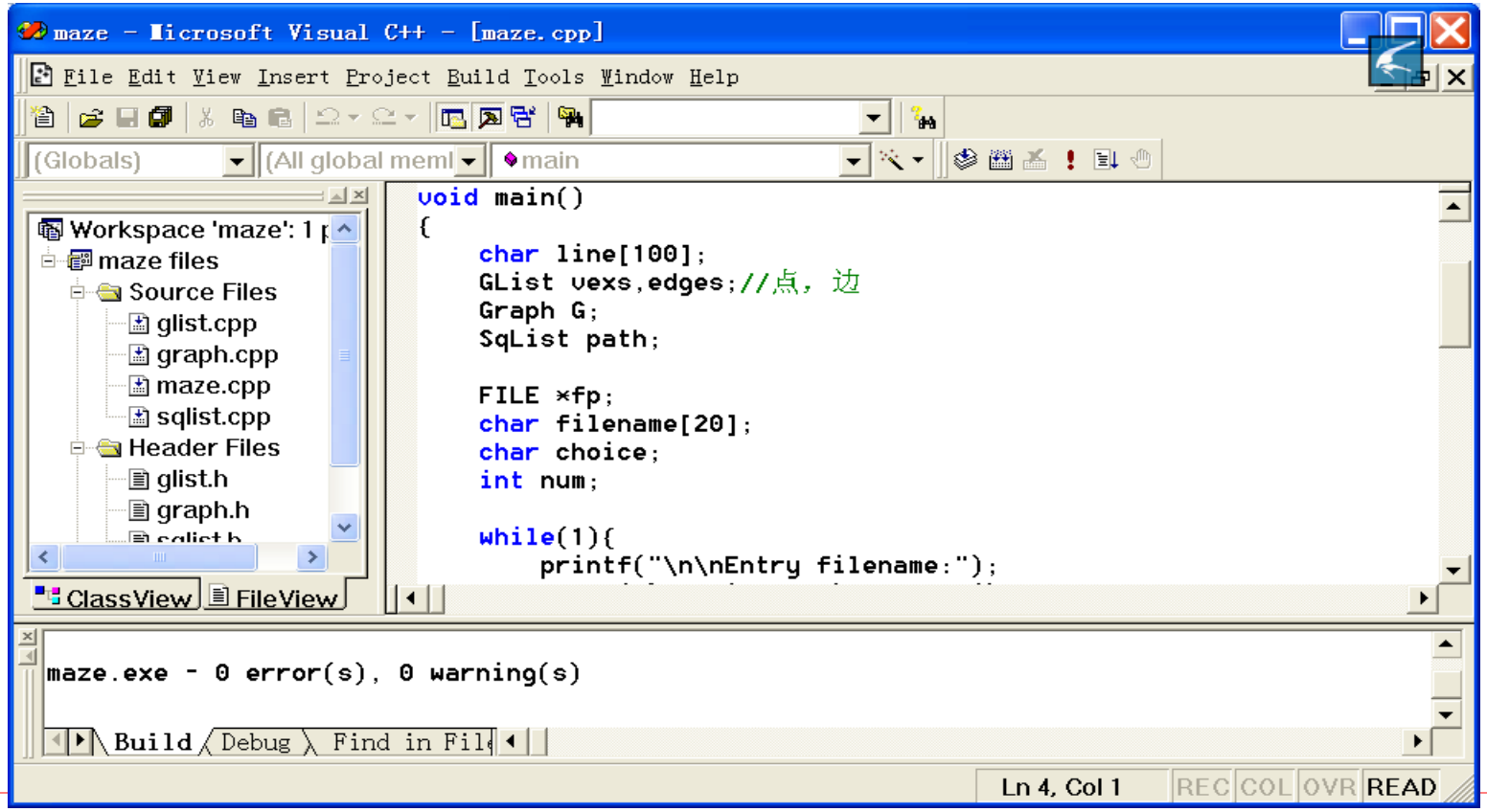






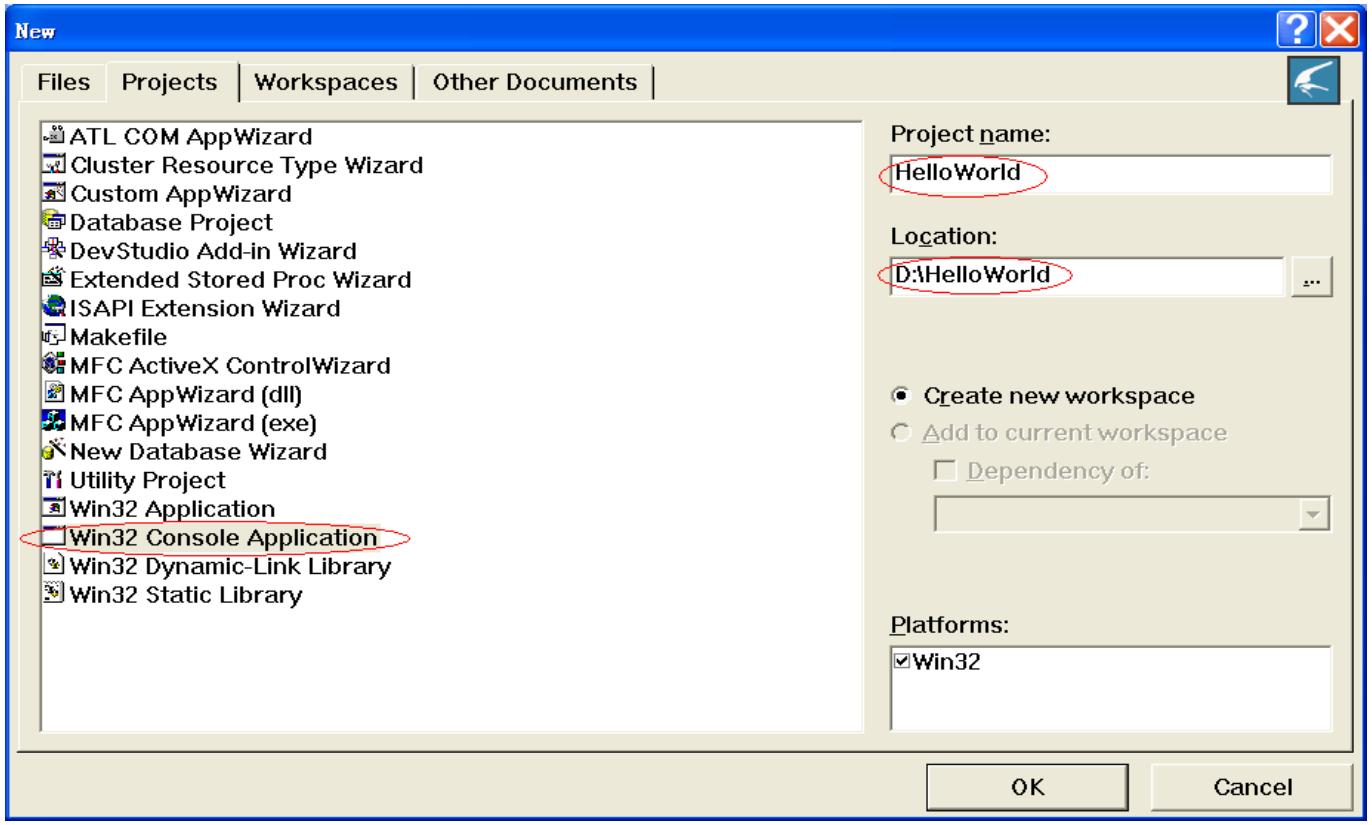
Visual C++ 6.0

- Visual C++6.0 provide application wizard with which a simple application can be construct automatically.



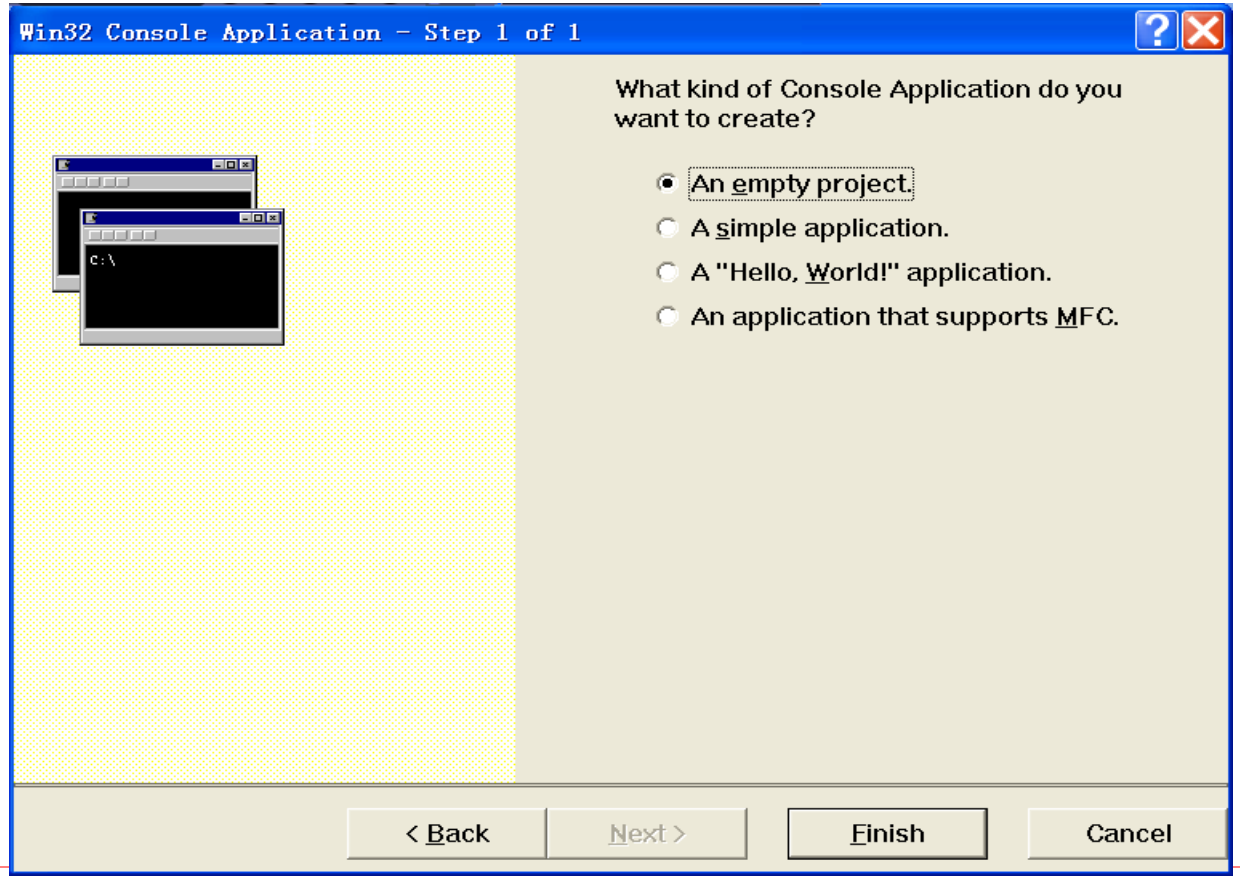
The first C program：HelloWorld

- Start Visual C++ 6.0,then chose file->new->projects->Win32 Console Application



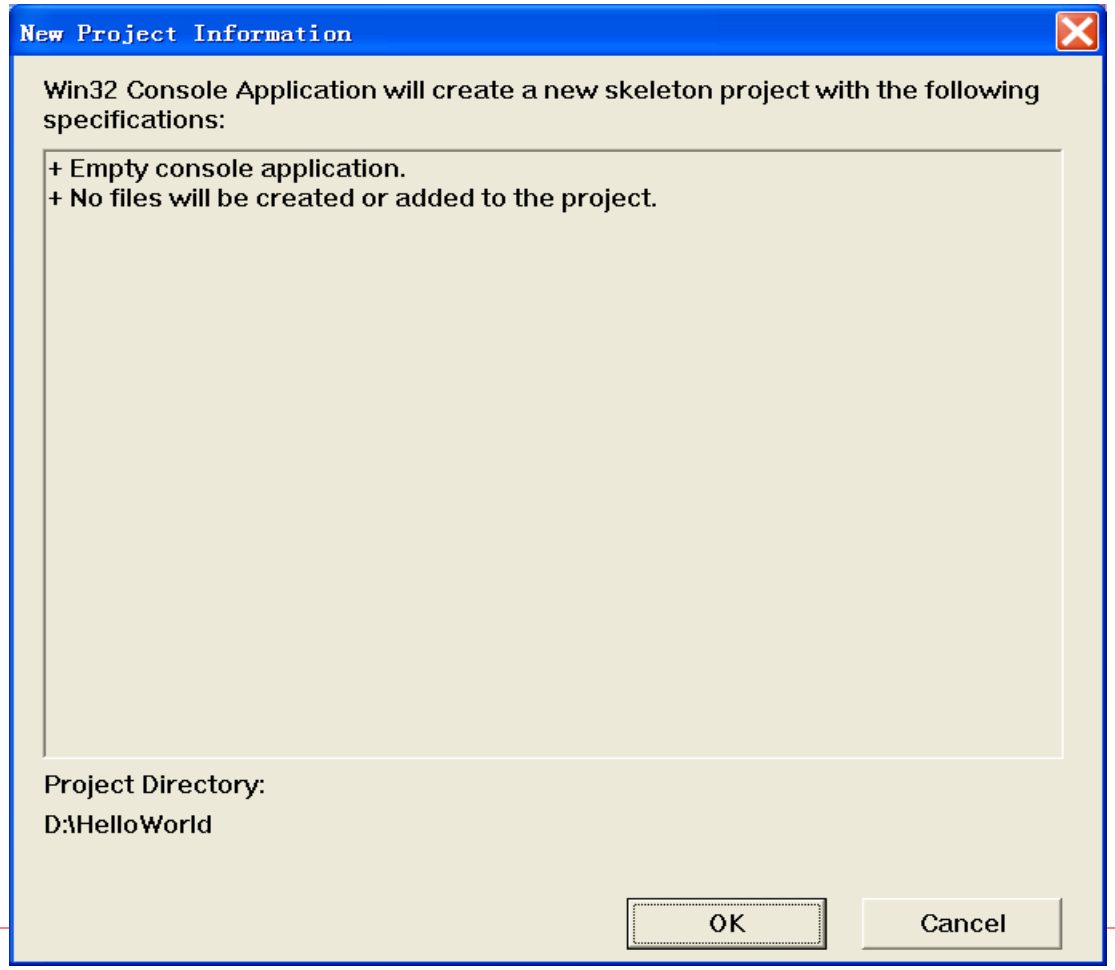
The first C program：HelloWorld

- Choose to construct a new project (An empty project)



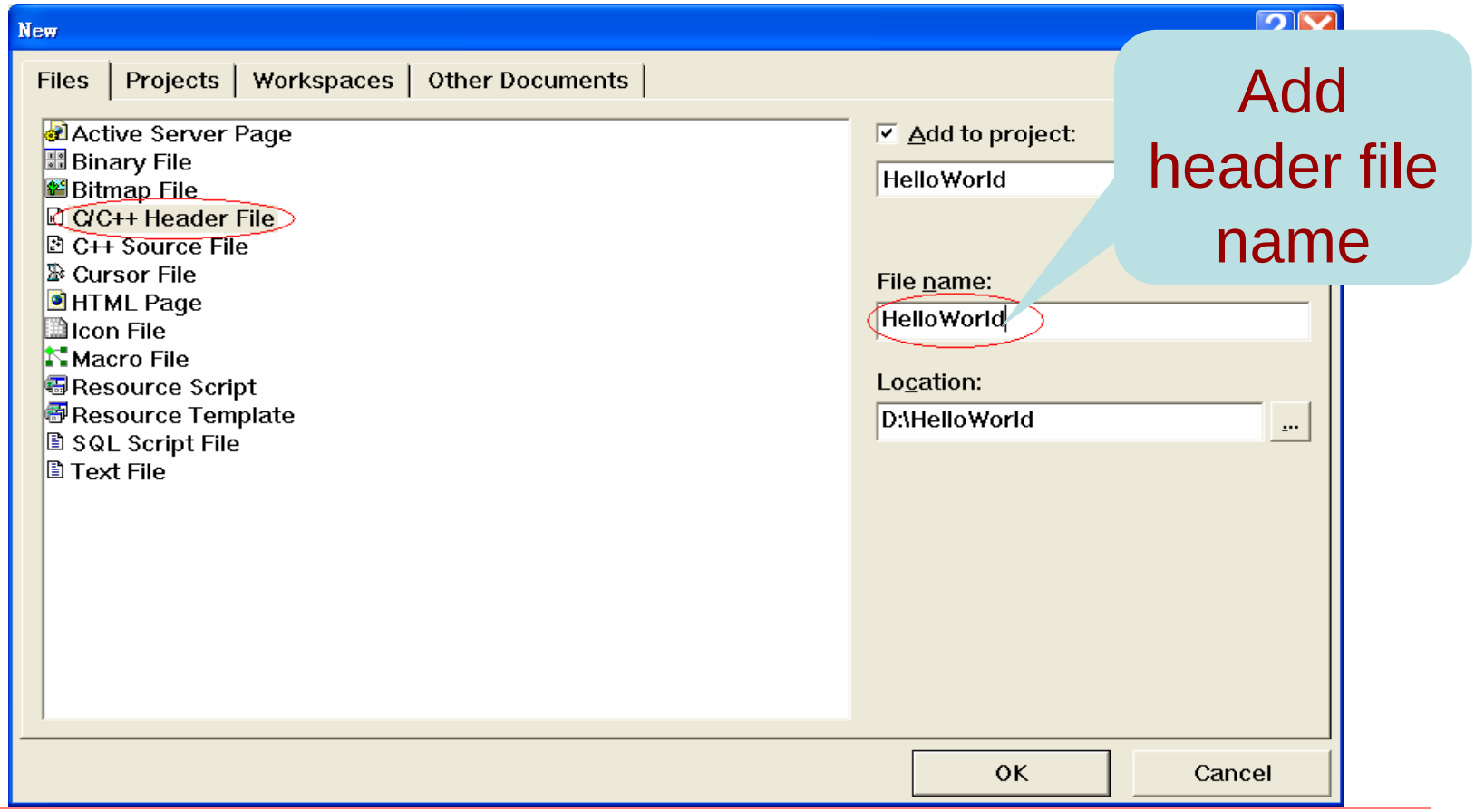
The first C program：HelloWorld

- Project construction information



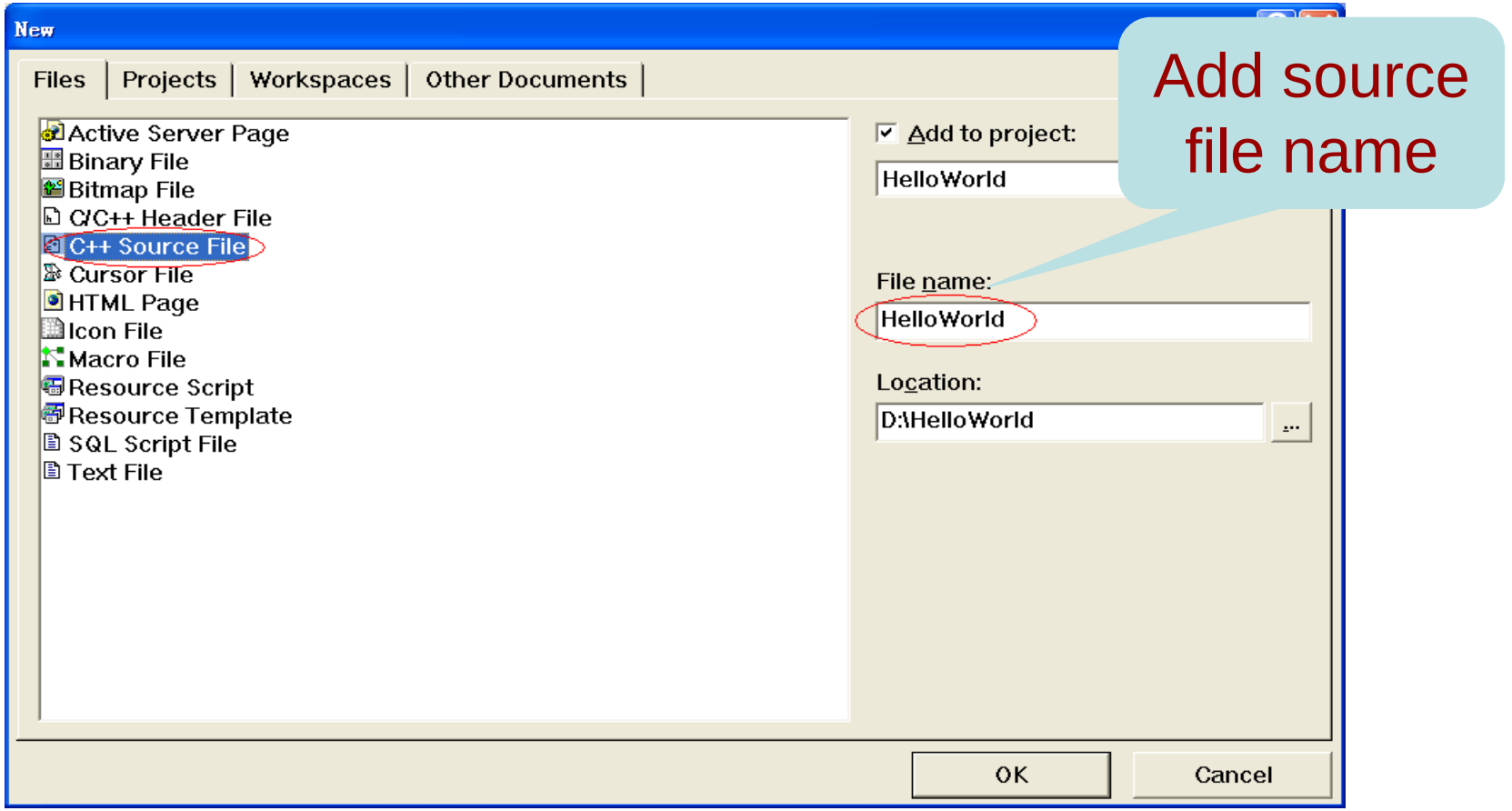
Add *.h file to the project

- Chose file->new->file->C/C++ Header File



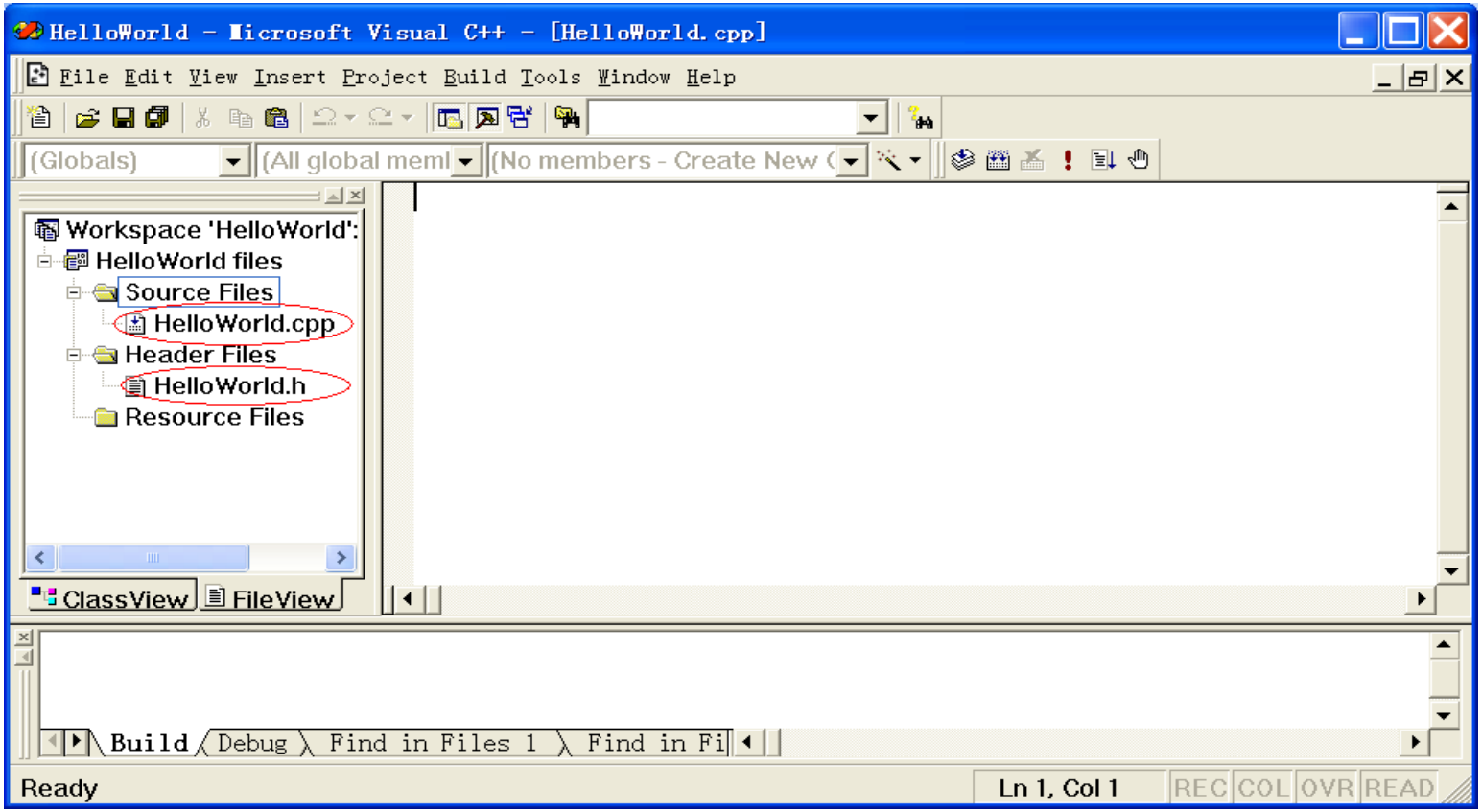
Add *.cpp (*.c) file to the project

- Choose menu file->new->file->C/C++ Source File



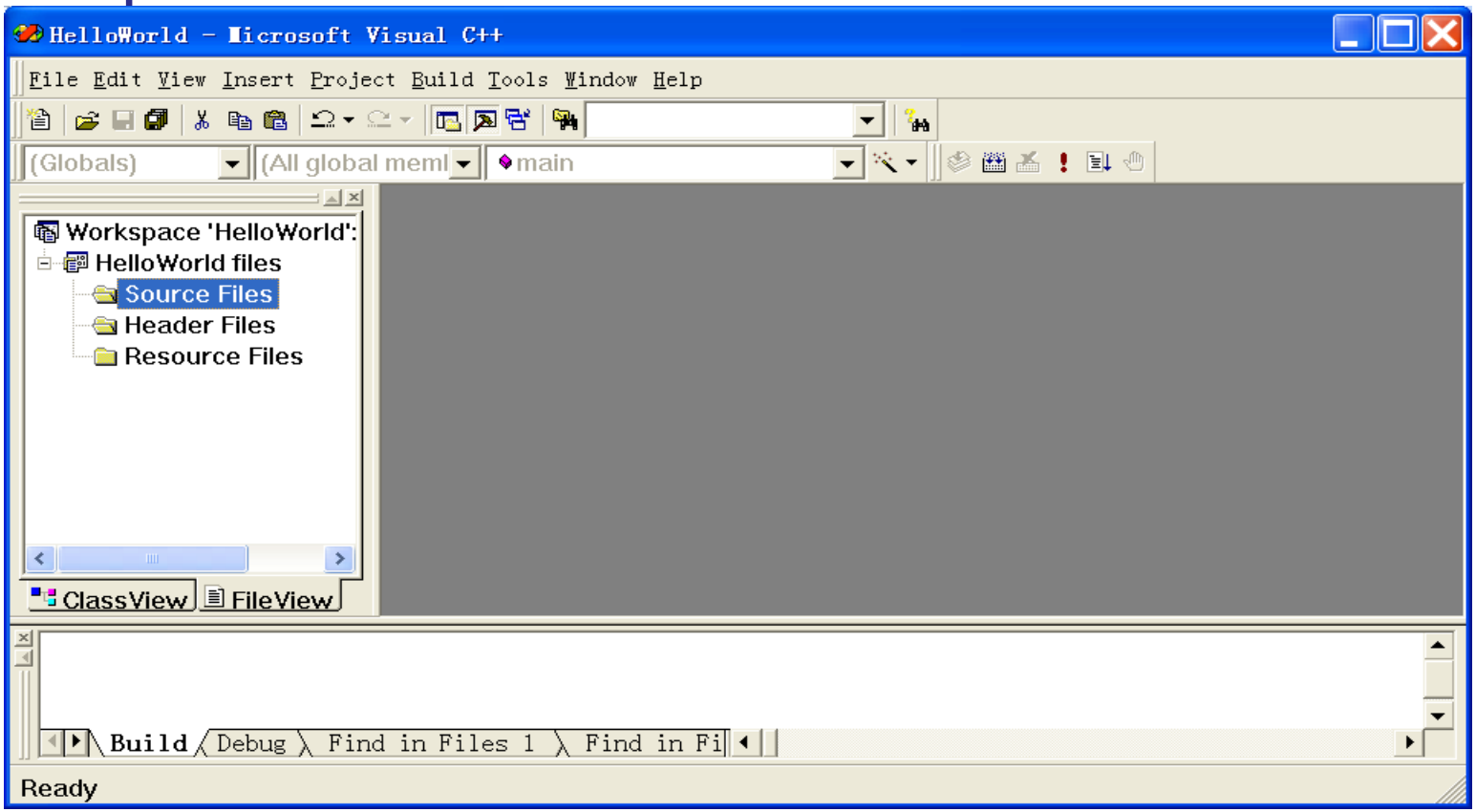
Project file view

- A project including a .h file and a .cpp file



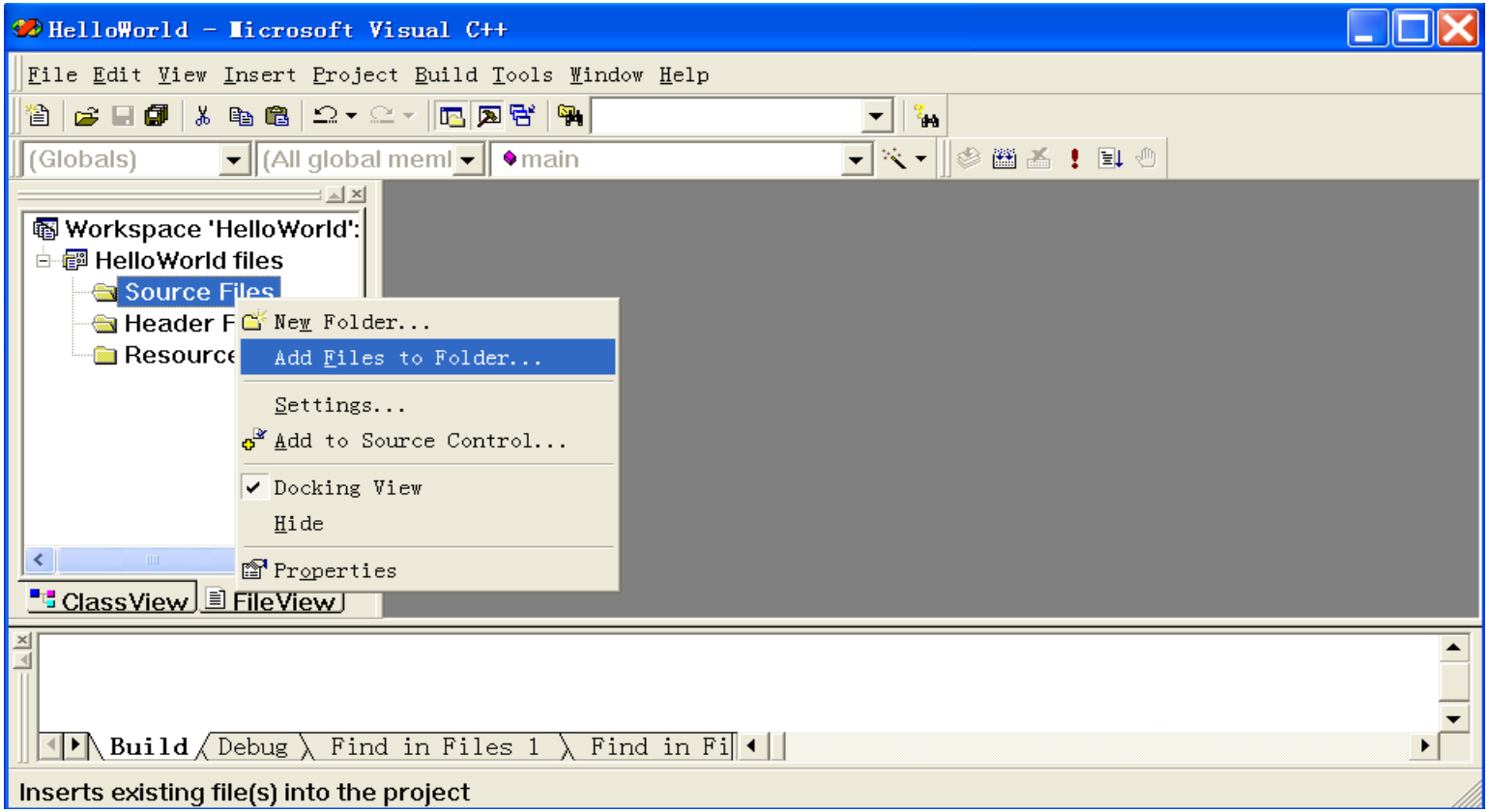
Directly add existed .h or .cpp files

- Choose Source Files or header files in File View plate



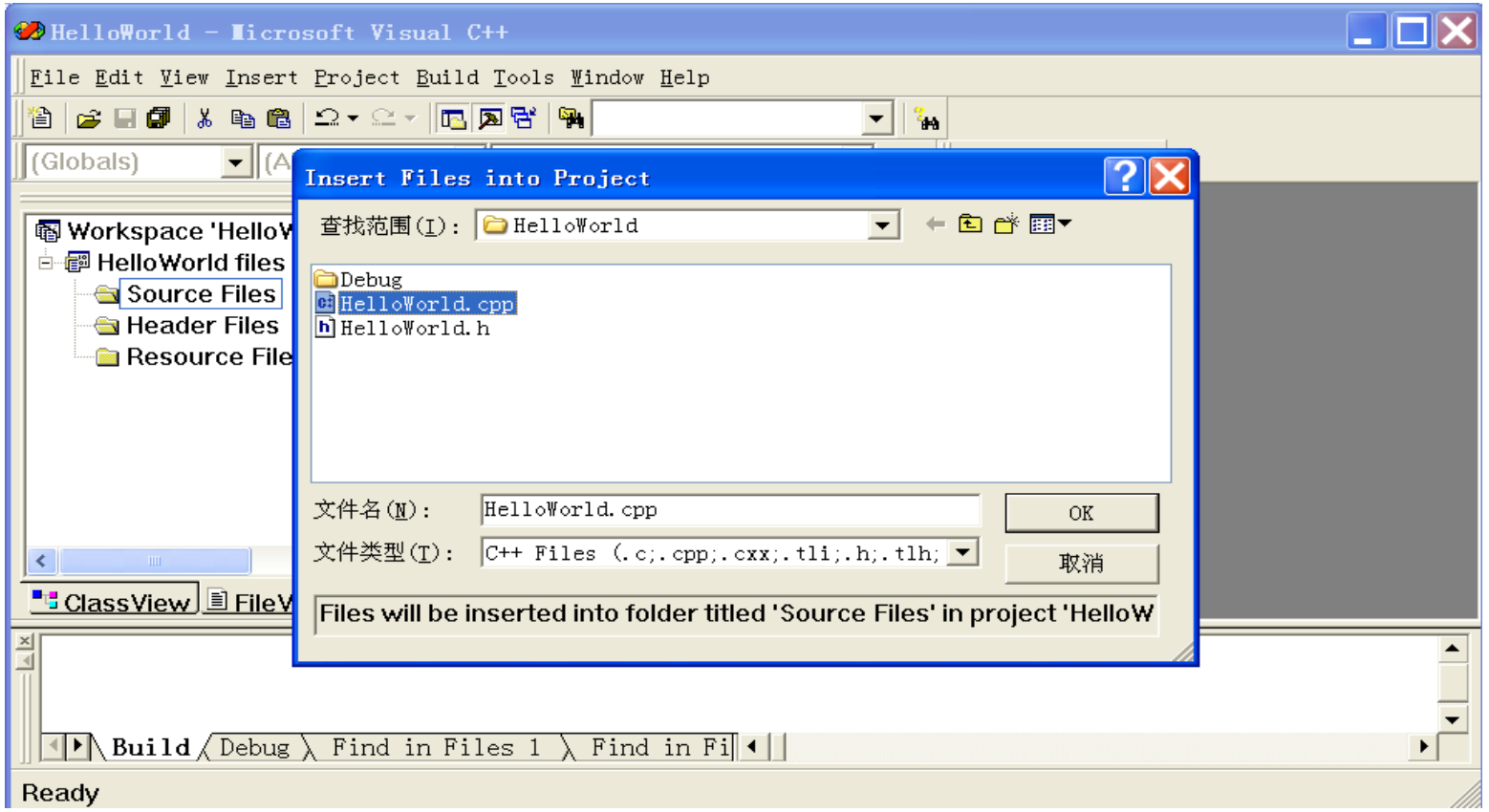
Directly add existed .h or .cpp files

- Click right key and choose Add Files to Folder…

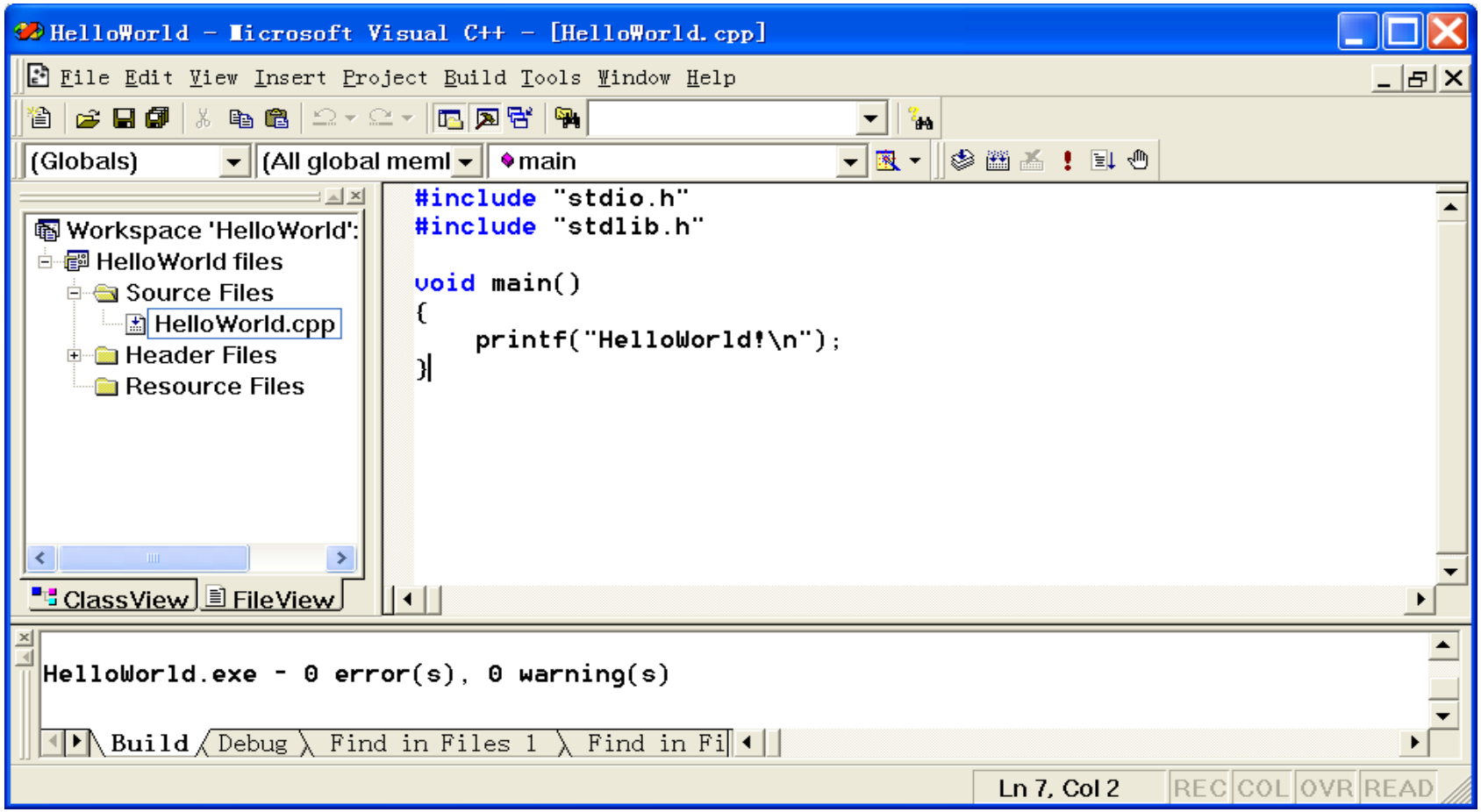


Directly add existed .h or .cpp files

- Choose .h，.cpp files from dialogue box



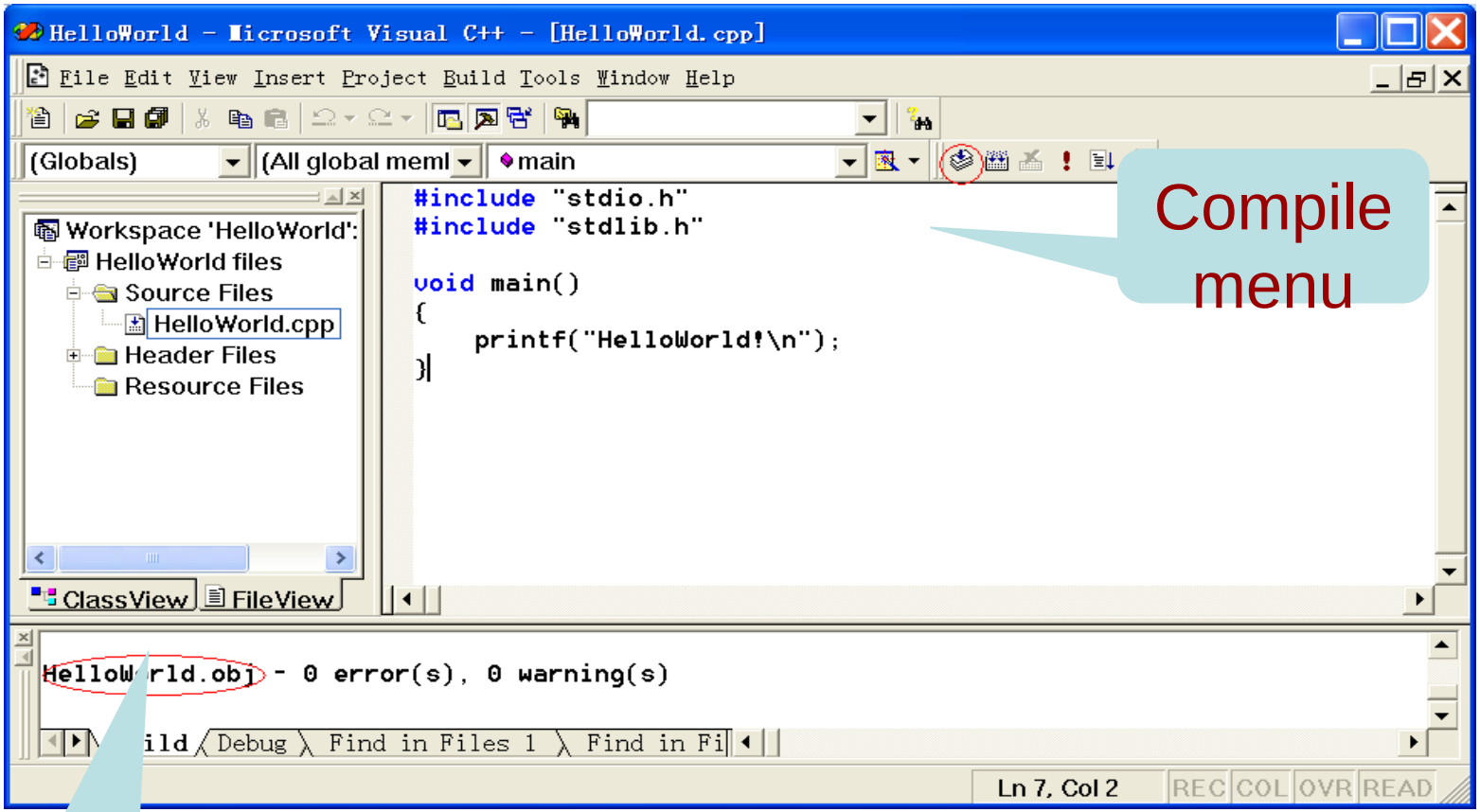
Add C code to the project



Compile

- After compiling, the *.obj file is created for linking
- Choose Build→Compile，or shortcut keys “Ctrl+F7” or click the Compile button directly.

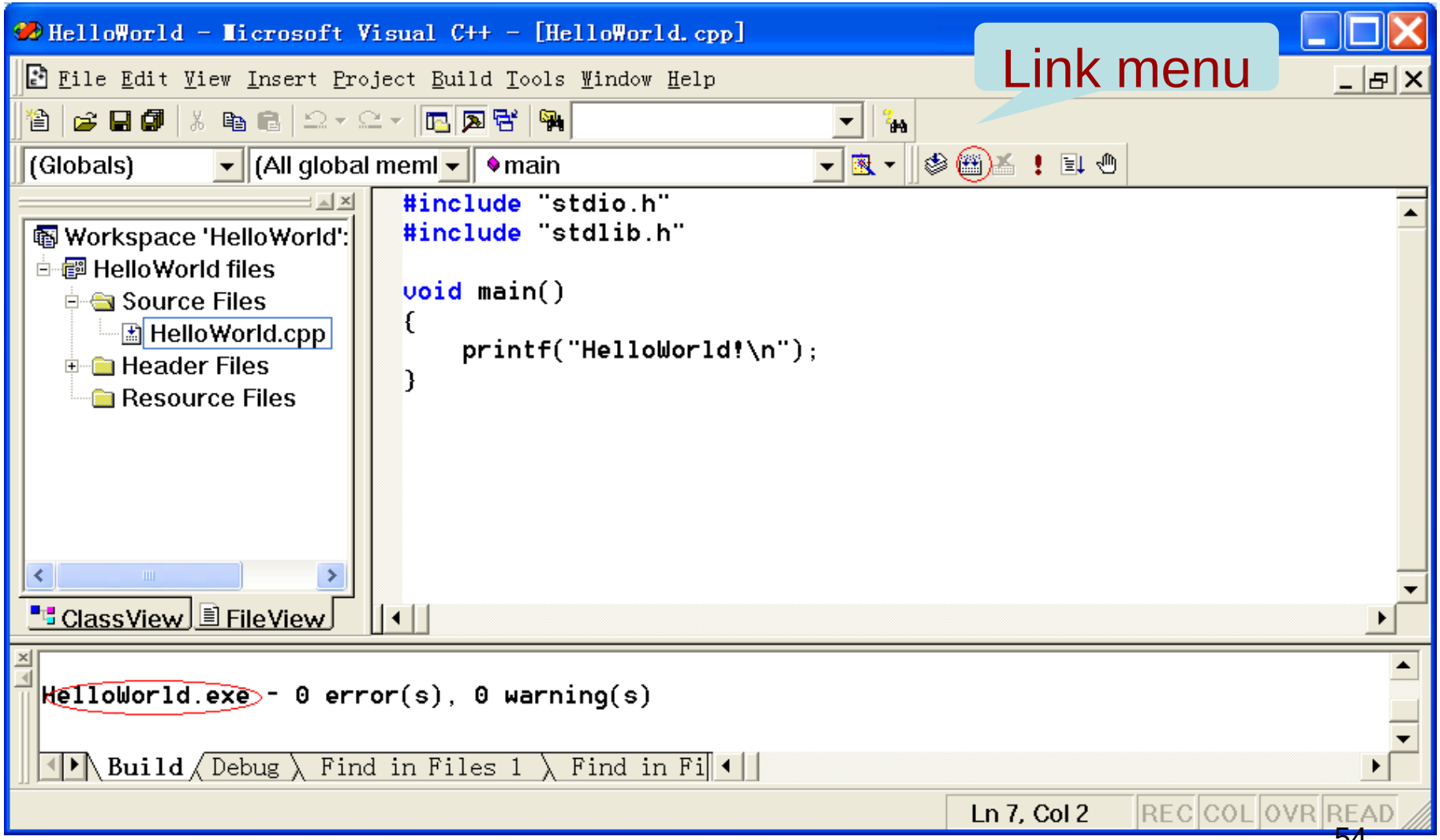
Compile


HelloWorld - Microsoft Visual C++ - [HelloWorld.cpp]
File Edit View Insert Project Build Tools Window Help
(Globals)
(All global meml
main
Workspace 'HelloWorld':
HelloWorld files
Source Files
HelloWorld.cpp
Header Files
Resource Files
ClassView
FileView
#include "stdio.h"
#include "stdlib.h"
void main()
{
printf("HelloWorld!\n");
}
HelloWorld.obj - 0 error(s), 0 warning(s)
Debug
Find in Files 1
Find in Fi
Ln 7, Col 2
REC COL OVR READ
Compile menu
Generate .obj file

Link

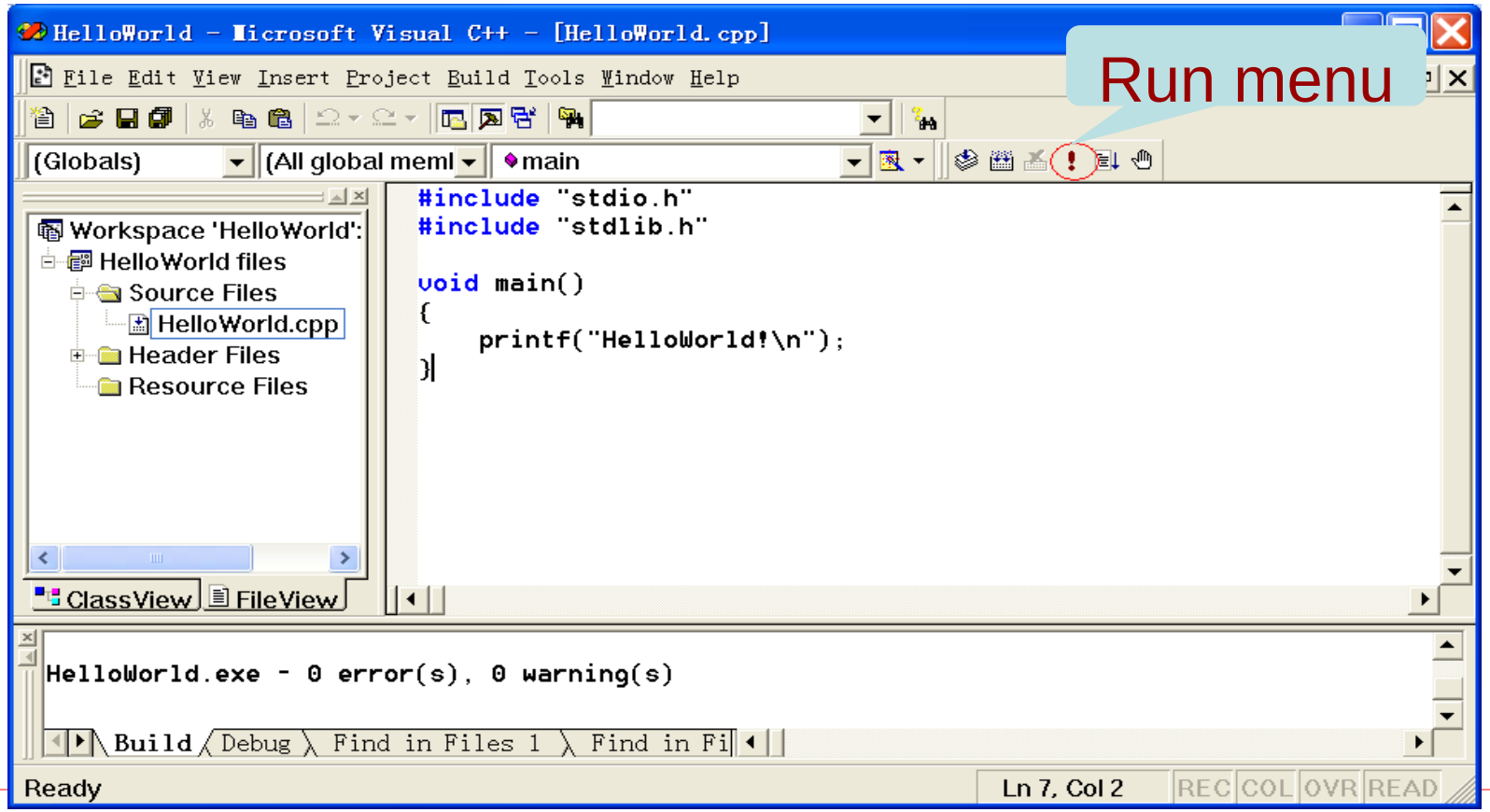
- After Linking, the *.exe file is created for executing
- Choose Build→Build，or shortcut keys “F7” or click the Build Button directly.

Link

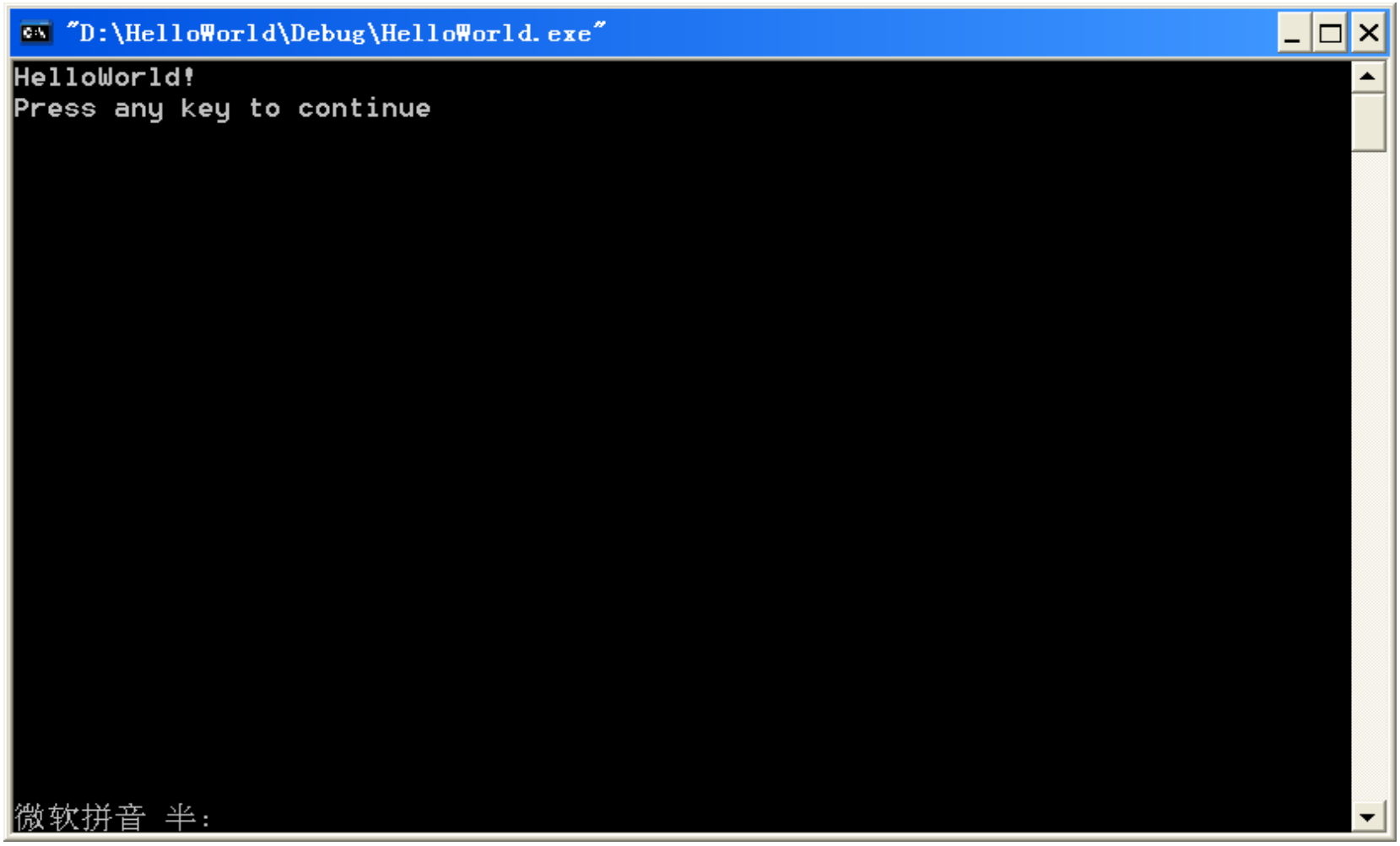

HelloWorld - Microsoft Visual C++ - [HelloWorld.cpp]
Link menu
File Edit View Insert Project Build Tools Window Help
(Globals)
(All global meml
main
Workspace 'HelloWorld':
HelloWorld files
Source Files
HelloWorld.cpp
Header Files
Resource Files
ClassView
FileView
#include "stdio.h"
#include "stdlib.h"
void main()
{
printf("HelloWorld!\n");
}
HelloWorld.exe - 0 error(s), 0 warning(s)
Build
Debug
Find in Files 1
Find in Fi
Ln 7, Col 2
REC COL OVR READ

Execute

- After successful linking, choose Build→Execute or shortcut keys “Ctrl+F5” or directly click Execute Button



Output


"D:\HelloWorld\Debug\HelloWorld.exe"
HelloWorld!
Press any key to continue
微软拼音 半:

Programming style

- Suggestions:
  - Indent(缩进)
  - { } alignment（对齐）
  - More comments
  - Suitable blank lines

```
void main( )
{
    int  i , j ,  sum;
    sum=0;
    for(i=1; i<10;i++)
   {
        for(j=1;j<10;j++)
        {
            sum+=i*j ;
        }
    }printf("%d\n",sum);
}
```

Reference

- The C Programming Language (Second Edition)，机械工业出版社， Brian W. Kernighan & Dennis M. Ritchie
- 《C语言程序设计》（第三版），清华大学出版社，谭浩强等
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- 《C语言程序设计》，天津大学出版社 ，高福成
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Thank you!