UNDERSTANDING THE PROGRAMMING

Ibn Musa **al-Khwarizmi** (Algorizm) (770 - 840 AD) was born in Uzbekistan. His parents migrated to Baghdad when he was a child. He is best known for introducing the mathematical concept Algorithm, which is so named after his last name.

Al-Khwarizmi was one of the greatest mathematicians who ever lived. He was the founder of several branches and basic concepts of mathematics. He is also famous as an astronomer and geographer. He is recognized as the founder of Algebra, as he not only initiated the subject in a systematic form but also developed it to the extent of giving analytical solutions of linear and quadratic equations. The name Algebra is derived from his famous book Al-Jabr wa-al-Muqabilah. He developed in detail trigonometric tables containing the sine functions. Al-Khwarizmi also developed the calculus of two errors, which led him to the concept of differentiation. He also refined the geometric representation of conic sections.

Programming is instructing a computer to perform a task for you with the help of a programming language. The instructing part requires a step by step solution to the task. This step by step solution is called an algorithm after the name of AlKharizmi.

People who make computer programs are called programmers. There are usually two difficulties for computer programmers; Finding a feasible algorithm (algorithm design) and writing the program (implementation). People who use the programs are called end-users.

A computer program (software) contains a sequence of instructions for a computer. One program is usually composed of three parts:

- Input part gets the data from an input device. Our programs, in the book, will get the data from keyboard or from a text file.
- Process part is the hardest working part of the program. It carries out the algorithm and finds out the desired result.
- Output part gives the result of the program. Our programs will display the result on the screen or print it into a text file.

The First C++ Program

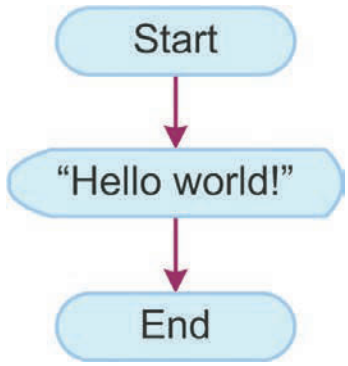
It is time to type our first C++ program. This program is going to prompt a line of text that says "Hello World!". This program has no input and no process but only output which says "Hello world!".

All the programs in this book have been compiled with Microsoft Visual Studio 2005. You can also compile them with GNU C++ (g++) in Linux environment, or use free Windows IDEs like Dev-C++ (http://www.bloodshed.net) and CodeBlocks (http://www.codeblocks.org).

```
/*
PROG: C1_01hello.cpp
Understanding structure of a C++ program.
Printing a line of text.
Using comments.
*/

#include <iostream>
//includes the declarations of the basic standard input-output
//library in C++, and its functionality is going to be used later
//in the program.

using namespace std;
//Namespaces are containers that contain the declarations of all
//the elements of the standard C++ library

int main()                    //the only function in this program.
{
  cout <<"Hello world!";      //print "Hello world!". cout is
                              //declared in the iostream standard
                              //file within the std namespace


  system("pause");            //Wait until user hits a key and
```

```
                                  //displays a message
  return 0;                       //the main function ends properly
}
```

```
Hello world!Press any key to continue . . .
```



Flowchart of the Program "01hello".

C++ programs consist of one or more modules. Each module performs a specific task. These modules are called functions. The "Hello World!" program has only one module that is the main function. Any C++ program is been started to execute from the main function so each program must have this function.

Before the functions, the program has an "**include**" and "**using namespace**" part. This part declares the libraries where the C++ commands we are going to use in the program are defined.

Like each sentence ends with a period ('.'), each C++ statement ends with a semicolon character ('**;**').

Besides the program codes, the program has some comments. C++ has two ways to insert comments into source code: Single line comment and multiple line comment. Single line comments are written behind the double slash characters ("**//**") and multiple line comments are enclosed between slash and asterisk ("**/***") and asterisk and slash ("***/**") characters. Comments are ignored by the compiler.

A **flowchart** is a visual representation of the algorithms. Is is made up of a few symbols: terminal, input, process, decision, output, and connector.

Breaking a Text into Multiple Lines

Use end of line "**endl**" or new line '**n/'** characters with in a cout statement to make a new line. '**n/**' characters are inherited from C programming. We prefer to use "**endl**" notation.

Include precise comments in your program to make it self-documentary and easy to read. Usually the reading time for programs is much more than the writing time.

```
/*
PROG: C1_02hello.cpp
Using endl.
*/
#include <iostream>
using namespace std;

int main()
{
  cout <<"Hello world!"<<endl;    //move the cursor to the
                                  //beginning of the next line.
  cout <<"This is my C++ program."<<endl<<endl;
  system("pause");
  return 0;
}
```

`cout<<"Hello "<<endl;` and `cout<<"Hello \n";` statemens print the same output.

```
Hello world!
This is my C++ program.

Press any key to continue . . .
```