Chapter 1 - Introduction to Computer Programming

At a Glance

Lesson Contents

Chapter Notes

Overview

Chapter 1 provides an introduction to computer programming. You will learn about the history of computers and about computer hardware. You will also learn about computer languages, how to classify them, and how executable programs are generated. Students will learn about algorithms and about the software development process. Through a case study, you will put to practice some of the concepts learned in the chapter. Finally, you learn about common programming errors and how to avoid them.

Objectives

- History and hardware
- Programming languages
- Algorithms
- The software development process
- Case study: Design and development
- Common programming errors

Topic Tips

History and Hardware

Topic Tip	The historical note on page 8 introduces Turing Machine. You may note that Turing's contributions to the field of computer science were so important that the highest award in the field of computing was named after him. For more information, see: **http://en.wikipedia.org/wiki/Turing_Award**.

Quick Quiz 1

1. The smallest and most basic data item in a computer is a _____; it is really a switch that can be either open (0) or closed (1).

2. What is the ALU of a computer?

3. What is the control unit of a computer?

4. A(n) _____ allows a computer to read or write any one file or program independent of its position on the storage medium.

Programming Languages

Topic Tip	For an example of the instruction set of an assembly language, see **http://home.comcast.net/~fbui/intel.html**.

Topic Tip	More on the history of algorithms can be found at: **http://en.wikipedia.org/wiki/Algorithm**.

Quick Quiz 2

1. What is an assembly language?

2. The program that translates a high-level source program as a complete unit before any individual statement is executed is called a(n) _____.

3. What is a linker?

4. When English phrases are used to describe an algorithm (the processing steps), the description is called _____.

The Software Development Process

Topic Tip	See the footnote on page 29 for a very interesting explanation on why the term *bug* is used to refer to program errors.

Quick Quiz 3

1. What is the software development process?

2. When writing a program, a(n) _____ structure provides the capability to make a choice between different instructions, depending on the result of some condition.

3. When writing a program, a(n) _____ structure involves summoning into action specific sections of code as they are needed.

4. What is a repetition structure?

Additional Resources

1. History of Computing Hardware:
   http://en.wikipedia.org/wiki/History_of_computing_hardware

2. C Programming Language:
   http://en.wikipedia.org/wiki/C_programming_language

3. Algorithm:
   http://en.wikipedia.org/wiki/Algorithm

4. Software Development Process:
   http://en.wikipedia.org/wiki/Software_development_process

Key Terms

- **Application software** consists of programs written to perform particular tasks required by users.应用软件
- The **Arithmetic and Logic Unit (ALU)** of a computer performs all of the computations, such as addition, subtraction, comparisons, and so on, that a computer provides.算术与逻辑单元
- Translator programs that translate assembly language programs into machine language programs are known as **assemblers**.汇编器
- Programming languages that use the substitution of word-like symbols, such as ADD, SUB, MUL, for the binary opcodes, and both decimal numbers and labels for memory addresses are referred to as **assembly languages**.汇编语言
- The smallest and most basic data item in a computer is a **bit**; it is really a switch that can be either open (0) or closed (1). 位

启动加载器

- The **bootstrap loader** is internally contained in ROM and is a permanent, automatically executed component of the computer's system software.
- The grouping of 8 bits to form a larger unit is an almost universal computer standard and is referred to as a **byte**. 字节
- The collections of patterns consisting of 0s and 1s used to represent letters, single digits, and other single characters are called **character codes**. 字符码
- Converting an algorithm into a computer program, using a language such as C, is called **coding the algorithm**. 为算法写代码
- When all of the statements in a high-level source program are translated as a complete unit before any individual statement is executed, the programming language is called a **compiled language**. 编译语言
- The program that translates a high-level source program as a complete unit before any individual statement is executed is called a **compiler**.编译器
- A **computer program** is a structured combination of data and instructions that is used to operate a computer and produce a specific result.计算机程序
- The **control unit** of a computer directs and monitors the overall operation of the computer.控制单元
- A **direct access storage device (DASD)** allows a computer to read or write any one file or program independent of its position on the storage medium.直接访问存储器
- An **executable program** is a program that can operate a computer.可执行程序

一级结构图

- A **first-level structure diagram** for an algorithm represents the first attempt at an initial, but not yet sufficiently detailed, structure for a solution algorithm.
- Initially, the most common magnetic disk storage device was the removable **floppy disk**. 软盘
- A **flowchart** provides a pictorial representation of an algorithm using specifically defined shapes. 流程图
- When mathematical equations are used to describe an algorithm, the description is called a **formula**. 公式
- In C, a procedure is referred to as a **function**. 函数
- Collectively, the components used to make a computer are referred to as **hardware**. 硬件
- When each statement in a high-level source program is translated individually and executed immediately upon translation, the programming language is called an **interpreted language**.

解释型语言

- The program that translates each statement in a high-level source program and executes it immediately upon translation is called an **interpreter**.解释器
- When writing a program, an **invocation** structure involves invoking, or summoning into action, specific sections of code as they are needed. 调用
- A **linker** combines additional machine language code with the object program to create a final executable program. 连接器
- Both machine and assembly languages are classified as **low-level languages**; this is because both of these language types use instructions that are directly tied to one type of computer. 低级语言

机器语言程序

- Executable programs are always written as a sequence of binary numbers, which is a computer's internal language, and are also referred to as **machine language programs**.

硬磁盘

- A **magnetic hard disk** consists of either a single rigid platter or several platters that spin together on a common spindle.
- In Java, a procedure is referred to as a **method**. 方法

微处理器

- CPUs are constructed as a single microchip, which is referred to as a **microprocessor**.

- Operating systems that permit each user to run multiple programs are referred to as both **multiprogrammed** and **multitasking** systems. 多程序多任务
- **Multiuser systems** are able to handle multiple users concurrently. 多用户系统
- The output produced by the compiler is called an **object program**, which is a machine language version of the source code.
- Languages with object orientation like C++, Java, Visual Basic, and C#, are known as **object-oriented languages**. 面向对象语言

操作码
- **Opcode** is short for operation code.
- Collectively, the set of system programs used to operate and control a computer is called the **operating system**. 操作系统

问题求解算法
- The three tasks of an overall solution algorithm are the primary responsibility of almost every problem, and we refer to this algorithm as the **Problem-Solver Algorithm**.

过程式语言
- In a **procedural language**, the available instructions are used to create self-contained units, referred to as procedures.

过程
- The purpose of a **procedure** is to accept data as input and transform the data in some manner to produce a specific result as an output.
- The program instructions resulting from coding an algorithm are referred to as **program code**, or simply **code**, for short. 程序代码，代码
- In an automobile, control is provided by the driver, who sits inside of and directs the car; in a computer, the driver is called a **program**.程序
- A statement of a problem, or a specific request for a program, is referred to as a **program requirement**.程序需求
- The set of instructions that can be used to construct a program is called a **programming language**. 程序设计语言
- **Programming** is the process of writing instructions in a language that the computer can respond to and that other programmers can understand. 编程
- When English phrases are used to describe an algorithm (the processing steps), the description is called **pseudocode**.伪代码
- When writing a program, a **repetition** structure, which is also referred to as **looping** and **iteration**, provides the ability for the same operation to be repeated based on the value of a condition.重复，循环，迭代

科学方法
系统方法
- Each field of study has its own name for the systematic method used to design solutions to problems. In science this method is referred to as the **scientific method**, while in engineering disciplines the method is referred to as the **systems approach**.

选择
- When writing a program, a **selection** structure provides the capability to make a choice between different instructions, depending on the result of some condition.

顺序
- When writing a program, a s**equence** structure defines the order in which instructions are executed by the program.

软件
- Another term for a program or set of programs is **software**.
- The technique used by professional software developers for understanding the problem that is being solved and for creating an effective and appropriate software solution is called the **software development process**. 软件开发过程
- Programs written in a computer language (high or low level) are referred to interchangeably as both **source programs** and **source code**.源程序，源代码

结构型语言
- A **structured language** is a high-level procedural language, such as C, that enforces structured procedures.

结构型过程
- Procedures conforming to structure guidelines are known as **structured procedures**.

系统软件
- **System software** is the collection of programs that must be readily available to any computer system to enable the computer to operate.

自上而下算法开发

易失的

- A **top-down algorithm development** starts at the topmost level and proceeds to develop more and more detailed algorithms as it proceeds to the final set of algorithms.
- Main memory is **volatile**; whatever is stored in it is lost when the computer's power is turned off.
- Main memories combine 1 or more bytes into a single unit, referred to as a **word**. 字