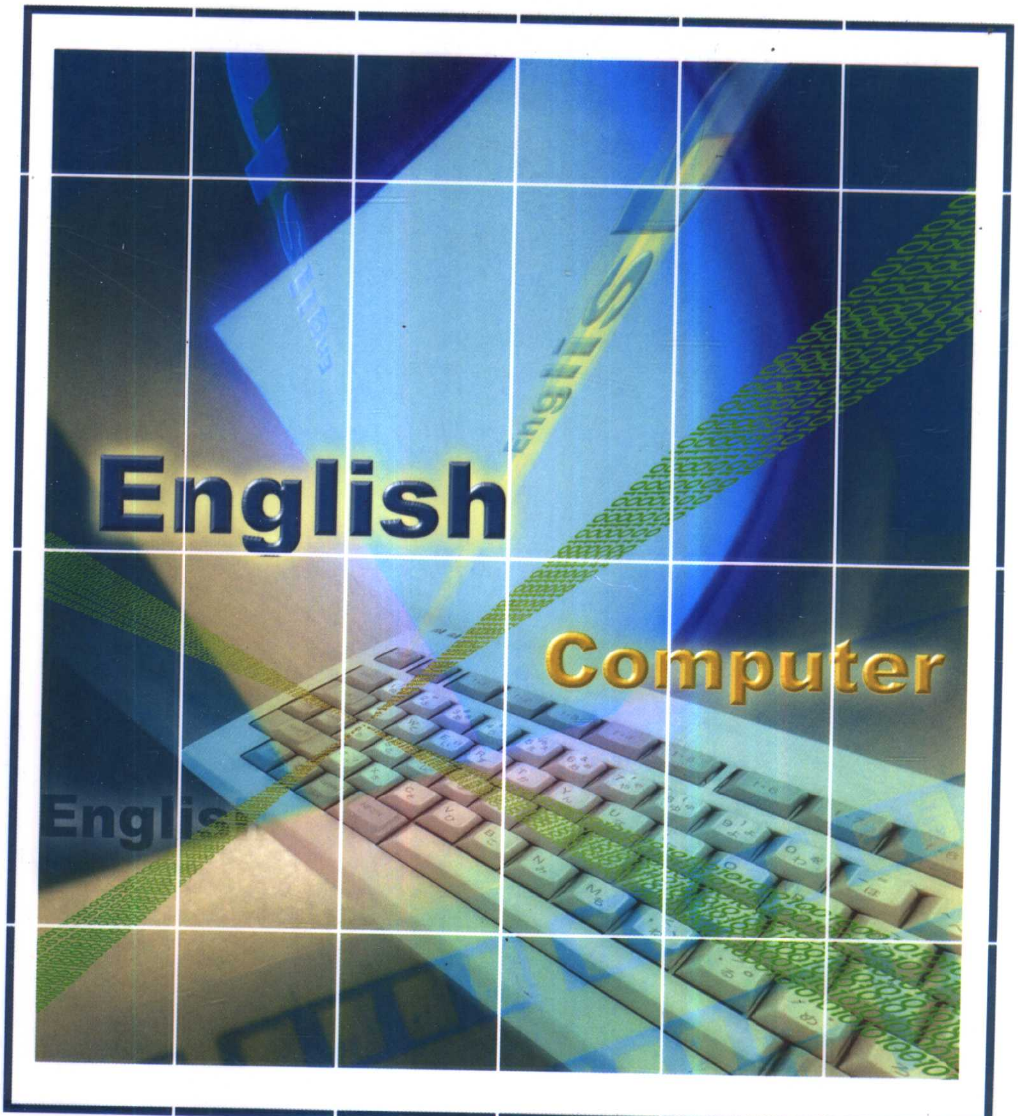
新世纪计算机类本科系列教材



最新计算机专业英语

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内 容 简 介

本书是一部关于计算机科学与技术领域的英语教材。书中对计算机技术基础内容作了全面总结，对计算机领域新技术的发展进行了追踪。本书取材新颖，系统性强。

为了帮助读者提高科技文献的阅读和写作能力，书中注释（Notes）部分对语言难点进行了诠释，基本术语（Key Terms）部分对计算机专业术语进行了解释，练习（Exercises、Discussions）部分将有助于读者对课文内容的理解，写作（Writing）部分专题讲述了科技英语写作的一些方法。另外，为了方便读者学习，我们还给出了原材料的参考译文。

本书可作为大专院校的计算机专业英语教材，也可以作为相关专业的工程技术人员提高计算机英语水平的读物。

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前　言

计算机技术发展日新月异，它影响着社会生活的各个方面。为了提高我国广大科技人员和计算机用户阅读和理解计算机技术英文资料的能力，我们特编写了本书。在本书的编写过程中，我们参考了大量国内外优秀的文献，既注重基础知识又突出新技术。内容新和对某一方面的知识进行系统性的总结是本书的重要特色。

全书分为两部分。第一部分为计算机系统基础，包括计算机系统和组成、操作系统、数据库和数据仓库、管理支持系统、人工智能和智能代理、超流水线技术和超标量技术、磁盘冗余阵列和电子商务等。第二部分介绍了计算机新技术的发展及趋势，包括软硬件同步设计、IP 电话技术及发展、神经接口技术、中间件技术、网络安全与反病毒技术、实时 Java 技术等。

为了帮助读者提高科技文献的阅读和写作能力，我们对每篇原材料中的语言难点进行了诠释（Notes 部分），对计算机专业术语进行了解释（Key Terms 部分），并配备了课后练习（Exercises、Discussions 部分）和参考译文，同时我们还为读者讲述了科技英语写作的一些方法和技巧（Writing 部分）。

本书由西北工业大学计算机科学与工程系王丽芳主编，由西北工业大学外语系阮红梅、杨林和西北工业大学计算机科学与工程系聂培尧编写。感谢刘伟同学奉献他的作品 Science Development: The Source of Civilization 用于本书。感谢陈江对本书的关心。陈骥、姚宁波、陈小平、王勇等人对本书的出版也做了有意义的工作，在此我们深表谢意！对参考文献的作者，我们表示最诚挚的感谢！

由于作者水平有限，书中难免有不当之处，敬请读者批评指正！

编　者

2001 年 4 月

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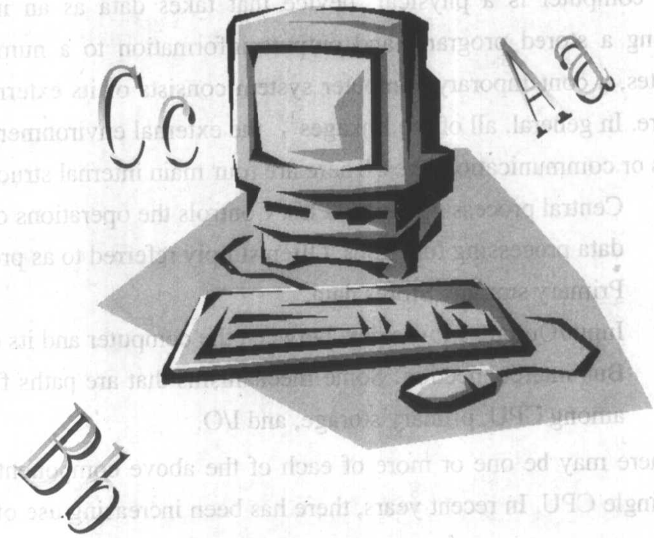
参 考 译 文

第一部分　计算机系统基础

Part I



Fundament of Computer System

1

The Computer System and Components

A computer is a physical[1] device that takes data as an input, transforms these data by executing a stored program, and outputs information to a number of devices. As Figure 1-1 illustrates, a contemporary computer system consists of its external environment and its internal structure. In general, all of the linkages[2], the external environment can be classified as peripheral devices or communication lines. There are four main internal structural components:

- Central processing unit (CPU): Controls the operations of the computer and performs its data processing functions. Often simply referred to as processor.
- Primary storage: Stores data.
- Input/Output: Moves data between the computer and its external environment.
- Bus interconnection: Some mechanisms that are paths for transmitting data and signals among CPU, primary storage, and I/O.

There may be one or more of each of the above components. Traditionally, there has been just a single CPU. In recent years, there has been increasing use of multiple processors in a single system.

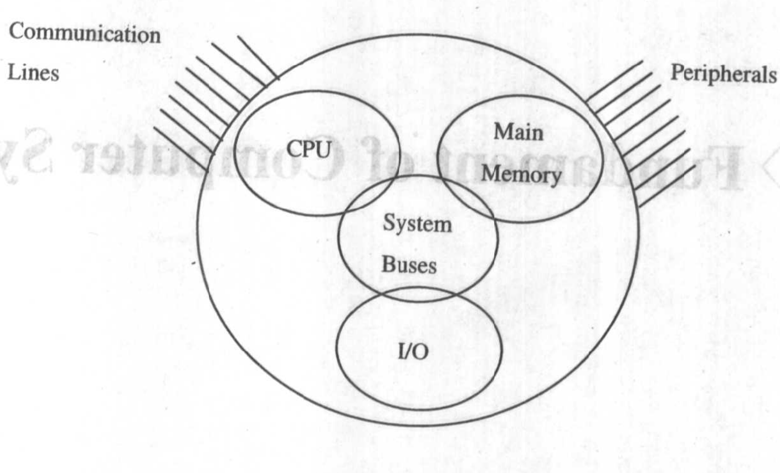


Figure 1-1 The Computer

1.1 The CPU

The CPU is responsible for the manipulation of symbols, numbers, and letters and also controls the other parts of the computer system. The CPU has two major sections: an arithmetic-logic unit (ALU) and a control unit. Both of these units work closely with primary memory to carry out processing tasks inside the system unit.

Primary Memory Primary memory (also called main memory, primary storage, and internal storage) holds:

- The programs and the data being used by those programs.
- Intermediate processing results.
- Output that is ready to be transmitted to secondary storage or to an output device.

Once[3] programs, data, intermediate results, and output are stored in primary memory, the CPU has to be able to find them again. Thus each location in primary memory has an address. In many computer systems, a single address will store a single character of data. The size of primary memory varies from computer to computer. Whenever an item of data, an instruction, or the result of a calculation is stored in memory , it is assigned an address , so the CPU can locate it again when it is needed .

Primary memory is relatively expensive and limited in size. For this reason it is only used temporarily. Once the computer is finished with specific pieces of data and program instructions, they are overwritten[4] by new incoming data or program instructions, released as output, or returned to secondary storage.

The Arithmetic-Logic Unit The arithmetic-logic unit (ALU) is the section of the CPU that does arithmetic and logic operations on data. Arithmetic operations include such tasks as addition, subtraction, multiplication, and division. Logic operations involve the comparison of two items of data to determine if they are equal, and if not[5], which is larger. All data coming into the CPU, including non-numeric data such as letters of the alphabet, are coded in digital (numeric) form. As a result, the ALU can perform logical operations on letters and words as well as on numbers. Such basic arithmetic and logic operations are the only ones the computer can perform. That might not seem very impressive, but when combined in various ways at great speed, these operations enable computers to perform immensely complex tasks.

The Control Unit The control unit controls and coordinates the other components of the computer. It reads stored program, instructs one at a time, and based on what the program tells it to do, directs other components of the computer to perform the required tasks.[6] For example, it might specify which data should be placed in primary storage, which operation the ALU should perform on the data, and where the results should be stored. It might also direct the result to an appropriate output device, such as a printer. After each instruction is executed, the control unit proceeds to the next instruction.

Registers To enhance the effectiveness of the computer, the control unit and ALU contain special storage locations that act as high-speed staging areas[7]. These areas are called registers. Since[8] registers are actually a part of the CPU, their contents can be handled much more rapidly than the contents of primary memory. So to speed up processing, for example, program instructions and data are normally loaded into the registers from primary memory just before processing. These devices play a crucial role in making computer speeds extremely fast.

There are several types of registers, including those listed here: instruction register and address register: before each instruction in a program is processed, the control unit breaks it into two parts. The part that indicates what the ALU is to do next (for example, add, multiply, compare) is placed in the instruction register. The part that gives the address of the data to be used in the operation is placed in the address register. Storage register: the storage register temporarily stores data that have been retrieved from primary memory prior to[9] processing. Accumulator: the accumulator temporarily stores results of ongoing arithmetic and logic operations. Flag register: the ALU will also set flags as the result of an operation. For example, an overflow flag is set to 1 if the result of a computation exceeds the length of the register into which it is to be stored. The instruction and address registers are often located in the control unit, whereas the storage register, accumulator, and flag register are often in the ALU.

1.2 Memory Devices

Several kinds of semiconductor memory chips are used in primary storage. Each serves a different purpose.

Random-Access-Memory Random-access-memory (RAM) is used for short-term storage of data or program instructions. The contents of RAM can be read and changed when required. RAM is volatile: this means that if the computer's electricity supply is disrupted or the computer is turned off, its contents will be lost. Thus, RAM can be used only as temporary storage.

RAM technology has been divided into two technologies: static and dynamic. A dynamic RAM is made with cells that store data as charge on capacitors. Because capacitors have a natural tendency to discharge, dynamic RAMs require periodic charge refreshing to maintain data storage. In a static RAM, binary values are stored using traditional flip-flop logic-gate configurations. A static RAM will hold its data as long as power is supplied to it. A dynamic RAM is more dense and less expensive than a corresponding static RAM, whereas[10] static RAMs are generally somewhat faster than dynamic RAMs.

Read-Only Memory Because of advances in small semiconductor memories, there has a trend in recent years to build some software functions directly into computer chips. Like RAM, these all electronic chips are mounted on boards inside the system unit. Once placed on these chips, programs can be accessed very rapidly. On many microcomputers, for example, the operating system is built onto a chip rather than being stored on a floppy disk. This kind of " software in hardware" is called firmware. Several kinds of firmware are available.

Read-only memory (ROM) is by far the most common form of firmware. A ROM module contains a program supplied by the manufacture. The program can be read from the module, but it is impossible for a user to destroy the contents of the module by accidentally writing over them (hence "read-only").

Like the ROM, the programmable ROM (PROM) is nonvolatile and may be written into only once. For the PROM, the written process is performed electrically and may be performed by a supplier or customer at a time later than the original chip fabrication. Special equipment is required for the writing or "programming" process. PROMs provide flexibility and convenience.

The Erasable Programmable Read-Only Memory (EPROM) EPROM is read and written electrically, as with PROM. However, before a write[11] operation, all the storage cells must be erased to the same initial state by exposure of the packaged chip to ultraviolet radiation. This erasure process can be performed repeatedly; each erasure can take as much as 20 minutes to perform. Thus, the EPROM can be altered multiple times and, like the ROM and PROM, holds its data virtually indefinitely. For comparable amounts of storage, the EPROM is more expensive than PROM, but it has the advantage of the multiple update capability.

Electrically Erasable Programmable Read-Only Memory (EEPROM) EEPROM can be written into at any time without erasing prior contents, only the byte or bytes addressed are update. The write operation takes considerably longer than the read operation, on the order of several hundred microseconds per byte. The EEPROM combines the advantage of nonvolatile with the flexibility of being updateable in place, using ordinary bus control, address, and data lines. EEPROM is more expensive than EPROM and also is less dense, supporting fewer bits per chip.

Flash Memory The newest form of semiconductor memory is flash memory (so named because of the speed with which it can be reprogrammed). First introduced in the mid-1980s, flash memory is intermediate between EPROM and EEPROM in both cost and functionality. Like EEPROM, flash memory uses an electrical erasing technology. An entire flash memory can be erased in one or a few seconds, which is much faster than EPROM. In addition, it is possible to erase just blocks of memory rather than an entire chip. However, flash memory does not provide byte-level erasure. Like EPROM, flash memory uses only one transistor per bit, and so achieves the high density (compared with EEPROM) of EPROM.

1.3 Input / Output

Input and output devices make it possible for human beings to interact with computers. The speed, capacity, and ease of use of input and output devices have a direct bearing on the performance of an entire information system.

Input Technology Input device can be viewed as some of the sense organs of a computer system. Our input sense organs for sight, sound, touch, taste, and smell convey information to our central nervous system. Along the way, this information is encoded into a pattern that the brain can process. In an analogous way, keyboards, computer terminal, digital scanners, touch screens, computer mouse, pen-based input, optical character recognition, sensing devices, and voice input devices are some of the ways computer systems receive information, that is then encoded for processing.

Generally, an information system is activated by the input of data or information. Input can also deactivate[12] processing, just as a light switch turn off a light as well as turn it on. Thus the primary role of input is active or deactive information pressing.

Input is a process that involves the use of a device to encode or transform data into digital codes that the computer can process. For example, if you press the letter A on the keyboard terminal or personal computer, you activate an information cycle. The key is simply a switch that senses a finger touch and triggers a cycle to accomplish the following: (1) the keystroke is encoded, or converted into a machine-readable code, (2) the encoded piece of data is stored in a memory location for later processing, and (3) output is provided by displaying the letter A on the computer's monitor screen.

Output Technology Information processing is complete when the results of processing are communicated. The pattern that a computer program produces is a stream of coded symbols. In most cases, it is the job of the output device to decode these code symbols into a form of information that is easy for people to use or understand, such as text, pictures, graphics, or sound.

The exception to this rule arises when the output from a computer system is not intended directly to use by people. A good example of this is saving[13] your files on a mass-storage device for later input to the computer. A more dramatic example is a factory computer system in which the output is designed for use by machines instead of people. One of the earliest examples of this, the numerically controlled machine, such as drill presses, lathes, and milling machine, uses the output of a computer program to control directly its own operation without human involvement. In this example, humans are involved only when they take the output of a program, which is usually a strip of punched paper tape, mount it on the machine's input device, and start up the machine. Today, entire factories are run by robots. These robots are not the kind we see in science fiction movies, but rather programmable general-purpose manipulators that are capable of controlling and operating an entire assembly line.

1.4 Bus Interconnection

A bus is a communication pathway connecting two or more devices. A key characteristic of a bus is that it is a shared transmission medium. Multiple devices connect to the bus, and a signal transmitted by any one device is available for reception by all other devices attached to the bus. If