21 世纪高等院校计算机系列规划教材

Computer

□ 主 编 陈建峡

计算机英语

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内 容 简 介

本书是用英语编写的计算机专业技术教材，按照计算机知识的结构层次编写，分为计算机基础、软件工程、计算机网络和计算机应用四大部分。本教材的课文来源于经典原版外文书籍的摘录和改写，结构清晰合理，语言地道简洁。

书中每单元介绍一个研究领域，分为两篇课文：第一篇课文是对某项计算机技术的理论概述，介绍其历史、原理、研究方法以及将来的发展趋势；第二篇课文是关于该理论技术在生活中的某个具体应用。

与同类教材的不同之处在于，本书在每个单元后增添了实用科技论文写作指导，给出了许多例句和范文，以便帮助读者熟悉和掌握科技论文的写作方法，增强专业交流的能力。

本书可供大专院校计算机及 IT 相关专业的学生学习计算机专业英语使用，也可供参加各类计算机考试的考生、IT 行业的技术人员以及谋求出国发展的计算机人才学习参考。

前　言

计算机技术和英语是跨世纪人才事业腾飞的两翼，缺一不可。计算机专业英语对于计算机专业的人才更是必不可少的工具。编者执教多年，常看到一些专业优秀的学生被英语这只“拦路虎”所困扰，限制了自我的发展。事实上，英语的学习没有窍门，“唯手熟耳”，正如钱钟书先生所说“绝顶聪明的人，偏要下最笨的工夫”。

本教材的课文来源于经典原版外文书籍的摘录和改写，结构清楚合理，语言地道简洁，并给出大量科技论文写作的例句和范文。希望本教材使读者能够掌握计算机英语的特点和专业词汇，提高阅读计算机外文书籍及文献资料的能力，同时加强运用英语交流专业知识的能力。

本书由陈建峡主编。全书共有 12 个单元。陈建峡编写第 1、2、12 单元课文和第 1、6、7、9、10、11、12 单元科技论文部分；陈晓炜编写第 7、8、9 单元课文和第 2、3 单元科技论文部分；陈永辉编写第 3 单元课文和第 4 单元科技论文部分；陈菲编写第 4 单元课文和第 5 单元科技论文部分；梅清编写第 5 单元课文和第 8 单元科技论文部分；刘建舟编写第 6、10 单元课文；李红编写第 11 单元课文。本书在出版过程中得到华中科技大学出版社的鼎力支持，在此表示衷心的感谢！

由于编者水平有限，书中难免有不当之处，敬请读者批评指正。

编者

2005 年 8 月于武汉

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Section A Computer Overview

I. Introduction to Computer

A computer is a machine with an **intricate network** of electronic **circuits** that operate **switches** or **magnetize** tiny metal **cores**. The switches, like the cores, are capable of being in one of two possible states that is, on or off; magnetized or **demagnetized**. The machine is capable of storing and **manipulating** numbers, letters, and **characters**.

The basic job of computers is the **processing** of information. For this reason, computers can be defined as devices, which accept information in the form of instructions called a program and characters called data, perform mathematical and/or logical operations on the information, and then supply results of these operations. The program, or part of it, which tells the computers what to do and the data, which provide the information needed to solve the problem, are kept inside the computer in a place called memory.

Computers are thought to have many remarkable powers. However, most computers, whether large or small have three basic capabilities. First, computers have circuits for performing arithmetic operations, such as addition, **subtraction**, division, multiplication and **exponentiation**. Second, computers have a means of communicating with the user. After all, if we couldn't feed information in and get results back, these machines wouldn't be of much use. However, certain computers (commonly **minicomputers** and **microcomputers**) are used to control directly things such as robots, **aircraft navigation** systems, medical instruments, etc. Some of the most common methods of inputting information are to use **punched cards**, **magnetic tape**, disks, and **terminals**. The computer's input device (which might be a card reader, a tape drive or disk drive, depending on the medium used in inputting information) reads the information into the computer. For outputting information, two common devices used are a printer which prints the new information on paper, or a **CRT** display screen which shows the results on a TV-like screen.

Third, computers have circuits, which make decisions. The kinds of decisions which computer circuits can make are not of the type: "Who would win a war between two countries?" or "Who is the richest person in the world?" Unfortunately, the computer can only decide three things. Namely: Is one number less than another? Are two numbers equal? And, is one number greater than another?

II. History of Computers

Let us take a look at the history of the computers that we know today. The very first calculating device used was the ten fingers of a man's hands. This, in fact, is why today we still count in tens and multiples of tens. Then the **abacus** was invented, a bead frame in which the beads are moved from left to right. People went on using some form of abacus well into the 16th century, and it is still being used in some parts of the world because it can be understood without knowing how to read.

During the 17th and 18th centuries many people tried to find easy ways of calculating. J. Napier, a Scotsman, devised a mechanical way of multiplying and dividing, which is how the modern **slide rule** works. Henry Briggs used Napier's ideas to produce **logarithm tables** which all mathematicians use today. **Calculus**, another branch of mathematics, was independently invented by Sir Isaac Newton, an Englishman, and Leibniz, a German mathematician.

The first real calculating machine appeared in 1820 as the result of several people's experiments. This type of machine, which saves a great deal of time and reduces the possibility of making mistakes, depends on a series of ten-toothed gear wheels. In 1830 Charles Babbage, an Englishman, designed a machine that was called "The Analytical Engine". This machine, which Babbage showed at the Paris Exhibition in 1855, was an attempt to cut out the human being altogether, except for providing the machine with the necessary facts about the problem to be solved. He never finished this work, but many of his ideas were the basis for building today's computers.

In 1930, the first **analog** computer was built by an American named Vannevar Bush. This device was used in World War II to help guns Mark 1, the name given to the first digital computer, was completed in 1944. The men responsible for this invention were Professor Howard Aiken and some people from IBM. This was the first machine that could figure out long lists of mathematical problems, all at a very fast rate. In 1946 two engineers at the University of Pennsylvania, J. Eckert and J. Mauchly, built the first **digital** computer using parts called **vacuum tubes**. They named their new invention ENIAC. Another important advancement in computers came in 1947, when John von Newmann developed the idea of keeping instructions for the computer inside the computer's memory.

The first generation computers, which used vacuum tubes, came out in 1950. Univac I is an example of these computers which could perform thousands of calculations per second. In 1960, the second generation computers was developed and these could perform work ten times faster than their predecessors. The reason for this extra speed was the use of **transistors** instead of vacuum tubes. Second-generation computers were smaller, faster and more dependable than first-generation computers. Third-generation computers appeared on the market in 1965. These computers could do a million calculations a second, which are 1 000 times as many as first-generation computers. Unlike second-generation computers, these are controlled by tiny integrated circuits and are consequently smaller and more dependable. Fourth-generation computers have now arrived, and the integrated circuits that are being developed have been greatly reduced in size.

This is due to **microminiaturization**, which means that the circuits are much smaller than before; as many as 1 000 tiny circuits now fit onto a single **chip**. A chip is a square or rectanular piece of silicon, usually form 1/10 to 1/4 inch, upon which several layers of an integrated circuit are etched or imprinted, after which the circuit is encapsulated in plastic, ceramic or metal. Fourth-generation computers are 50 times faster than third-generation computers and can complete approximately 1 000 000 instructions per second.

At the rate computer technology is growing, today's computers might be obsolete by 1985 and most certainly by 1990. It has been said that if transport technology had developed as rapidly as computer technology, a trip across the Atlantic Ocean today would take a few seconds.

III. Characteristics

All computers have several characteristics in common, regardless of make or design. Information, in the form of instructions and data, is given to the machine, after which the machine acts on it, and a result is then returned. The information presented to the machine is the input; the internal manipulative operations, the processing; and the result, the output. These three basic concepts of input, processing, and output occur in almost every aspect of human life whether at work or at play. For example, in clothing manufacturing, the input is the pieces of cut cloth, the processing is the sewing together of these pieces, and the output is the finished garment.

Figure 1.1 shows **schematically** the fundamental hardware components in a computer system. The centerpiece is called either the computer, the **processor**, or, usually, the **central processing unit** (CPU). The term "computer" includes those parts of hardware in which calculations and other data manipulations are performed, and the high-speed internal memory in which data and calculations are stored during actual execution of programs. Attached to the CPU are the various **peripheral devices** such as card readers and keyboards (two common examples of input devices). When data or programs need to be saved for long periods of time, they are

stored on various **secondary memory devices** or storage devices such as magnetic tapes or magnetic disks.

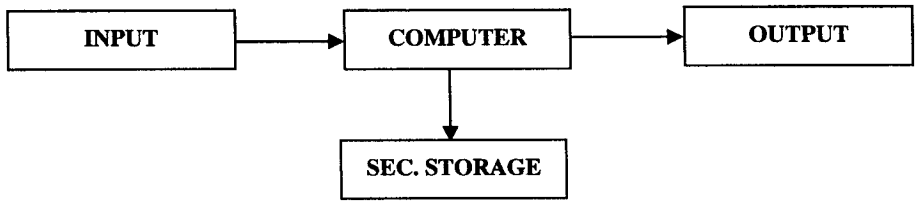


Figure 1.1 Hardware Components

Computers have often been thought of as extremely large adding machines, but this is a very narrow view of their function. Although a computer can only respond to a certain number of instructions, it is not a single-purpose machine since these instructions can be combined in an infinite number of sequences. Therefore, a computer has no known limit on the kinds of things it can do; its **versatility** is limited only by the imagination of those using it.

In the late 1950s and early 1960s when electronic computers of the kind in use today were being developed, they were very expensive to own and run. Moreover, their size and **reliability** were such that a large number of support **personnel** were needed to keep the equipment operating. This has all changed now that computing power has become **portable**, more **compact**, and cheaper.

Ⅳ. Computer Capabilities and Limitations

Like all machines, a computer needs to be directed and controlled in order to perform a task successfully. Until such time as a program is prepared and stored in the computer's memory, the computer "knows" absolutely nothing, not even how to accept or reject data. Even the most **sophisticated** computer, no matter how capable it is, must be told what to do. Until the capabilities and the limitations of a computer are recognized, its usefulness cannot be thoroughly understood.

In the first place, it should be recognized that computers are capable of doing **repetitive** operations. A computer can perform similar operations thousands of times, without becoming bored, tired, or even careless.

Secondly, computers can process information at extremely rapid rates. For example, modern computers can solve certain classes of arithmetic problems millions of times faster than a skilled mathematician. Speeds for performing **decision-making** operations are comparable to those for arithmetic operations but input-output operations, however, involve mechanical motion and

hence require more time. On a typical computer system, cards are read at an average speed of 1 000 cards per minute and as many as 1 000 lines can be printed at the same rate.

Thirdly, computers may be **programmed** to calculate answers to whatever level of accuracy is specified by the **programmer**. In spite of newspaper headlines such as "Computer Fails", these machines are very **accurate** and reliable especially when the number of operations they can perform every second is considered. Because they are man-made machines, they sometimes **malfunction** or break down and have to be repaired. However, in most instances when the computer fails, it is due to human error and is not the fault of the computer at all.

In the fourth place, general-purpose computers can be programmed to solve various types of problems because of their flexibility. One of the most important reasons that why computers are so widely used today is that almost every big problem can be solved by solving a number of little problems — one after another.

Finally, a computer, unlike a human being, has no intuition. A person may suddenly find the answer to a problem without working out too many of the details, but a computer can only proceed as it has been programmed to. Using the very limited capabilities possessed by all computers, the task of producing a university payroll, for instance, can be done quite easily. The following kinds of things need to be done for each employee on the payroll. First: Input information about the employee such as wage rate, hours worked, tax rate, **unemployment** insurance, and **pension** deductions. Second: Do some simple arithmetic and decision-making operations. Third: Output a few printed lines on a cheque. By repeating this process over and over again, the payroll will eventually be completed.

Reading Exercises

Task 1 Fill in the blanks with the information given in the text.

1. The basic idea of a computer is that we can make the machine do what we want by that turn certain _____ on and turn others off, or that magnetize or do not _____ the cores.
2. Most computers, whether large or small, have three basic capabilities such as ____ , _____ , and _____.
3. Some of the most common methods of inputting information are to use _____, _____ , disks, and _____.
4. A computer can replace people in dull _____ , but it has no originality; it works according to the _____ given to it and cannot exercise any value judgments.
5. In 1930, the first _____ was built by an American named Vannevar Bush. This device was used in World War Ⅱ to help guns Mark 1, the name given to the first _____ , was completed in 1944.

6. Second-generation computers were smaller, faster and more dependable than _____ computers. The reason for this extra speed was the use of _____ instead of vacuum tubes.
7. Handling or _____ the information that has been given to the computer, in such ways as doing _____ , adding information or making comparisons is called _____.
8. A computer is not a single-purpose machine since these _____ can be combined in an infinite number of sequences, its _____ is limited only by the imagination of those using it.

Task 2 Translate the following terms or phrases from English into Chinese and vice versa.

1. intricate network
2. aircraft navigation
3. punched card
4. magnetic tape
5. computer terminal
6. vacuum tube
7. peripheral devices
8. secondary memory devices
9. computer capabilities
10. enormous speeds
11. 判定
12. 小型机
13. 晶体管
14. 处理器
15. 中央处理器
16. 阴极射线管
17. 计算机指令
18. 模拟计算机
19. 程序员
20. 操作故障

Section B Today's Computer

There are many different types of computer available today. These range from giant **supercomputers** with immense processing power to small hand-held electronic personal organizers.

They are **categorized** into different types depending upon their size and processing power: supercomputers, mainframes, minicomputers, microcomputers, **embedded** computers and so on.

I. Supercomputer

Supercomputers are the fastest and most expensive computers in the world. They are used for performing **trillions** of complex calculations in a very short time. Their main use is for:

- Weather forecasting
- Space exploration

- Advanced scientific research
- Military establishment— weapons research
- **Pharmaceutical** / Drug testing

Supercomputers cost over a hundred million pounds to build and need specifically designed rooms and environments to ensure that they operate efficiently.

- **Whilst** they are working, supercomputers generate so much heat that an air conditioning system is required.
- There can be many miles of cables which connect the computer to the various peripherals. In order to hide this, false floors and ceilings are often needed.
- The supercomputer usually requires its own electricity generator to ensure that it can continue to work if a power failure occurs.
- The atmosphere must be kept free of dust particles. Special **filters** have to be installed to ensure that the air is kept clean.
- Smoke detectors are essential to help detect any fires immediately.

2003— Japan has built the world's fastest computer. It has the combined power of the 20 fastest US computers together. "Assembled from 640 specialized nodes that are in turn composed of 5 104 processors made by NEC, the new Japanese supercomputer occupies the space of four tennis courts and has achieved a computing speed of 35.6 trillion mathematical operations a second." Wow, that's a computer.

II. Mainframes

Mainframes are large machines that can carry out different tasks for many people at the same time. They are slower than a supercomputer, but far less expensive. They execute billions of instructions per second and can process large volumes of data **simultaneously**. They are usually connected to a large number of peripherals e.g. printers, disc drives, terminals and so on.

Mainframe computers are often used to control an entire factory assembly line— recording the movement of materials, paying of bills, sending invoices and so on. They are used by large companies such as:

- Gas and electricity suppliers— for billing;
- Banks— for managing your accounts;
- Insurance companies— looking after your policies;
- Airlines— handling your tickets;

- Police— crime detection;
- Car companies— managing factories.

They are operated by specialist, trained personnel and kept in air-conditioned rooms away from the office or factory floor. Ordinary users normally use a terminal to access the system. They are very expensive— an average mainframe would cost around 4 million pounds to build.

III. Minicomputer

These computers look similar to personal computers that you or I use regularly at home. They are used for doing powerful jobs, which could once only be performed by mainframes. They tend to be used by small to medium sized businesses to manage their data processing needs. Examples of the types of business that would use a minicomputer are:

- **Estate** agents— tracking house sales;
- Travel agents— for the latest holiday or travel details;
- Small insurance companies— handling customer information.

They are much less expensive than a mainframe computer, usually somewhere in the region of £100 000. Unlike supercomputers and mainframes, minicomputers do not need to be housed in any special environment— a reasonably clean, cool, room will do. You will usually find them in normal offices. However, they still need a trained person to look after them, for tasks such as backing up the data and handling the network. A minicomputer often has a handful of terminals connected to it, unlike a mainframe which may have hundreds.

IV. Microcomputer (Desktop PC)

In the early days (1980's) these types of machine were called a microcomputer, for example, schools often had a "BBC microcomputer". But now we tend to call them a "desktop Personal Computer" or "PC" if you want to be really brief. The desktop PC has a central processing unit housed in a metal case (often a "tower"). Along with a keyboard, mouse and monitor.

Modern PC are quite powerful, being able to carry out thousands of millions of calculations per second. And because the PC is so versatile and relatively cheap, they are found in most homes, offices and schools. This allows them to be used for all kinds of tasks:

- Office applications such as word-processing, spreadsheets and databases;
- Engineering work— designing kitchens at a showroom;
- Video work— for handling your **camcorder**;
- Music— creating, playing and storing;
- Entertainment and information— Internet.

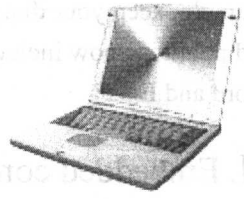
Main Advantages

- They can be easily **upgraded** to include new software or hardware.
- They are relatively **robust** and can be used almost continually for very long periods of time.
- It is possible to "mix and match" specifications and components, in effect creating a custom-made machine.
- Monitors come in a range of sizes and qualities and can be chosen specifically to suit the user's preferences.
- It is easy to replace an individual part if damaged.
- PCs can be used for many different tasks, e.g. multi-media, work processing, financial record keeping and playing games.
- They can run a vast range of software, often simultaneously.
- They can be physically **screwed** down thus making them fairly secure from theft.

Disadvantages

- Desktop PCs are not easily portable. They are large and heavy.
- They require a large amount of permanent office space.
- They need a fan to prevent overheating. Thus they can be fairly noisy.
- They can only be run on mains electricity and need to be situated near to a power point.
- New advances in technology means that PCs get out of date very quickly.

V. Laptop



The key difference between a Desktop PC and a laptop is that the laptop is built as a relatively small one-piece unit. The monitor or display is permanently attached to the main box and cannot be removed. When in use, it is **swiveled** up to reveal the keyboard. In order to carry or store the laptop, the display is swiveled down onto the keyboard to form a compact box that can be easily stored or carried around.

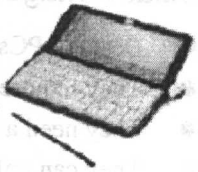
Laptops can be used in pretty much the same way as a Desktop PC and indeed many people prefer to use them. They can be attached to a printer, **scanner** and external mouse. They can have the same processing power and same memory as their larger counterparts.

Laptop computers generally cost more than a Desktop PC with exactly the same specification because they are more difficult to design and manufacture. The screen or display is particularly expensive, the larger it is, the more the machine will cost. A laptop typically weighs

around 2 — 3 kg and is very thin approximately 1 — 2 inche. Every laptop can be powered by battery or mains electricity. Typically they can run between 1 — 6 hours before they need to be **recharged**.

Ⅵ. PDA/Palmtop

Personal Digital Assistants (PDAs) were originally developed as an electronic organizers. They aimed to replace diaries, "to do" lists and address books. However, rapid development has resulted in **palmtops** and PDAs becoming almost cut down computers in their own right. The main choice in selecting a PDA is whether you want long battery life, which will give you a black and white display, limited memory and limited functions, or a short battery life but having color displays and a much extended software capability.



Palmtops are very similar to PDAs in their use. The main difference is that palmtops have a built in keyboard. The advantage in having a keyboard is that most people are familiar with entering information in this way. Whereas PDAs need a **stylus** (a bit like a pen) the user has to learn a special form of writing called Graffiti. However, the keyboards are very cramped and so are mainly useful for small amounts of data entry, for example, taking notes at a meeting or recording customer details.

Because of their limited capacity and the need to back up data regularly, PDAs and palmtops can connect to a laptop or desktop PC in order to store and exchange information. For example, keep your diary up to date on your desktop or update your "to do" list. The latest PDAs and palmtops now include special cut down versions of popular office software such as Microsoft Word and Excel.

Ⅶ. Embedded computer

Computer chips are now cheap enough to install in everyday items. They offer many functions that would otherwise be far too expensive to produce. For example, these all contain an embedded computer:

- Telephones;
- Televisions;
- Cameras;
- Washing Machines;
- Microwave Cookers;
- Dishwashers;