DIANZIKEJIDAXUECHUBANSHE
XILIEJIAOCAI

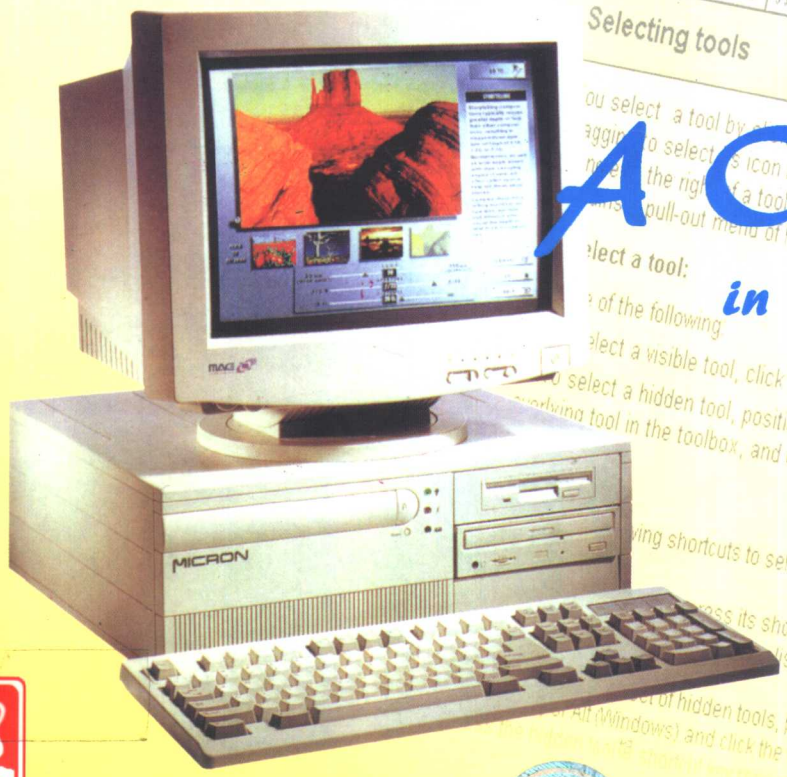
高等学校
电子信息类
系列教材

大专计算机

计算机专业英语

A Course in Computer English

朱晋蜀 编著



电子科技大学出版社

UESTC PUBLISHING HOUSE

计算机专业英语

A Course in Computer English

朱晋蜀　编著

电子科技大学出版社

内 容 提 要

本书内容涉及计算机发展史、数字逻辑、输入输出设备、微机原理、数据结构、C 语言、操作系统、管理信息系统、网络、计算机病毒等计算机学科的主要内容。每章均配有导读、习题。全书正文无一个汉字，有利于读者学习纯正英文。本书汲取了美国、加拿大计算机专业大学教材的特色和风格，是作者长期致力于计算机英语教学改革的结晶，具有鲜明的特色与创新性。

本书可作为大专计算机专业教材，也可作为使用计算机的广大科技人员的自学参考书。

声　明

计算机专业英语

A Course in Computer English

朱晋蜀　编著

出　　版：电子科技大学出版社　（成都建设北路二段四号，邮编：610054）
责任编辑：朱　丹
发　　行：全国新华书店
印　　刷：峨眉电影制片厂印刷厂
开　　本：787×1092　1/16　　印张　11.25　　字数　273 千字
版　　次：1998 年 3 月第一版
印　　次：1998 年 10 月第三次
书　　号：ISBN 7—81043—851—4/TP・357
印　　数：7001—11000 册
定　　价：12.90 元

Preface

The purpose of this course, as its title indicates, is to teach students of computer science major, whose second language is English, the language of computer scientific English. An attempt has been made to arrange simple pieces in order of the systematization of computer science. A few slight simplifications have been made here and there in the vocabulary and context, but this has not been done to any great extent.

English is a very important tool for Chinese university and college students, especially for computer students. I am still impressed when I studied Data Structure in Chengdu Radio Engineering Institute (University of Electronic Science & Technology of China) in 1980. Having been reading and studying English textbook since then have given me so much help and many benefits for my Master degree, and studied computer networking in Canada, and my job.

The book is intended primarily for the 70 hours' computer scientific English course. A variety of materials have been collected and edited from computer science textbooks which were published in the United States. The range of the book is from the history of computer to the Internet. I believe it's systematic and informative.

The most important thing for a student is that he or she can read and understand English papers and books in the computer science field after their graduating from university or college. Three purposes have been intended by this book:

(1) Study pure English.

(2) Learn quite a lot of computer terminology.

(3) Review and refresh computer science concepts.

Learning a language is not a matter of acquiring a set of rules and building up a large vocabulary. The teacher's efforts should not be directed at informing his students about a language, but at enabling them to use it. A student's mastery of a language is ultimately measured by how well he can use it, not by how much he knows about it. A student who has learnt a lot of grammar but cannot use a language is in the position of a pianist who has learnt a lot about harmony but cannot play the piano. The student's command of a language will therefore be judged not by how much he knows, but by how well he can perform.

As we know, there are all four basic language skills: understanding, speaking, read-

ing and writing. But the emphasis of this course is wholly on the comprehension and understanding. The students are trained to use his eyes instead of his ears.

For comprehension reading, upon encountering an unfamiliar vocabulary item in a passage there are several strategies which readers can use to determine the message of the author. First, they can continue reading, realizing that often a single word will not prevent understanding of the general meaning of a selection. If further reading does not solve the problem, readers can use one of three basic skills to arrive at an understanding of the unfamiliar word. They can use context clues to see if surrounding words and grammatical structures provide information about the unknown word. They can use word analysis to see if understanding the parts of the word leads to understanding of the word. Or, they can use a dictionary to find an appropriate definition.

Guessing the meaning of an unfamiliar word from context clues involves using the following kinds of information:

(1) knowledge of the topic about which readers are reading;

(2) knowledge of the meanings of the other words in the sentence (or paragraph) in which the word occurs;

(3) knowledge of the grammatical structure of the sentences in which the word occurs.

If you are a computer student, do you think you need to look up the word "evil" in the following sentence in a dictionary?

Most hardware manufacturers view operating systems as a necessary **evil** *without which their hardware would not sell at all.*

Do you understand the meaning of the following sentence without knowing the exact meaning of "undergone"?

Operating systems, like computer hardware, have **undergone** *a series of revolutionary changes called generations.*

Another way to discover the meanings of unfamiliar vocabulary items is to use word analysis, that is, to use knowledge of the meanings of the parts of a word. Many English words have been formed by combining parts of older English, Greek, and Latin words. For instance, the word *bicycle* is formed the parts *bi-*, meaning two, and *cycle*, meaning round or wheel. Often knowledge of the meanings of these word parts can help the reader to guess the meaning of an unfamiliar word.

Sometimes the meaning of a single word is essential to understand the total meaning of selection. If context clues and word analysis do not provide enough information, it will be necessary to use a dictionary. I believe students should use an English/English dictionary. Because it will give readers more precise information. It's important way to learn a pure English. Using an E/E dictionary is not as hard as most students imagine. For exam-

ple, the explanation of word *prone* is: (adj.) having the probability of (usu. something undesirable): *One is more prone to make mistakes when one is tired.* The explanation and the sample sentence make it easy to understand.

Sometimes comprehension of an entire passage requires the understand ing of a single sentence. It's called key sentence sentence where the main idea comes from in the paragraph or even in a passage.

Students need to use all of their language skills to understand the reading selections in *A Course in Computer English*. The book contains many types of selections on a wide variety of topics on computer science. These selections provide practice in using different reading strategies to extract the message of the author. They also give students practice in four basic reading skills: skimming, scanning, reading for thorough comprehension, and critical reading.

Skimming is quick reading for the general idea(s) of a passage. This kind of rapid reading is appropriate when trying to decide if careful reading would be desirable or when there is no time to read something carefully.

Like skimming, scanning is also quick reading. However, in this case the search is more focused. To scan is to read quickly in order to locate specific information. When you read to find a particular date, name, or number, you are scanning.

Reading for thorough comprehension is careful reading in order to understand the total meaning of the passage. At this level of comprehension the reader is able to summarize the author's ideas but has not yet made a critical evaluation of those ideas.

Critical reading demands that readers make judgments about what they read. This kind of reading requires posing and answering questions such as, Does my own experience support that of the author? Do I share the author's point of view? Am I convinced by the author's arguments and evidence?

Systematic reading of computer science technology will make computer students refresh their computer knowledge and practice in the basic language and reading skills necessary to become proficient readers.

Any effort of this scope is bound to have its flaws. I assume complete responsibility for any remaining defects. It is possible to publish the third edition of this book in two years, and I would be most grateful for reader's comments, criticisms, and corrections. Any correspondence should be sent to Zhu Jinshu (author). I will acknowledge all correspondence immediately.

It is a pleasure to acknowledge the encouragement and assistance of many people who have helped me in this project. First of all, to Ms. Fran Locke, the officer of the International Office of Northatlantic College of Canada, go my special thanks. She gave me a lot of current using computer textbooks. Special thanks also go to Liu Zhuochen, a lab teach-

er of Chengdu Electromechanical College, who type half of the contents of the chapters. Grateful acknowledgment is made to Professor Pan Qijin, an instructor of Ph. D. of Southwest Jiaotong University for help with the final proof reading. He has also given me some kind suggestions.

And above all, thanks go to Liu Hong, my wife, who has provided the incredible support and understanding without which this book could never have come to fruition.

Zhu Jinshu
E-mail: mzhu@rose.cnc.ac.cn

Contents

Chapter 1

The History of Computers

Computers have been in use for a relatively short period of time. The first commercial computers became available in the early 1950s. Since then, computers have gone through a rapid evolution. But before that time, computers and computing devices developed slowly.

1.1 Computing and Data Processing

People have been trying to find easier ways of doing calculations for thousands of years. The abacus, invented over 2 500 years ago, was one of the first efforts. The first mechanical calculator was invented by Blaise Pascal, a French mathematician, in 1642.

1.1.1 Babbage's Analytical Engine

The first major step toward the development of a computer took place in 1822. A British mathematician, Charles Babbage, designed a machine that he called the difference engine, for calculating certain types of mathematical tables. According to his design, the difference engine would use gears and levers to do calculation. Babbage received several grants from the British government to build the machine, but he was never able to complete it (A machine based on Babbage's ideas was completed in 1855 and used in the United States and Great Britain).

In 1834, while working on the difference engine, Babbage conceived the idea of a more powerful calculating machine, which he called the analytical engine. As with the difference engine, this machine would use gears and levers for calculations. In addition, it would have the capability of storing up to one thousand numbers and could be programmed for different calculations. Many of the ideas for programming the analytical engine were developed by Augusta Ada Byron. In a way, she was the first programmer.

Babbage never completed the analytical engine, partially because the technology needed to build the machine's parts was not available. The engine, however, had many of the characteristics of a modern computer: a primary storage, an arithmetic unit, and programming capabilities. It lacked the electronic characteristics of current computers, however. Had Babbage lived on hundred years later, he may have invented the first electronic computer.

1.1.2 Hollerith's Punched Cards

To enter programs into his analytical engine, Babbage planned to use cards with pat-

terns of holes in them. He borrowed the idea from a loom invented by Joseph Jacquard in France in 1801. The loom wove patterns into fabric by following instructions given by holes in cards. In Babbage's analytical engine, the cards would contain instructions to tell the machine what calculations to perform.

Jacquard's cards were also the inspiration for Herman Hollerith, an engineer working for the Census Bureau in the late 1800s. The Census Bureau takes the U. S. census every ten years. The 1880 census required $7(\frac{1}{2})$ years to compile. With population growth, the Census Bureau projected that the 1890 census could take more than ten years to tabulate, so something had to be done. Hollerith conceived the idea of recording census data on cards similar to Jacquard's. Patterns of holes in the cards could represent different population characteristics. The cards were called punched cards. Hollerith invented two machines for punching holes in the card, one machine for sorting cards based on patterns of holes, and another machine for counting or tabulating data from cards. Using Hollerith's punched card machines, the 1890 census took only $2(\frac{1}{2})$ years to compile.

Hollerith saw a commercial value to his ideas, so in 1896 he formed the Tabulating Machine Company to manufacture and sell his machines. His machines were used in the 1900 census as well as by some businesses for data processing. In 1911, the Tabulating Machine Company merged with several others companies to form the Computing-Tabulating-Recording (CTR) Company. In 1924, CTR changed its name to International Business Machines Corporation (IBM), which today is the largest computer manufacturer in the world.

After the 1900 census, the Census Bureau had a disagreement with Hollerith and hired James Powers to develop new punched card machines for the 1910 census. Powers used a different type of card from that used by Hollerith, and his machines had additional capabilities. Like Hollerith, however, Powers saw a commercial value to his machines, so he formed the Powers Accounting Machine Company in 1911. In 1927, his company became a division of Remington Rand Inc., which eventually became Sperry Corporation. Then, in 1986 Sperry merged with Burroughs Corporation to form Unisys Corporation. Today, Unisys is one of the largest computer manufacturers after IBM.

The punched cards of Hollerith and Powers were used for many years after their development. Punched card machines became more and more sophisticated, until many businesses had rooms full of machines used for punched card data processing. For years, computers used punched cards as their main form of input. The modern punched card is still available today, but is rarely used.

1.2 The Invention of the Computer

It is hard to say exactly when the modern computer was invented. Starting in the

1930s and through the 1940s, a number of machines were developed that were like a computer. But most of these machines did not have all the characteristics that we associate with computers today. These characteristics are that the machine is electronic, that it has a stored program, and that it is general purpose.

One of the first computerlike devices was developed in Germany by Konrad Zuse in 1941. Called the Z3, it was general-purpose, stored-program machine with many electronic parts, but it had a mechanical memory. Another electromechanical computing machine was developed by Howard Aiken, with financial assistance from IBM, at Harvard University in 1943. It was called the Automatic Sequence Control Calculator Mark I, or simply the Harvard Mark I. Neither of these machines was a true computer, however, because they were not entirely electronic.

1.2.1 The ENIAC

Perhaps the most influential of the early computerlike devices was the Electronic Numerical Integrator and Computer, or ENIAC. It was developed by J. Presper Eckert and John Mauchly at the University of Pennsylvania. The project began in 1943 and was completed in 1946. The machine was huge; it weighed 30 tons and contained over 18 000 vacuum tubes.

The ENIAC was a major advancement for its time. It was the first general-purpose, electronic computing machine and was capable of performing thousands of operations per second. It was controlled, however, by switches and plugs that had to be manually set. Thus, although it was a general-purpose electronic device, it did not have a stored program. Therefore, it did not have all the characteristics of a computer.

While working on the ENIAC, Eckert and Mauchly were joined by a brilliant mathematician, John von Neuman. Together, they developed the idea of a stored program computer. This machine, called the Electronic Discrete Variable Automatic Computer, or EDVAC, was the first machine whose design included all the characteristics of a computer. It was not completed, however, until 1951.

Before the EDVAC was finished, several other machines were built that incorporated elements of the EDVAC design of Eckert, Mauchly, and von Neuman. One was the Electronic Delay Storage Automatic Computer, or EDSAC, which was developed in Cambridge, England. It first operated in May of 1949 and is probably the world's first electronic, stored-program, general-purpose computer to become operational. The first computer to operate in the United States was the Binary Automatic Computer, or BINAC, which became operational in August of 1949.

1.2.2 The UNIVAC I

Like other computing pioneers before them, Eckert and Mauchly formed a company in 1947 to develop a commercial computer. The company was called the Eckert-Mauchly

Computer Corporation. Their objective was to design and build the Universal Automatic Computer or UNIVAC. Because of difficulties getting financial support, they had to sell the company to Remington Rand in 1950. Eckert and Mauchly continued to work on the UNIVAC at Remington Rand and completed it in 1951. Known as the UNIVAC I, this machine was the first commercially available computer.

The first UNIVAC I was delivered to the Census Bureau and used for the 1950 census. The second UNIVAC I was used to predict that Dwight Eisenhower would win the 1952 presidential election, less than an hour after the polls closed. The UNIVAC I began the modern of computer use.

1.3 Computer Generations

Since the UNIVAC I, computers have evolved rapidly. Their evolution has been the result of changes in technology that have occurred regularly. These changes have resulted in four main generations of computers.

1.3.1 First-Generation Computer: 1951～1958

First-generation computers were characterized by the use of vacuum tubes as their principal electronic component. Vacuum tubes are bulky and produce a lot of heat, so first-generation computers were large and required extensive air conditioning to keep them cool. In addition, because vacuum tubes do not operate very fast, these computers were relatively slow.

The UNIVAC I was the first commercial computer in this generation. As noted earlier, it was used in the Census Bureau in 1951. It was also the first computer to be used in a business application. In 1954, General Electric took delivery of a UNIVAC I and used it for some of its business data processing.

The UNIVAC I was not the most popular first-generation computer, however. This honor goes to the IBM 650. It was first delivered in 1955 before Remington Rand could come out with a successor to the UNIVAC I. With the IBM 650, IBM captured the majority of the computer market, a position it still holds today.

At the same time that hardware was evolving, software was developing. The first computers were programmed in machine language, but during the first computer generation, the idea of programming language translation and high-level languages occurred. Much of the credit for these ideas goes to Grace Hopper, who, as a Navy lieutenant in 1945, learned to program the Harvard Mark I. In 1952, she developed the first programming language translator, followed by others in later years. She also developed a language called Flow-matic in 1957, which formed the basis for COBOL, the most commonly used business programming language today.

Other software developments during the first computer generation include the design

of the FORTRAN programming language in 1957. This language became the first widely used high-level language. Also, the first simple operating systems became available with first-generation computers.

1.3.2 Second-Generation Computers: 1959～1963

In the second generation of computers, transistors replaced vacuum tubes. Although invented in 1948, the first all-transistor computer did not become available until 1959. Transistors are smaller and less expensive than vacuum tubes, and they operate faster and produce less heat. Hence, with second-generation computers, the size and cost of computers decreased, their speed increased, and their air-conditioning needs were reduced.

Many companies that had not previously sold computer entered the industry with the second generation. One of these companies that still makes computers is Control Data Corporation (CDC). They were noted for making high-speed computers for scientific work.

Remintong Rand, now called Sperr-Rand Corporation, made several second-generation UNIVAC computers. IBM, however, continued to dominate the industry. One of the most popular second-generation computers was the IBM 1401, which was a medium-sized computer used by many businesses.

All computers at this time were mainframe computers costing over a million dollars. The first minicomputer became available in 1960 and cost about $120 000. This was the PDP-1, manufactured by Digital Equipment Corporation (DEC).

Software also continued to develop during this time. Many new programming languages were designed, including COBOL in 1960. More and more businesses and organizations were beginning to use computers for their data processing needs.

1.3.3 Third-Generation Computers: 1964～1970

The technical development that marks the third generation of computers is the use of integrated circuits or ICs in computers. An integrated circuit is a piece of silicon (a chip) containing numerous transistors. One IC replaces many transistors in a computer, resulting in a continuation of the trends begun in the second generation. These trends include reduced size, reduced cost, increased speed, and reduced need for air conditioning.

Although integrated circuits were invented in 1958, the first computers to make extensive use of them were not available until 1964. In that year, IBM introduced a line of mainframe computers called the System/360. The computers in this line became the most widely used third-generation machines. There were many models in the System/360 line, ranging from small, relatively slow, and inexpensive ones, to large, very fast, and costly models. All models, however, were compatible so that programs written for one model could be used on another. This feature of compatibility across many computers in a line was adopted by other manufacturers of third-generation computers.

The third computer generation was also the time when minicomputers became

widespread. The most popular model was the PDP-8, manufactured by DEC. Other companies, including Data General Corporation and Hewlett-Packard Company, introduced minicomputers during the third generation.

The principal software development during the third computer generation was the increased sophistication of operating systems. Although simple operating systems were developed for first- and second-generation computers, many of the features of modern operating systems first appeared during the third generation. These include multiprogramming, virtual memory, and time sharing. The first operating systems were mainly batch systems, but during the third generation, interactive systems, especially on minicomputers, became common. The BASIC programming language was designed in 1964 and became popular during the third computer generation because of its interactive nature.

1.3.4 Fourth-Generation Computers: 1971～?

The fourth generation of computers is more difficult to define than the other three generations. This generation is characterized by more and more transistors being contained on a silicon chip. First there was large scale integration (LSI), with hundreds and thousands of transistors per chip, then came very large scale integration (VLSI), with tens of thousands and hundreds of thousands of transistors. The trend continues today.

Although not everyone agrees that there is a fourth computer generation, those that do feel that it began in 1971, when IBM introduced its successors to the System/360 line of computers. These mainframe computers were called the System/370, and current-model IBM computers, although not called System/370s, evolved directly from these computers.

Minicomputers also proliferated during the fourth computer generation. The most popular lines were the DEC PDP-11 models and the DEC VAX, both of which are available in various models today.

Supercomputers first became prominent in the fourth generation. Although many companies, including IBM and CDC, developed high-speed computers for scientific work, it was not until Cray Research, Inc., introduced the Cray 1 in 1975 that supercomputers became significant. Today, supercomputers are an important computer classification.

Perhaps the most important trend that began in the fourth generation is the proliferation of microcomputers. As more and more transistors were put on silicon chips, it eventually became possible to put an entire computer processor, called a microprocessor, on a chip. The first computer to use microprocessors became available in the mid-1970s. The first microcomputer designed for personal use was the Altair, which was sold in 1975. The first Apple computer, market with the IBM PC in 1981. Today, microcomputers far outnumber all other types of computers combined.

Software development during the fourth computer generation started off with little change from the third generation. Operating systems were gradually improved, and new