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计算机英语

Computer English (第4版)

(Fourth Edition)

刘艺 王春生 等编



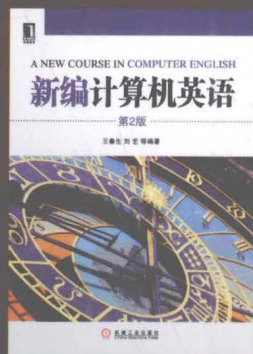
机械工业出版社
China Machine Press



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定价：35.00元



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投稿热线：(010) 88379006

上架指导：计算机/计算机英语

ISBN 978-7-111-42038-5



9 787111 420385 >

定价：45.00元

计算机英语

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(第4版)

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机械工业出版社
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图书在版编目 (CIP) 数据

计算机英语 / 刘艺等编. —4 版. —北京: 机械工业出版社, 2013.4

ISBN 978-7-111-42038-5

I. 计… II. 刘… III. 电子计算机-英语 IV. TP3

中国版本图书馆 CIP 数据核字 (2013) 第 066975 号

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封底无防伪标均为盗版

本书法律顾问 北京市展达律师事务所

本书涉及计算机与计算机科学的基础知识、计算机体系结构、计算机语言与编程、软件开发、软件过程、数据库、计算机网络、因特网、移动与云计算、计算机安全、计算机文化、电子商务等深刻影响我们生活的信息技术。本书以计算机领域英语时文和经典原版教材为基础, 通过大量精心挑选的阅读材料, 配以相应的注释和练习, 使读者能够快速掌握计算机领域的大量专业词汇以及相关的语法等, 并提高阅读和检索计算机原版文献资料的能力。

本书选材广泛、图文并茂, 采用双色印刷, 极大方便了读者的学习和查阅。书后还附有词汇表和缩略语表。本书可作为高等院校计算机及相关专业“计算机英语”课程的教材, 也可供参加计算机水平考试的考生、IT 行业的工程技术人员以及其他有需要的读者学习参考。

机械工业出版社 (北京市西城区百万庄大街 22 号 邮政编码 100037)

责任编辑: 余洁

中国电影出版社印刷厂印刷

2013 年 5 月第 4 版第 1 次印刷

185mm×260mm·20 印张

标准书号: ISBN 978-7-111-42038-5

定 价: 45.00 元

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前 言

英语作为计算机及 IT 业的行业性语言，有着其他语言所不能替代的功能。无论是学习最新的计算机技术，还是使用最新的计算机软硬件产品，都离不开对计算机英语的熟练掌握。正是为了适应这种要求，不少有实力、有远见的院校纷纷开设了计算机英语课。有些院校不仅把它作为计算机专业的必修课，还将其作为一门实用的选修课推广到其他专业。

本书是按照最新《大学英语教学大纲》对专业英语的要求，为开设计算机英语课程而编写的面向 21 世纪的教材。在满足计算机专业英语教学的同时，我们并没有过分沉溺于晦涩抽象的理论和专业术语之中，而是注重实际应用与调动学习兴趣。本书选材广泛，内容丰富，涉及计算机基础知识、硬件结构、程序设计、软件工程、应用开发、网络通信、信息安全、电子商务以及其他深刻影响着我们生活的信息技术。

值得一提的是，我们编写出版的《计算机英语》深受读者喜爱，已被全国上百所高校采用。经过 12 年来的多次修订改版，已经在全国热销了 20 万册，作为计算机专业英语教材其销量在同类图书中一直领先。为不断保持教学创新，跟踪计算机英语的发展，本教材与时俱进，不断升级完善。第 4 版更新了约 1/4 的文章和练习，并加强了教辅和售后服务。这次经过全面修订的《计算机英语（第 4 版）》更加适应深化计算机英语教学改革的需要。

这次修订主要完成以下工作：

- 课文更新 第 4 版替换了内容过时或不太合适的课文，约占全书总篇幅的 1/4。新增的课文紧跟技术潮流，把握主流趋势。既有涉及云计算这样的最新时文，也有关于计算机科学的经典论述。借此也引入了大量新的技术术语和缩略语，为读者尽快独立阅读英文资料，融入英文技术社区提供帮助。
- 对保留的课文进行修改 在本次修订中，我们对一些保留课文中的疏漏进行了改正，调整了部分注解，使之更加贴切。
- 保持全书的体系结构 本书参考 ACM 推荐的 CS0、CS1、CS2 课程体系，并保持第 3 版的 12 个教学单元不变。新版中去除了过时的文章，并调整和优化了内容结构，新增了移动与云计算单元。

本书在出版过程中得到机械工业出版社华章分社的鼎力支持，同时谈亮、刘春花、洪蕾、王珊珊、蒋丹丹、蔡敏、徐大琴、吴英等也为本书的编写和顺利出版付出了心血，在此一并表示感谢！

尽管本书在编写过程中，在资料的查核、术语的汉译、生词的注音以及文字的规范等方面都做了大量工作，但由于计算机领域的发展日新月异，许多新术语尚无确定的规范译法，加上编者水平有限，书中难免有不尽如人意之处，恳请广大读者不吝赐教。

编 者

2013 年 2 月于南京

E-mail: book4u@sina.com

计算机英语 BBS: <http://www.xici.net/b1119133/>

使用说明

1. 本教材共 12 单元，每单元包括三篇文章。课文 A 为精读材料，课文 B 和课文 C 为泛读材料。三篇课文均围绕同一主题。课文 A 一般为该主题的概述，课文 B 和课文 C 多就该主题的某一具体方面或具体例子展开讨论。课文长度一般为 1200~1800 词。对于课文 A，要求能正确理解和熟练掌握其内容。对于课文 B 和课文 C，要求能掌握中心大意，抓住主要事实。

2. 课文 A 配有四项练习，即“课文理解填空”、“词组中英文互译”、“完形填空”和“段落翻译”；课文 B 和课文 C 配有两项练习，即“课文理解填空”和“词组中英文互译”。各项练习均与课文内容和计算机专业紧密结合，旨在巩固和拓展学生所学内容。

3. 教育部 2007 年印发的《大学英语课程教学要求》将高等学校非英语专业本科生的英语教学要求分为三个层次，即“一般要求”、“较高要求”和“更高要求”，并规定：“一般要求是高等学校非英语专业本科毕业生应达到的基本要求。”专业英语课程按要求应放在大学英语（公共英语）教学完成之后。这就意味着大学本科生在学习专业英语之前应达到“一般要求”，但不一定达到“较高要求”或“更高要求”。因此，本教材的生词选注参照“一般要求”应掌握的词汇，所注生词计有两类：一类是通用词，即超出“一般要求”的词汇；另一类为计算机及相关专业词汇，是超出“一般要求”或“一般要求”未注明有关词义的词汇。

4. 生词均用蓝色粗体在课文中标出，并在课文旁边的文本框中进行注释，以便于阅读和记忆。相同生词原则上只在首次出现之处进行注释，但书后附有词汇表备查。每个生词一般标注一个发音，但有的常用异读音也标了出来，中间用逗号分隔；如系英美发音差异，英国发音在前，美国发音在后，中间用分号分隔。生词注音中的斜体音标表示该音可读可不读；短划（-）用于截同示异，代表与前面所注发音相同的部分。

5. 计算机英语的特点之一是大量使用缩略语。本教材对缩略语采取两种处理方式：一是在首次出现之处进行脚注；二是对大家熟知或其意思在文中不言自明的缩略语未加脚注。但是，无论哪种情况，所有缩略语均收入书后的缩略语表，以备查阅和方便记忆。另外，在计算机英语中，缩略语所代表的词组或术语在大小写上有比较随意和不一致的现象，本教材原则上尊重原文所采用的形式。

6. 关于计算机专业英语课的开设，建议本科生安排在第五学期至第七学期，研究生安排在第一学年。完成本教材的学习后应达到的要求，可参照教育部颁布的《大学英语教学大纲》（修订本）有关专业英语的规定。

编者

2013 年 2 月

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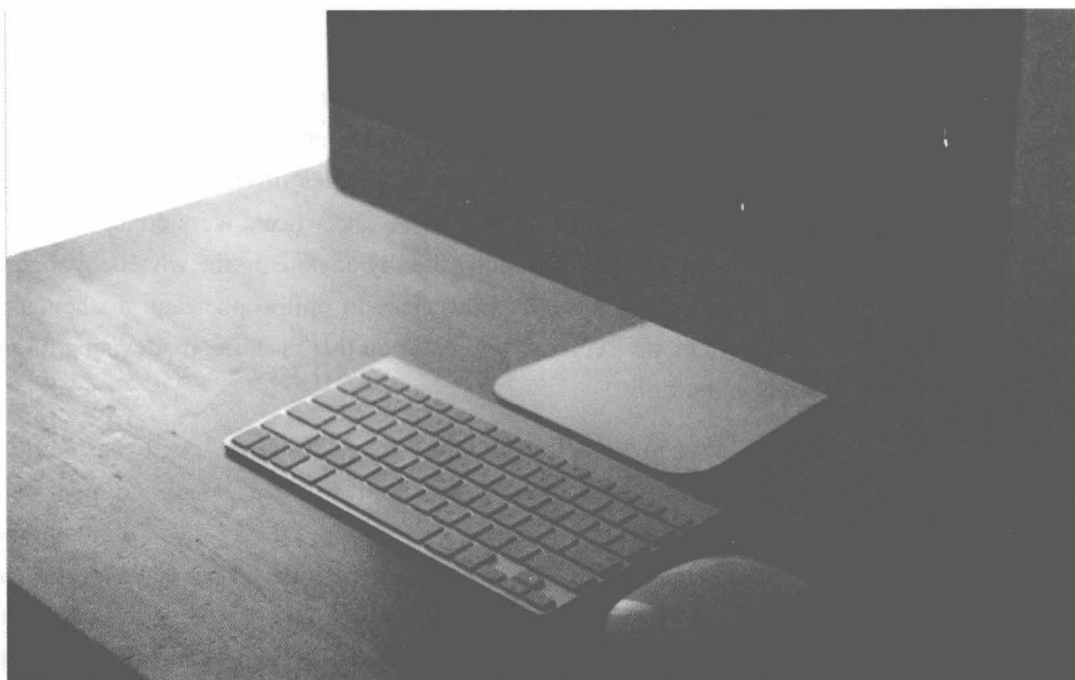
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Unit 1 Computer and Computer Science

(计算机与计算机科学)

Section A

Computer Overview



overview

/ˈəʊvəvjuː/

n. 概述; 概观

calculation

/ˌkælkjuˈleɪʃən/

n. 计算

numeric(al)

/njuːˈmerɪk(əl)/

a. 数字的; 数值的

banking /ˈbæŋkɪŋ/

n. 银行业(务)

I. Introduction

A computer is an electronic device that can receive a set of instructions, or program, and then carry out this program by performing **calculations** on **numerical** data or by manipulating other forms of information.

The modern world of high technology could not have come about¹ except for the development of the computer. Different types and sizes of computers find uses throughout society in the storage and handling of data, from secret governmental files to **banking transactions** to private

¹ *come about*: 发生, 产生。

transaction

/træn'zækʃən, -'sæk-/
n. 交易; 事务(处理), 事项(处理)

automation

/,ɔ:tə'meɪʃən/
n. 自动化

conjecture

/kən'dʒektʃə/
n. 推测, 猜想

privacy

/'praɪvəsi, 'praɪ-, 'praɪ-/
n. 隐私; 秘密

precursor

/'pri:kə:sə, pri-/
n. 先驱

digit

/'dɪdʒɪt/
n. 数字

loom

/lu:m/n. 织机

perforated

/'pɜ:fəreɪtɪd/
a. 穿孔的

statistician

/'stætɪ'stɪʃjən/
n. 统计学家; 统计员

conceive

/kən'si:v/
v. (构) 想出

punched card

穿孔卡片

electrical contact

电触点

compile

/kəm'paɪl/
v. 汇编; 编译

census

/'senses/
n. 人口普查

analytic(al)

/'æne'lɪtɪk(əl)/
a. 分析的

Analytical Engine

分析机, 解析机

household accounts. Computers have opened up a new era in manufacturing through the techniques of **automation**, and they have enhanced modern communication systems. They are essential tools in almost every field of research and applied technology, from constructing models of the universe to producing tomorrow's weather reports, and their use has in itself opened up new areas of **conjecture**. Database services and computer networks make available a great variety of information sources.¹ The same advanced techniques also make possible invasions of personal and business **privacy**. Computer crime has become one of the many risks that are part of the price of modern technology.

II. History

The first adding machine, a **precursor** of the digital computer, was devised in 1642 by the French scientist, mathematician, and philosopher Blaise Pascal². This device employed a series of ten-toothed wheels, each tooth representing a **digit** from 0 to 9. The wheels were connected so that numbers could be added to each other by advancing the wheels by a correct number of teeth. In the 1670s the German philosopher and mathematician Gottfried Wilhelm Leibniz³ improved on this machine by devising one that could also multiply.

The French inventor Joseph-Marie Jacquard⁴, in designing an automatic **loom**, used thin, **perforated** wooden boards to control the weaving of complicated designs. During the 1880s the American **statistician** Herman Hollerith⁵ **conceived** the idea of using perforated cards, similar to Jacquard's boards, for processing data. Employing a system that passed **punched cards** over **electrical contacts**, he was able to **compile** statistical information for the 1890 United States **census**.

1. The Analytical Engine

Also in the 19th century, the British mathematician and inventor

¹ Database services and computer networks make available a great variety of information sources.: 数据库服务和计算机网络使各种各样的信息源可供使用。这句话由于宾语(a great variety of information sources)较长,因此将宾语的补语(available)放到了宾语的前面。文中下一句话也属同样情况。

² Blaise Pascal: 布莱斯·帕斯卡(1623—1662), 法国数学家、物理学家、哲学家, 概率论创立者之一。

³ Gottfried Wilhelm Leibniz: 戈特弗里德·威廉·莱布尼兹(1646—1716), 德国自然科学家、哲学家, 微积分、数理逻辑的先驱, 提出了二进制。

⁴ Joseph-Marie Jacquard: 约瑟夫·玛丽·雅卡尔(1752—1834), 法国著名的织机工匠, 纹板提花机的主要改革家。

⁵ Herman Hollerith: 赫尔曼·何勒里斯(1860—1929), 美国发明家和统计学家。

Difference Engine
差分机

input stream
输入(信息)流
deck /dek/
n. 卡片叠, 卡片组

printer /'printə/
n. 打印机

analog(ue)
/'ænelɒg/
a. 模拟的

shaft /ʃɑ:ft/
n. 轴

approximation
/ə.pɹɒksɪ'meɪʃən/
n. 近似(值)

torpedo /tɔ:'pi:dəu/
n. 鱼雷

submarine
/sʌbmə'ri:n/
n. 潜艇

bombsight
/'bɒmsaɪt/
n. 轰炸瞄准器

incorporate
/ɪn'kɔ:pəreɪt/
v. 包含, 吸收; 把...
合并, 使并入

vacuum tube
真空管

crack /kræk/
v. 破译

encipher /ɪn'saɪfə/
v. 把...译成密码

Charles Babbage¹ worked out the principles of the modern digital computer. He conceived a number of machines, such as the **Difference Engine**, that were designed to handle complicated mathematical problems. Many historians consider Babbage and his associate, the mathematician Augusta Ada Byron², the true pioneers of the modern digital computer. One of Babbage's designs, the Analytical Engine, had many features of a modern computer. It had an **input stream** in the form of a **deck** of punched cards, a "store" for saving data, a "mill" for arithmetic operations, and a **printer** that made a permanent record.³ Babbage failed to put this idea into practice, though it may well have been technically possible at that date.

2. Early Computers

Analogue computers began to be built in the late 19th century. Early models calculated by means of rotating **shafts** and gears. Numerical **approximations** of equations too difficult to solve in any other way were evaluated with such machines. Lord Kelvin⁴ built a mechanical tide predictor that was a specialized analogue computer. During World Wars I and II, mechanical and, later, electrical analogue computing systems were used as **torpedo** course predictors in **submarines** and as **bombsight** controllers in aircraft. Another system was designed to predict spring floods in the Mississippi River⁵ basin.

3. Electronic Computers

During World War II, a team of scientists and mathematicians, working at Bletchley Park, north of London, created one of the first all-electronic digital computers: Colossus⁶. By December 1943, Colossus, which **incorporated** 1,500 **vacuum tubes**, was operational. It was used by the team headed by Alan Turing⁷, in the largely successful attempt to **crack** German radio messages **enciphered** in the Enigma code⁸.

¹ *Charles Babbage*: 查尔斯·巴比奇(1792—1871), 英国数学家和发明家。

² *Augusta Ada Byron*: 奥古斯塔·埃达·拜伦(1815—1852), 英国数学家, 诗人拜伦之女。

³ *It had an input stream in the form of a deck of punched cards, a "store" for saving data, a "mill" for arithmetic operations, and a printer that made a permanent record.*: 它有一个以一叠穿孔卡片的形式存在的输入流、一个保存数据的“仓库”、一个进行算术运算的“工厂”和一个产生永久性记录的打印机。

⁴ *Lord Kelvin*: 开尔文勋爵(1824—1907), 全名威廉·汤姆森·开尔文(William Thomson Kelvin), 英国物理学家, 发展了热力学理论, 创立了热力学绝对温标(即开尔文温标)。

⁵ *the Mississippi River*: 密西西比河, 发源于美国中北部的湖沼区, 南注墨西哥湾, 系美国主要河流。

⁶ *Colossus*: 该词读作 /ke'lɒsəs/, 有“巨像”、“巨人”、“巨物”等意。

⁷ *Alan Turing*: 艾伦·图灵(1912—1954), 英国数学家和逻辑学家。

⁸ *Enigma code*: 恩尼格码, 德军在第二次世界大战期间采用的一种密码。

prototype

/'prəʊtətaɪp/

n. 原型; 样机

overshadow

/ˌəʊvə'ʃædəʊ/

v. 使相形见绌

integrator

/'ɪntɪgreɪtə/

n. 积分器

patent /'peɪtənt/

n. 专利(权)

overturn

/ˌəʊvə'tɜ:n/

v. 推翻; 废除

Independently of this, in the United States, a **prototype** electronic machine had been built as early as 1939, by John Atanasoff¹ and Clifford Berry² at Iowa State College³. This prototype and later research were completed quietly and later **overshadowed** by the development of the Electronic Numerical **Integrator** And Computer (ENIAC⁴) in 1945. ENIAC was granted a **patent**, which was **overturned** decades later, in 1973, when the machine was revealed to have incorporated principles first used in the Atanasoff-Berry Computer.

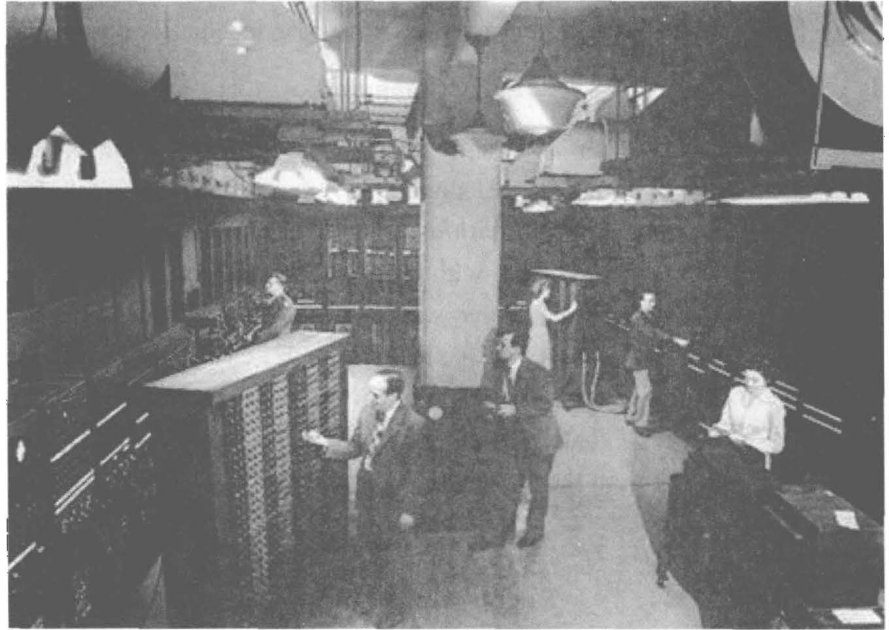


Figure 1A-1: ENIAC was one of the first fully electronic digital computers.

ENIAC (see Figure 1A-1) contained 18,000 vacuum tubes and had a speed of several hundred multiplications per minute, but originally its program was wired into the processor⁵ and had to be manually altered. Later machines were built with program storage, based on the ideas of the **Hungarian-American** mathematician John von Neumann⁶. The instructions,

Hungarian

/hʌŋ'ɡeəriən/

a. 匈牙利的

¹ *John Atanasoff*: 约翰·阿塔纳索夫(1903—1995), 美国物理学家。

² *Clifford Berry*: 克利福德·贝里(1918—1963), 美国物理学家。

³ *Iowa State College*: (美国)艾奥瓦州立学院。

⁴ *ENIAC*: 电子数字积分计算机, ENIAC 计算机 (*Electronic Numerical Integrator And Computer* 的首字母缩略), 读作 /'i:niæk/。

⁵ *originally its program was wired into the processor*: 其程序最初是通过导线传送到处理器内的。

⁶ *John von Neumann*: 约翰·冯·诺依曼(1903—1957), 美籍匈牙利数学家, 对量子物理、数学逻辑和高速计算机的发展均有贡献。

memory /'meməri/

n. 存储器, 内存
paper-tape reader
纸带阅读器

execution

/ˌeksɪ'kjʊʃən/

n. 执行, 运行

transistor

/træn'zɪstə, -'sɪs-/

n. 晶体管

advent /'ædvent/

n. 出现, 到来

versatile /'vɜ:sətəɪl/

a. 多用途的,
通用的

logical element

逻辑元件

spacing /'speɪsɪŋ/

n. 间隔

integrated

/'ɪntɪɡreɪtɪd/

a. 集成的, 综合的,
一体化的

integrated circuit

集成电路

fabricate

/'fæbrɪkeɪt/

v. 制作

substrate

/'sʌbstreɪt/

n. 衬底, 基底

microprocessor

/'maɪkrəʊ'prəʊsesə/

n. 微处理器

microchip

/'maɪkrəʊtʃɪp/

n. 微芯片

etch /etʃ/

v. 蚀刻

like the data, were stored within a “**memory**”, freeing the computer from the speed limitations of the **paper-tape reader** during **execution** and permitting problems to be solved without rewiring the computer.

The use of the **transistor** in computers in the late 1950s marked the **advent** of smaller, faster, and more **versatile logical elements** than were possible with vacuum-tube machines. Because transistors use much less power and have a much longer life, this development alone was responsible for the improved machines called second-generation computers. Components became smaller, as did inter-component **spacings**, and the system became much less expensive to build.

4. Integrated Circuits

Late in the 1960s the integrated circuit, or IC (see Figure 1A-2), was introduced, making it possible for many transistors to be **fabricated** on one silicon **substrate**, with interconnecting wires plated in place.¹ The IC resulted in a further reduction in price, size, and failure rate. The **microprocessor** became a reality in the mid-1970s with the introduction of the large-scale integrated (LSI) circuit and, later, the very large-scale integrated (VLSI) circuit (**microchip**), with many thousands of interconnected transistors **etched** into a single silicon substrate.

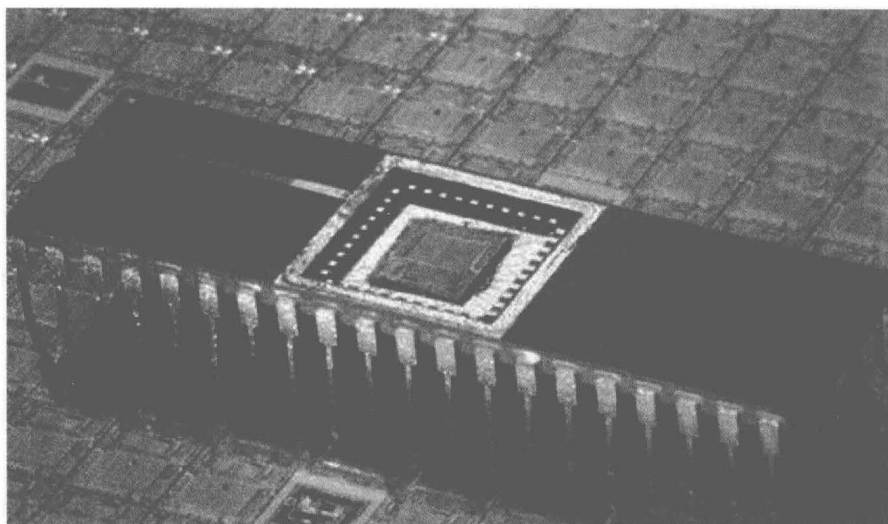


Figure 1A-2: An Integrated Circuit

To return, then, to the switching capabilities of a modern computer:

¹ *making it possible for many transistors to be fabricated on one silicon substrate, with interconnecting wires plated in place:* 从而有可能将许多晶体管制作在一块硅衬底上, 晶体管之间用覆镀在适当位置的导线相连接。

binary /'bainəri/
a. 二进制的

bit /bit/ n. 位, 比特

byte /baɪt/ n. 字节

datum /'deɪtəm/
n. ([复] **data**)
数据

graphics /'græfɪks/
n. 图形, 图形显示

decimal /'desɪməl/
a. 十进制的

switch /'swɪtʃ/
n. 交换(设备);
开关; 转换

chip /tʃɪp/ n. 芯片

instruction set
指令集

ongoing /'ɒŋ,ɡəʊɪŋ/
a. 正在进行的,
不间断的

conceptually
/kən'septʃuəli/
ad. 概念上

microcomputer
/'maɪkrəʊkəm'pjʊ:tə/
n. 微型计算机

desktop /'desktpɒp/
a. 桌面的; 台式(计算机)的

laptop /'læptɒp/
n. 膝上型计算机

palmtop /'pɑ:mtɒp/
n. 掌上型计算机

workstation
/'wɜ:k.steɪʃən/
n. 工作站

minicomputer
/'mɪnɪkəm'pjʊ:tə/
n. 小型计算机

mainframe
/'meɪnfreɪm/
n. 主机, 大型机

supercomputer
/'sɜ:pəkəm'pjʊ:tə/
n. 超级计算机,
巨型计算机

central processing unit 中央处理器

bus /bʌs/ n. 总线

computers in the 1970s were generally able to handle eight switches at a time. That is, they could deal with eight **binary** digits, or **bits**, of data, at every cycle. A group of eight bits is called a **byte**, each byte containing 256 possible patterns of ONs and OFFs (or 1s and 0s). Each pattern is the equivalent of an instruction, a part of an instruction, or a particular type of **datum**, such as a number or a character or a **graphics** symbol. The pattern 11010010, for example, might be binary data—in this case, the **decimal** number 210—or it might be an instruction telling the computer to compare data stored in its **switches** to data stored in a certain memory-**chip** location.

The development of processors that can handle 16, 32, and 64 bits of data at a time has increased the speed of computers. The complete collection of recognizable patterns—the total list of operations—of which a computer is capable is called its **instruction set**. Both factors—the number of bits that can be handled at one time, and the size of instruction sets—continue to increase with the **ongoing** development of modern digital computers.

III. Hardware

Modern digital computers are all **conceptually** similar, regardless of size. Nevertheless, they can be divided into several categories on the basis of cost and performance: the personal computer or **microcomputer**, a relatively low-cost machine, usually of **desktop** size (though “**laptops**” are small enough to fit in a briefcase, and “**palmtops**” can fit into a pocket); the **workstation**, a microcomputer with enhanced graphics and communications capabilities that make it especially useful for office work; the **minicomputer**, generally too expensive for personal use, with capabilities suited to a business, school, or laboratory; and the **mainframe** computer, a large, expensive machine with the capability of serving the needs of major business enterprises, government departments, scientific research establishments, or the like (the largest and fastest of these are called **supercomputers**).

A digital computer is not a single machine: rather, it is a system composed of five distinct elements: (1) a **central processing unit**; (2) input devices; (3) memory storage devices; (4) output devices; and (5) a communications network, called a **bus**, which links all the elements of the system and connects the system to the external world.

IV. Programming

A program is a sequence of instructions that tells the hardware of a computer what operations to perform on data. Programs can be built into the hardware itself, or they may exist independently in a form known as software. In some specialized, or “**dedicated**”, computers the operating instructions are **embedded** in their **circuitry**; common examples are the **microcomputers** found in calculators, **wristwatches**, car engines, and **microwave ovens**. A general-purpose computer, on the other hand, although it contains some **built-in** programs (in ROM¹) or instructions (in the processor chip), depends on external programs to perform useful tasks. Once a computer has been programmed, it can do only as much or as little as the software controlling it at any given moment enables it to do. Software in widespread use includes a wide range of applications programs—instructions to the computer on how to perform various tasks.

V. Future Developments

One continuing trend in computer development is **microminiaturization**, the effort to compress more circuit elements into smaller and smaller chip space. Researchers are also trying to speed up circuitry functions through the use of **superconductivity**, the phenomenon of decreased electrical resistance observed in certain materials at very low temperatures.

The “fifth-generation” computer effort to develop computers that can solve complex problems in ways that might eventually merit the description “creative”² is another trend in computer development, the ideal goal being true **artificial intelligence**. One path actively being explored is parallel-processing computing, which uses many chips to perform several different tasks at the same time. One important parallel-processing approach is the **neural network**, which **mimics** the **architecture** of the nervous system. Another ongoing trend is the increase in computer **networking**, which now employs the worldwide data communications system of satellite and cable links to connect computers globally. There is also a great deal of research into the possibility of “optical” computers—hardware that processes not pulses of electricity but much faster pulses of light.

dedicated

/ˈdedikeɪtɪd/

a. 专用的

embed /ɪmˈbed/

v. 把…嵌入

circuitry /ˈsɜːkɪtri/

n. 电路

wristwatch

/ˈrɪstwɒtʃ/

n. 手表

microwave oven

微波炉

built-in /ˈbɪltˈɪn/

a. 内置的, 内部的

microminiaturization

/ˈmaɪkrəʊ.mɪnɪ-

tʃəraɪˈzeɪʃən/

n. 微小化, 超小型化

superconductivity

/ˈsjuːpə.kɒndʌkˈtɪvɪti/

n. 超导(电)性

artificial

intelligence

人工智能

neural /ˈnjuərəl/

a. 神经的

neural network

神经网络

mimic /ˈmɪmɪk/

v. 模仿

architecture

/ˈɑːkɪtektʃə/

n. 体系结构

networking

/ˈnet.wɜːkɪŋ/

n. 连网, 联网, 建网

¹ ROM: 只读存储器 (read-only memory 的首字母缩略), 读作 /rɒm/。

² merit the description “creative”: 用“创造性的”这个词来形容名副其实。

Exercises

I. Fill in the blanks with the information given in the text:

1. According to many historians, the true pioneers of the modern digital computer are _____ and _____.

2. A digital computer is generally made up of five distinct elements: a central processing unit, _____ devices, memory storage devices, _____ devices, and a bus.

3. The microprocessor is a central processing unit on a single chip. It was made possible in the mid-1970s with the introduction of the LSI circuit and the _____ circuit.

4. According to the text, modern digital computers can be divided into four major categories on the basis of cost and performance. They are microcomputers, _____, minicomputers, and _____.

5. The first electronic computers, such as Colossus and ENIAC created in Britain and the United States respectively, used _____ tubes, which later gave place to _____.

6. A program is a sequence of _____ that can be executed by a computer. It can either be built into the hardware or exist independently in the form of _____.

7. The smallest unit of information handled by a computer is bit, which is the abbreviation of binary _____. A group of _____ bits is called a(n) _____.

8. One of the trends in computer development is _____, the effort to compress more circuit elements into smaller and smaller _____ space.

II. Translate the following terms or phrases from English into Chinese and vice versa:

1. artificial intelligence
2. paper-tape reader
3. optical computer

11. 数据的存储与处理
12. 超大规模集成电路
13. 中央处理器

- | | |
|------------------------------|-----------|
| 4. neural network | 14. 个人计算机 |
| 5. instruction set | 15. 模拟计算机 |
| 6. parallel processing | 16. 数字计算机 |
| 7. difference engine | 17. 通用计算机 |
| 8. versatile logical element | 18. 处理器芯片 |
| 9. silicon substrate | 19. 操作指令 |
| 10. vacuum tube | 20. 输入设备 |

III. Fill in each of the blanks with one of the words given in the following list, making changes if necessary:

<i>microcomputer</i>	<i>computing</i>	<i>digital</i>	<i>base</i>
<i>advent</i>	<i>mode</i>	<i>circuit</i>	<i>significance</i>
<i>chip</i>	<i>appear</i>	<i>speed</i>	<i>transistor</i>
<i>minicomputer</i>	<i>combine</i>	<i>categorization</i>	<i>integration</i>

We can define a computer as a device that accepts input, processes data, stores data, and produces output. According to the _____ of processing, computers are either analog or _____. They can also be classified as mainframes, _____, workstations, or microcomputers. All else (for example, the age of the machine) being equal, this _____ provides some indication of the computer's _____, size, cost, and abilities.

Ever since the _____ of computers, there have been constant changes. First-generation computers of historic _____, such as *UNIVAC* (通用自动计算机), introduced in the early 1950s, were _____ on vacuum tubes. Second-generation computers, _____ in the early 1960s, were those in which _____ replaced vacuum tubes. In third-generation computers, dating from the 1960s, integrated _____ replaced transistors. In fourth-generation computers such as _____, which first appeared in the mid-1970s, large-scale _____ enabled thousands of circuits to be incorporated on one _____. Fifth-generation computers are expected to _____ very-large-scale integration with sophisticated approaches to _____, including artificial intelligence and true distributed processing.

IV. Translate the following passage from English into Chinese:

Computers will become more advanced and they will also become easier to use. Improved speech recognition will make the operation of a