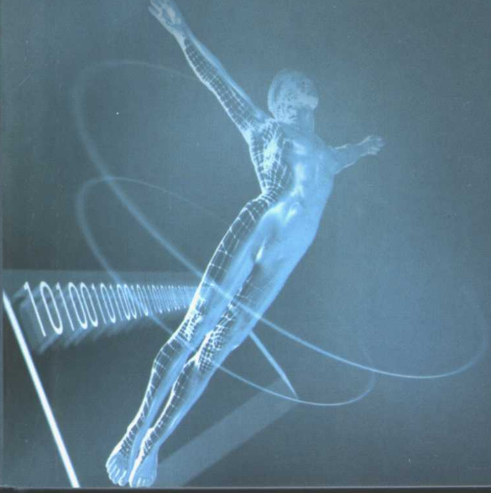
21世纪高新科技专业英语阅读系列

计算机与信息技术

Computer Information Technology

魏巍　周霖　主编



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前　　言

世界的发展需要中国，中国的富强也离不开世界。打开国门，与全世界交流，才是中国发展的正确道路。尤其是随着中国成功地加入 WTO，科技英语的地位显得更为重要，国际、国内的许多公司企业迫切需要掌握这项技能的人才。为了适应社会的发展和需要，同时为了配合目前高等学校纷纷设立的双语课程的教学，我们专门组织各高校工科专业的青年教师骨干和学术学科带头人编写了《21 世纪高新科技专业英语阅读系列》丛书。

本丛书共分 8 册，包括：《材料科学与化学工程》、《计算机与信息技术》、《光电世界》、《电子世界》、《现代通信技术》、《航天航空技术》、《生物工程与医学》、《人工智能》。

每个分册都在精选富有时代感和代表性文章的基础上，精心设计了技术背景、词语注释、句子注释三个方面的内容。技术背景能帮助读者进一步了解各项科学技术在全世界的发展、现状以及未来；词语注释、句子注释能使读者更好地理解文章内容，并进一步掌握专业词汇和语句。其中：

《材料科学与化学工程》用通俗易懂的语言讲述了材料科学和化学工程的各个研究方向，使读者对这两个学科有较全面的了解。本书在选材方面注意了材料科学和化学工程领域内的最新科技进展，使读者能够追踪到两个学科的研究发展前沿。

《计算机与信息技术》是一系列当今热点技术的汇总，覆盖了几乎整个计算机与信息技术领域内的相关内容。无论是早期的电

话网、大型电脑和半导体技术，或是新兴的 Internet、局域网、个人电脑及重要软件；无论是最新的理论研究，或是实践中的重大成果，都有相关的英语文章与之相对应。

《光电世界》主要讲述了光电技术的应用，包括电力市场、太阳能发电、电子碰撞电离现象、电荷耦合器件、全光逻辑器件以及光子学的研究等知识。

《电子世界》收集了可编程逻辑电路、转换脉冲、数字信号处理、动态随机存储器、混合信号设计及有关电子工程技术各个方面的知识。

《现代通信技术》讲述了现代通信技术的各种方式以及各种通信系统，并对下一代通信方式进行了预测：随着社会经济的发展，电话业务的适度发展和数据业务的超常发展将是未来我国电信业务市场的主要特征，电话业务由主变辅，以互联网技术为核心的数据网络将最终成为网络的主体。

《航空航天技术》基于“航天航空技术的发展显示了中国综合国力的增强”这一认识，对航空航天技术中相关领域分别进行了阐述，不仅介绍了太阳系的成员，探索了外层空间，阐述了飞机的制造，更展望了航空航天技术的发展。

《生物工程与医学》涵盖了人类基因工程、人类基因组数据、人工制造血管、超级人造细胞、干细胞、人类寿命、遗传、克隆等生物技术知识，并分析了进餐时间与人体生物钟的关系，人寿保险与社会的关系，癌症药物的新来源以及过敏、精神分析、肥胖症和糖尿病等社会医学问题，全面概述了生物与医学等方面的知识。

《人工智能》讲述了人工智能理论的原理，人类智能与机器之间的关系，人工智能、逻辑推理计算机、模糊计算机和神经网络计算机之间的关系以及人工智能技术开发、人工生命研究、机器人等

知识,能够帮助读者获得有关人工智能各个方面的最新技术发展情况。

通过对丛书的阅读,我们不仅希望能使读者对相关领域内的常用科技英语词汇、术语有一个全面的初步印象,还想借此机会能够让大家进一步了解到科技的发展现状与趋势,从而为大家在具体研究中起到一定的帮助作用。

如果您看完本书后觉得物有所值,能使您的知识有所增长,那就是我们最大的欣慰了。由于时间仓促,作者水平有限,书中难免存在疏漏与不足之处,还望各位专家读者不吝赐教,以便我们修订再版时予以订正。

编者

2003.05

内 容 简 介

21世纪是信息的时代，科技社会的发展使得信息技术无处不在。本书立足于信息与网络技术的发展前沿，精选出富有代表性和知识性的48篇文章，覆盖了几乎整个计算机与信息技术领域内的相关内容。从早期的电话网、大型电脑和半导体技术，到新兴的Internet、局域网、个人电脑及重要软件；既包括最新的理论研究，又包括实践中的重大成果。本书还精心设计了技术背景、词语注释、句子注释。技术背景能帮助读者进一步了解到计算机与信息技术在全世界的发展、现状以及未来；词语注释、句子注释能使读者更好地理解课文内容。

本书可作为高等院校电子工程与计算机专业师生的科技英语学习指导书，也可作为科研人员和专业人士进行科技英语学习的参考书。

Content

目　录

Chapter 1 Digital Signal Processing
数字信号处理

【原文】

Digital signal processing, a field which has its roots【1】in 17th and 18th century mathematics, has become an important modern tool in a multitude of diverse fields of science and technology(1). The techniques and applications of this field are as old as Newton and Gauss and as new as digital computers and integrated circuits.

Digital signal processing is concerned with the representation of signals by sequences【2】of numbers or symbols and the processing of these sequences. The purpose of such processing may be to estimate characteristic parameters of a signal or to transform a signal into a form which is in some sense more desirable【3】. The classical numerical analysis formulae, such as those designed for interpolation【4】, integration【5】, and differentiation【6】, are certainly digital signal processing algorithms【7】(2). On the other hand, the availability of high-speed digital computers has fostered the development of increasingly complex and sophisticated signal processing algorithms, and recent advances in integrated circuit technology promise economical implementations of very complex digital signal processing systems.

Signal processing, in general, has a rich history, and its importance is evident【8】in such diverse【9】fields as biomedical engineering

[10], acoustics[11], sonar[12], radar, seismology[13], speech communication, data communication, nuclear [14] science, and many others. In many applications, as, for example, in EEG and ECG analysis[15]or in systems for speech transmission and speech recognition, we may wish to extract some characteristic parameters. Alternatively[16], we may wish to remove interference, such as noise, from the signal or to modify the signal to present it in a form which is more easily interpreted by an expert. As another example, a signal transmitted over a communications channel is generally perturbed[17]in a variety of ways, including channel distortion, fading [18], and the insertion of background noise. One of the objectives at the receiver is to compensate[19]for these disturbances. In each case, processing of the signal is required(3).

Signal processing problems are not confined[20], of course, to one-dimensional signals. Many picture-processing applications require the use of two-dimensional signal processing techniques. This is the case, in X-ray enhancement, the enhancement, and analysis of aerial photographs for detection of forest fires or crop damage, the analysis of satellite weather photos, and the enhancement of television transmissions from lunar and deep-space probes[21]. Seismic data analysis as required in oil exploration, earthquake measurements and nuclear test monitoring[22]also utilizes multidimensional signal processing techniques.

Until recently, signal processing has typically been carried out using analog equipment. Some exceptions to this were evident in the 1950s, particularly[23]in areas where sophisticated[24]signal processing was required. This was the case, for example, in the analysis of some geophysical data, which could be recorded on magnetic tape for later processing on a large digital computer. This class of problems was one of the first examples of signal processing using digital computers. This type of signal processing could not generally be done in real-time; for example, minutes or even hours of computer time were often required to process only seconds of data. Even so, the flexibility of the digital computer made this alternative extremely inviting[25](4).

During this same period the use of digital computers in signal processing also arose in a different way. Because of the flexibility of digital computers, it was often useful to simulate a signal processing system on a digital computer before implementing it in analog hardware. In this way, a new signal processing algorithm, or system, could be studied in a flexible experimental environment before committing economic and engineering resources to constructing it. Typical examples of such simulations were the vocoder[26] simulations carried out at Lincoln Laboratory and at Bell Laboratories. In the implementation of an analog channel vocoder, the filter characteristics often affect the quality of the resulting speech signal in unpredictable ways. Through computer simulations, these filter characteristics were adjusted and the quality of a system evaluated prior to construction of the analog equipment(5).

In all of the above examples of signal processing using digital computers, the computer offered tremendous[27]advantages in flexibility. However, the processing could not always be done in realtime. Consequently, a prevalent[28]attitude[29]at that time was that the digital computer was being used to approximate, or simulate, an analog signal processing system. In keeping with that style, early work on digital filtering was very much concerned with ways in which a filter could be programmed on a digital computer to that with analog-to-digital conversion of the signal, followed by the digital filtering, followed by digital-to-analog conversion, the overall system approximated a good analog filter. The notion[30] that digital systems might, in fact, be practical for the actual implementation of signal processing in speech communication or radar processing or any of the variety of other applications seemed at the cost, and size were, of course, three of the important factors in favor of the use of analog components.

As signals were being processed on digital computers, there was a natural tendency to experiment with increasingly sophisticated signal processing algorithms. Some of these algorithms grew out of the flexibility of the digital computer and had no apparent implementation in analog equipment. Thus, many of these algorithms were treated as interesting, but somewhat impractical, ideas. An example of a class of algorithms of this type was the set of techniques referred to as spectrum analysis and homomorphic filtering[31]. It had been clearly demonstrated on digital computers that these techniques could be applied to advantage in speech bandwidth compression systems, deconvolution[32], and echo removal. Implementation of these techniques requires the explicit evaluation of the inverse Fourier transform of the logarithm of the Fourier transform of the input. The required accuracy and resolution[33] of the Fourier transform were such that analog spectrum analyzers were not practical. The development of such signal processing algorithms made the notion of all-digital implementation of signal processing systems even more tempting(6). Active work began on the investigation of digital vocoders, digital spectrum analyzers, and other all-digital systems, with the hope that eventually such systems would become practical.

The evolution of a new point of view toward digital signal processing was further accelerated by the disclosure[34]in 1965 of an efficient algorithm for computation of Fourier transforms. This class of algorithms has come to be known as the fast Fourier transform or FFT. The implications of the FFT were significant from a number of points of view. Many signal processing algorithms which had been developed on digital computers required processing times several orders of magnitude greater than real-time(7). Often this was tied to the facts that spectrum analysis was an important component of the signal processing and that no efficient means had been known for implementing it. The fast Fourier transform algorithm reduced the computation time of the Fourier transform by orders of magnitude. This permitted the implementation of increasingly sophisticated signal processing algorithms with processing times that allowed interaction with the system. Furthermore, with the realization that the fast Fourier transform algorithm might, in fact, be implementable in special purpose digital hardware, many signal processing algorithms which previously had practical implementations with special purpose digital hardware.

Another important implication of the fast Fourier transform algorithm was tied to the fact that it was an inherently[35] discrete-time[36]concept. It was directed toward the computation of the Fourier transform of a discrete-time signal or sequence and involved a set of properties and mathematics that were exact in the discrete-time domain it was not simply an approximation to a continuous－time Fourier transform(8). The importance of this was that it had the effect of stimulating a reformulation of many signal processing concepts and algorithms in terms of discrete-time mathematics and these techniques then formed an exact set of relationships in the discrete-time domain. This represented a shift away from the notion that signal processing on a digital computer was merely【37】an approximation to analog signal processing techniques. With this shift in point of view there emerged a strong interest in the new or reborn 【38】field of digital signal processing.

The techniques and applications of digital signal processing are expanding at a tremendous rate. With the advent of large scale integration and the resulting reduction in cost and size of digital components, together with increasing speed, the class of applications of digital signal processing techniques is growing. Special purpose digital filters can now be implemented at sampling rates in the megahertz range. Special purpose processors for implementing the fast Fourier transform at high data rates are commercially【39】available. Simple digital filters have been integrated on circuit chips. Almost all current discussions of speech bandwidth compression systems are directed toward all digital implementation because these are now the most practical(9). Digital processors also form an integral part of many modern radar and sonar systems. In addition to the development of special purpose digital signal processing hardware, there are available special programmable digital signal processing computers whose architecture is matched to signal processing problems(10). Such computers are finding application in real-time signal processing as well as for real-time simulations directed toward the development of special purpose digital hardware.

The importance of digital processing appears to be increasing with no visible sign of saturation【40】. Indeed【41】, the future development of the field is likely to be even more dramatic than the