TELECOMMUNICATION ENGLISH

通信英语

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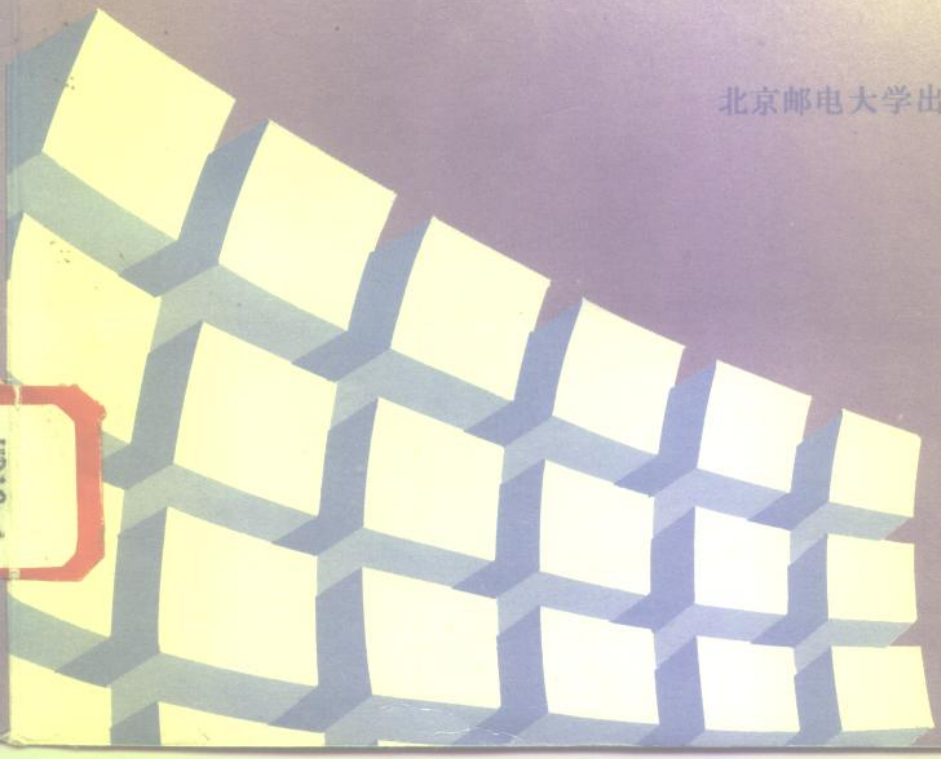
石方文
倪维桢　审

北京邮电大学出版社



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内 容 提 要

"通信英语"是为了适应我国邮电通信事业飞速发展的新形势,提高工程技术人员的专业英语水平而编写的一本英语自学教材,亦可作为大专院校(通信)专业英语的教科书。

本书内容广泛,涉及计算机、数字通信、数据通信、程控交换、移动通信、卫星通信、光纤通信、信号处理、电信网、ISDN 等方面,基本覆盖了当代通信的每一个领域。

本书课文主要选自美国高等院校的教科书和一些高级别的通信技术刊物。这些课文语言简朴,文字流畅,易于阅读和理解。每课附有生词表和课文注释,并配有练习题和阅读短文。

本书曾作为内部教材发行,得到了企业和院校的高度评价,深受欢迎。

前　言

为了适应我国邮电通信事业飞速发展的新形势，提高工程技术人员的专业英语水平和邮电高等函授学生专业英语的阅读能力，我们编写了这本“通信英语”。

“通信英语”共有22课。课文内容涉及计算机、数字通信、数据通信、卫星通信、光纤通信、程控交换、移动通信、微波通信、信号处理、电信网和ISDN等方面，基本覆盖了当代通信技术的每一个领域。

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考虑到读者学习过公共英语，已具有一定的英语基础，所以本书的编写是以扩大通信技术的词汇量、熟悉专业术语、了解科技文章的表达特点和掌握英语翻译技巧为宗旨的。我们认为，只要读者能熟练地阅读和翻译本书的课文，则看一般的通信专业英语文章就不会再感到费力。

本书的前身“通信英语”（内部印刷教材）自1993年初问世以来，得到了各方面读者的厚爱和好评，作者在此向他们表示深切的谢意。

本书由张筱华、王迎春、石方文编写，张筱华担任主编。在构思、编写和出版过程中，始终得到了邮电部教育司职工教育处的鼎力支持和帮助。另外，倪维桢教授仔细审阅了全部书稿并提出了不少宝贵意见。为此，在“通信英语”问世之际，作者向他

们表示衷心的感谢。

由于编写匆忙，书中会有一些不足之处，衷望读者批评指正。

张筱华　王迎春　石方文

于北京邮电大学函授学院

一九九四年元月

目　　录

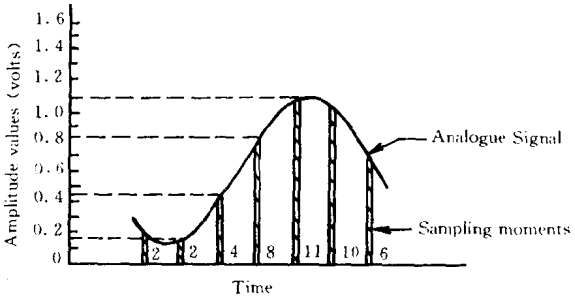
CONTENTS

1 The Principle of PCM[1]

TEXT

PCM is dependent on three separate operations, sampling, quantizing, and coding[2]. Many different schemes for performing these three functions have evolved during recent years[3], and we shall describe the main ones. In these descriptions we shall see how a speech channel of telephone quality may be conveyed as a series of amplitude values, each value being represented[4], that is, coded, as a sequence of 8 binary digits[5]. Furthermore, we shall prove that a minimum theoretical sampling frequency of order 6.8 kilohertz (kHz) is required to convey a voice channel occupying the range 300Hz to 3.4 kHz[6]. Practical equipments, however, normally use a sampling rate of 8 kHz, and if 8-digits per sample value[7] are used, the voice channel becomes represented by a stream of pulses with a repetition rate of 64 kHz, Fig. 1-1 illustrates the sampling, quantizing, and coding processes.

Reexamination of our simple example shows us that the speech signal of maximum frequency 3.4kHz has been represented by a signal of frequency 64kHz. However, if only 4 digits per sample value had been used, the quality of transmission



Amplitude value	Binary coded equivalent	Pulse code modulated signal
1	0000	
2	0001	
3	0010	
4	0011	
5	0100	
6	0101	
7	0110	
8	0111	
9	1000	
10	1001	
11	1010	
12	1011	
13	1100	
14	1101	
15	1110	
16	1111	

If the analogue signal shown above is "sampled", and then "coded" using the table, the transmitted pulse code modulated signal becomes:

Decimal values: 2 , 2 , 4 , 8 , 11 , 10 , 6

Binary values: 0001, 0001, 0011, 0111, 1010, 1001, 0101

PCM Signal:

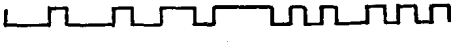


Fig. 1-1 The Sampling and Coding Processes, and the Resultant PCM Signal

would drop, and the repetition rate of the pulses would be reduced to 32 kHz. Thus the quality of transmission is dependent on the pulse repetition rate, and for digital communication systems these two variables may be interchanged most efficiently[8].

Digital transmission provides a powerful method for overcoming noisy environments. Noise can be introduced into a transmission path in many different ways; perhaps via a nearby lightning strike, the sparking of a car ignition system, or the thermal low-level noise within the communication equipment itself[9]. It is the relationship of the true signal to the noise signal, known as the signal-to-noise ratio, which is of most interest to the communication engineer[10]. Basically, if the signal is very large compared to the noise level[11], then a perfect message can take place; however, this is not always the case. For example, the signal received from a satellite, located in far outer space[12], is very weak and is at a level only slightly above that of the noise. Alternative examples may be found within terrestrial systems where, although the message signal is strong, so is the noise power.

If we consider binary transmission, the complete information about a particular message will always be obtained by simply detecting the presence or absence of the pulse. By comparison, most other forms of transmission systems convey the message information using the shape, or level of the transmitted signal; parameters that are most easily affected by the noise

and attenuation introduced by the transmission path[13]. Consequently there is an inherent advantage for overcoming noisy environments by choosing digital transmission.

So far in this discussion we have assumed that each voice channel has a separate coder, the unit that converts sampled amplitude values to a set of pulses; and decoder, the unit that performs the reverse operation. This need not be so, and systems are in operation where a single codec (i.e., coder, and its associated decoder) is shared between 24, 30, or even 120 separate channels. A high-speed electronic switch is used to present the analog information signal of each channel, taken in turn[14], to the codec. The codec is then arranged to sequentially sample the amplitude value, and code this value into the 8-digit sequence identified earlier. Thus the output to the codec may be seen as a sequence of 8 pulses relating to channel 1, then channel 2, and so on. This unit is called a time division multiplexer (TDM), and is illustrated in Fig. 1-2. The multiplexing principle that is used is known as word interleaving. Since the words, or 8-digit sequences, are interleaved in time.

At the receive terminal a demultiplexer is arranged to separate the 8-digit sequences into the appropriate channels. The reader may ask, how does the demultiplexer know which group of 8-digits relates to channel 1, 2, and so on? Clearly this is important! The problem is easily overcome by specifying a frame format, where at the start of each frame a unique sequence of pulses called the frame code, or synchronization

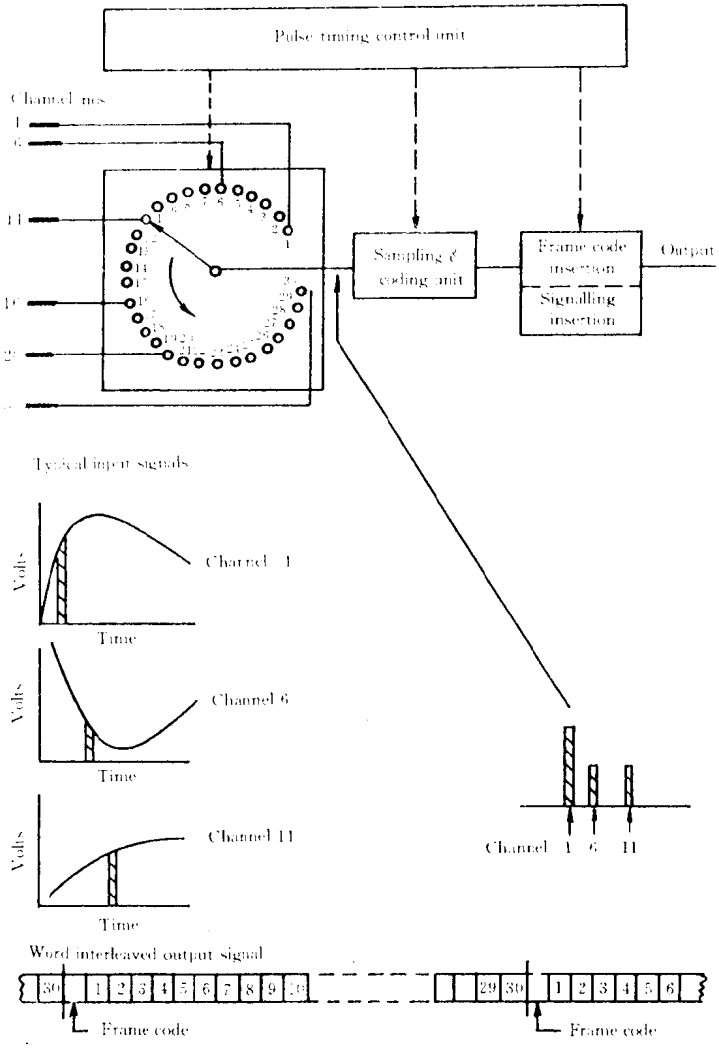


Fig. 1-2 The Function of the Time Division Multiplexer (TDM)

word, is placed so as to identify the start of the frame[15]. A circuit of the demultiplexer is arranged to detect the synchronization word, and thereby it knows that the next group of 8-digits corresponds to channel 1. The synchronization word reoccurs once again after the last channel has been received[16].

NEW WORDS & PHRASES

principle ['prinsipl] *n.* 原理
be dependent on 依赖，取决于
sample ['sæmpl] *vt.* 采样
n. 样值
quantize ['kwɔntaiz] *v.* 量化，分层
code [koud] *v.* 编码
n. 码
scheme [ski:m] *n.* 方案，设计，安排
describe [dis'kraib] *vt.* 叙述，描述
description *n.* 叙述，描述
amplitude ['æmplitju:d] *n.* 幅，幅度
binary ['bainəri] *a.* 二进制的
minimum ['miniməm] *n.* 最小值，最小量
theoretical [θiə'retikəl] *a.* 理论上的
repetition [repi'tiʃən] *n.* 重复，反复
reexamination *n.* 再审查，重考
maximum ['mæksiməm] *n.* 最大值
reduce [ri:dju:s] *v.* 减少，缩小
interchange [intə'tʃeindʒ] *v.* 互换，转换
method ['meθəd] *n.* 方式，方法，手段

overcome [ovə'kʌm] *v.* 克服，打败，征服

environment [in'vaiərəmənt] *n.* 环境，周围情况

lightning ['laitniŋ] *n.* 电光，闪电，雷电

strike [straik] *n.* 击，敲，打

spark [spɑ:k] *vi.* 发火花，打火，闪光

ignition [ig'niʃən] *n.* 点火，点火装置

signal-to-noise ratio 信号噪声比

satellite ['sætilait] *n.* 卫星

terrestrial [ti'restriəl] *a.* 地球的，地面的，大地的

by comparison 比较起来，相对之下

parameter [pə'ræmitə] *n.* 参数，系数

attenuation *n.* 衰减，衰耗

inherent [in'hiərənt] *a.* 固有的，内在的

assume [ə'sju:m] *v.* 假设，假定

decoder *n.* 解(译)码器

codec *n.* 编译码器

interleave [int'li:v] *vt.* 交插，交错

appropriate [ə'proupriit] *a.* 适当的，合适的

unique [ju:nik] *a.* 唯一的，独特的

reoccur *v.* 再发生，再次发生

NOTES

1. 本篇课文涉及数字通信领域，题目为："PCM 原理".
2. be dependent on 依靠，依赖，取决于.
3. performing 是 perform 的动名词. 动名词虽为名词，但仍保留着动词的某些特征，例如它仍可带有动词宾语. 本句中的 these three functions 就是 performing 的宾语.

   本课中这类例子很多，例如第四段中的最后一句中：

Consequently there is an inherent advantage for overcoming noisy environments by choosing digital transmission.

句中的 overcoming 和 choosing 都是动名词且带有自己的动词宾语.

4. each value being represented　这是一种独立分词结构，用来表示一种伴随状态. 可译成："而每一幅值被表示为…".

独立分词结构在科技文章中相当常见，例如：

There are many kinds of steel, each having its uses in industry.

钢有许多种，在工业中每种都有它自己的用途.

独立分词结构还可以表示时间、原因或条件等，对主句进行补充说明. 例如表示原因：

The resistance being very high, the current in the circuit was low.

由于电阻很高，故电路里的电流很小.

5. as a sequence of 8 binary digits　句中的 as 意为"作为，表为，成为". 该短语可译成："（表为）8 位二进制码的序列".

6. occupying　它是 occupy 的现在分词. 动词的-ing 形式可以作为名词用，称为动名词，本课注释 3 已对此作了介绍. 动词的-ing 形式亦可作形容词用（称现在分词）. 它一般修饰该动作的发出者，而且它亦可带有自己的宾语，例如本句中的：a voice channel occupying the range 300Hz to 3.4kHz.　该短语可译为："占有 300Hz 到 3.4kHz 频率范围的话路".

7. 8-digits per sample value　可译为"每样值 8 位码".

8. most efficiently 意为极有效地，极明显地.

9. 本句中的几个词组可译为：

lightning strike　打雷

sparking of a car ignition system　汽车点火系统的打火

thermal low-level noise　低电平的热噪声.

10. known as the signal-to-noise ratio　译为"称为信号噪声比".

11. compared to the noise level　意为"与噪声电平相比".

12. located in far outer space　这是一种分词短语结构. located 是动词的-ed 形式，称为过去分词，起形容词的作用. 这种分词往往用来修饰原来动词动作的承受者. 例如：

The trees planted by me have grown up. 我种的树已长大了.

再例如：

Electromotive force results in electrical pressure, compared to water pressure. 电动势产生电压，电压好比水压.

所以课文中的这一短语可译为："位于遥远太空中的（卫星）".

13. 本句中需要说明下述问题：

By comparision　相比之下

using the shape, or level of transmitted signal　为现在分词短语结构，作伴随情况状语，可译为："用传输信号的形状或电平（来传送信息）".

类似的例子还有：

The rockets rose hissing over the launching site. 火箭在发射场的上空嘶嘶地上升.

再例如：

They sat together, carefully studing the design of the circuits. 他们坐在一起仔细地研究着那些电路的设计.

对课文中的这个句子，全句可译为："相比之下，许多其他形式的传输系统是利用被传信号的形状或电平来传送信息的，而这些参数又极易受到传输途径中的噪声和衰耗的影响."

14. taken in turn　轮流地，依次地.

15. so as to　以便，为了.

16. 本句可译为："当最后一路收到之后，同步码字又再次出现".

EXERCISES

1. Please translate the following phrases into English: