

<<数字通信>>

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前言

John G. Proakis和Masoud Salehi所著的《数字通信（第五版）》是著者多年教学和科研的总结，是一本比较全面、系统、深入论述数字通信理论的经典力作，在学术界有很大的影响，同时也是一本优秀的研究生教材，多年来，国内外许多高等院校普遍采用本书作为信息和通信专业的研究生教材。

《数字通信（第五版）》有16章，共800多页/1100多页（中译版/英文版），内容十分丰富。麦格劳-希尔（亚洲）教育出版公司和电子工业出版社考虑到国内高等院校相关专业教学实际情况和读者的需求，计划在《数字通信（第五版）》的基础上适当地改编出版本书的精简版，要求精简版的篇幅大约为完全版的一半，以更好地适应国内教学和读者的需求。

由于精简的篇幅相当大，确定精简原则并制定一个周密的精简方案是非常重要的。为此，有必要先对《数字通信（第五版）》的结构和内容进行分析，全书的内容大致可分为三大部分：第一部分为数字传输理论（第1、2、3、4、5、9、10等章，约占全书篇幅44%），主要内容是论述通信信号、数字调制、同步和自适应均衡等；第二部分为信息传输理论（第6、7、8章，约占全书篇幅24%），主要论述信息论基础、信源编码和信道纠错编码等；第三部分为无线通信基础（第11、12、13、14、15、16等章，约占全书篇幅32%），主要论述衰落信道、扩频、多载波、多天线、多用户通信等。

这三部分内容不是截然分割，而是相互交叉、紧密联系的完整的理论体系。

例如，第一部分是传统的数字通信理论基础，当然也是无线通信的基础。

第三部分在讨论无线通信的论题时，更多地应用了第二部分的信息论与编码、信道纠错编码的理论知识。

考虑精简的要求和实际的教学情况，并结合多年的教学经验，确定以下的精简原则：保留信号传输理论内容（上述第一和第三两个部分），舍去信息传输理论内容（上述第二部分），并以传统而经典的数字传输理论为主，无线通信为辅。

第一部分基本完整地保留数字传输理论基础体系，主要精简其中比较深入的高级论题的内容。

第二部分全部精简。

第三部分无线通信基础除了精简与第二部分有关的内容其余均保留。

精简方案如下：整章精简的有第6、7、8、14、16五章。

主要鉴于以下的考虑：要求精简的幅度很大同时也不可能大幅度改写原著各章的内容；许多院校都开设了《信息论与编码》和《纠错编码》等课程；课时有限等。

整章保留的有第3、5、11、13四章。

部分精简的有第1、2、4、9、10、12、15七章。

部分精简的内容主要基于以下的考虑：非基本教学内容或后续专业课有更深入的介绍，深入的高级论题，与信息论及编码有关的内容，篇幅限制等。

在第2章中，除了精简部分小节内容外，还对2.1节（带通与低通信号的表示）和2.9节（带通和低通随机过程）的内容进行了改写。

2.1节的名称改为“带通信号与系统的表示”，本节包含2.1.1节（带通信号的表示法）和2.1.2节（带通系统对带通信号的响应）。

2.9节的名称改为“带通平稳随机过程”。

2.1节的改写方法主要参照《数字通信（第四版）》中4.1节（带通信号与系统的表示）。

改写主要基于以下的考虑：（1）《数字通信（第五版）》中2.1节介绍的傅里叶变换知识在先修课程“信号与系统”中已学过，可以省去。

（2）《数字通信（第五版）》中2.1节介绍的带通系统输出复包络有 $-1/2$ 系数[见式(2-1-30)]，这种表示方法不如《数字通信（第四版）》的表示方法[见式(4-1-36)]好，当然这与两版的带通系统的表示方法不同有关。

根据教学经验，《数字通信（第四版）》的表示方法比较好，读者更容易理解、记忆并掌握带通信号与系统的等效低通分析方法及其相关的概念。

其实，《数字通信（第四版）》的表示方法早在S.斯坦与J.J.琼斯著《现代通信原理》（科学出版社

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, 1979年, 英文原版S.Stein, J.J.Jones, Modern Communication Principles with Application to Digital Signaling, McGraw-Hill Inc., 1967年)中就已论述了。

这已成为传统而经典的表示方法和习惯, 被普遍采用。

此外, 还明确地给出了《数字通信(第四版)》已有的复互相关系数定义式。

2.9节的改写方法主要参照《数字通信(第四版)》中的4.1.4节(带通平稳随机过程的表示法)。这主要基于以下的考虑: 该节主要论述窄带高斯噪声的数学表示和统计特性, 这在国内许多本科通信原理教材和课程中都有详细的论述, 并与《数字通信(第四版)》论述一致, 是一种传统的经典论述方式。

因此采用《数字通信(第四版)》的论述和表示方法对国内大多数读者比较熟悉也容易接受和掌握。

本书是在《数字通信(第五版)》(张力军、张宗橙、宋荣芳、曹士珂等译)的基础上进行的, 参与本书改编工作的还有张宗橙、宋荣芳、曹士珂、曹轩宇、张晓辉、杨文、张海江、张杰、马平、周国平、孟云飞、周克琴。

完全版的内容精简后, 再进行整合, 对章节、公式、图表等编号进行必要的调整, 最终完成的精简版整体架构仍保持与完全版一致, 共有11章, 其中数字传输理论基础内容约占70%, 无线通信基础内容约占30%。

本书(中、英文精简版)由电子工业出版社和麦格劳-希尔(亚洲)教育出版公司委托 张力军负责内容精选和改编, 两家出版社为本书的出版和提高出版质量做出了很大的努力, 在此表示诚挚的谢意。

限于编译者的专业水平和教学经验, 精简版难免有疏漏和不当之处, 敬请读者不吝指正。

张力军 于南京邮电大学

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内容概要

本书是在《数字通信（第五版）》的基础上，根据国内的实际教学情况进行精简和改编的。主要的精简原则为：保留信号传输理论内容，舍去信息传输理论内容，并以传统而经典的数字传输理论为主，无线通信为辅。改编的部分主要是根据国内实际教学的常用习惯来进行的。精简后的内容主要涵盖：确定与随机信号分析；数字调制方法；AWGN信道的最佳接收机；载波和符号同步；通过带限信道的数字通信；自适应均衡；多信道和多载波系统；数字通信用扩频信号；衰落信道：信道特征与信号传输；多天线系统。

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