

<<数字通信基础>>

图书基本信息

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前言

The field of digital communication has evolved rapidly in the past few decades, with commercial applications proliferating in wireline communication networks (e.g., digital subscriber loop, cable, fiber optics), wireless communication (e.g., cell phones and wireless local area networks), and storage media (e.g., compact discs, hard drives). The typical undergraduate and graduate student is drawn to the field because of these applications, but is often intimidated by the mathematical background necessary to understand communication theory. A good lecturer in digital communication alleviates this fear by means of examples, and covers only the concepts that directly impact the applications being studied. The purpose of this text is to provide such a lecture style exposition to provide an accessible, yet rigorous, introduction to the subject of digital communication. This book is also suitable for self-study by practitioners who wish to brush up on fundamental concepts. The book can be used as a basis for one course, or a two course sequence, in digital communication. The following topics are covered: complex baseband representation of signals and noise (and its relation to modern transceiver implementation); modulation (emphasizing linear modulation); demodulation (starting from detection theory basics); communication over dispersive channels, including equalization and multicarrier modulation; computation of performance benchmarks using information theory; basics of modem coding strategies (including convolutional codes and turbo-like codes); and introduction to wireless communication. The choice of material reflects my personal bias, but the concepts covered represent a large subset of the tricks of the trade. A student who masters the material here, therefore, should be well equipped for research or cutting edge development in communication systems, and should have the fundamental grounding and sophistication needed to explore topics in further detail using the resources that any researcher or designer uses, such as research papers and standards documents.

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内容概要

《数字通信基础（英文版）》阐述了现代数字通信系统设计的基本知识，主要内容有：信号和噪声的复基带表述，调制和调解，分散信道通信，用信息理论计算性能基准点，现代解码方法基础知识，无线通信简介。

书中实例丰富，每章还配有练习题，帮助读者深刻理解重要通信原理。

《数字通信基础（英文版）》是通信专业高年级本科生和研究生教材，也可供工程技术人员参考。

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作者简介

Upamanyu Madhow博士，IEEE会士，无线通信和通信网领域知名学者。曾任职于贝尔通信实验室，现任加州大学圣巴巴拉分校电气与计算机工程系教授，致力于无线通信新技术的产业化。他拥有8项美国专利，并著有多篇颇有影响力的论文，被为业内人士广泛引用。

书籍目录

1 Introduction 11.1 Components of a digital communication system 21.2 Text outline 51.3 Further reading 62
 Modulation 72.1 Preliminaries 82.2 Complex baseband representation 182.3 Spectral description of random
 processes 312.3.1 Complex envelope for passband random processes 402.4 Modulation degrees of freedom 412.5
 Linear modulation 432.5.1 Examples of linear modulation 442.5.2 Spectral occupancy of linearly modulated signals
 462.5.3 The Nyquist criterion : relating bandwidth to symbol rate 492.5.4 Linear modulation as a building block
 542.6 Orthogonal and biorthogonal modulation 552.7 Differential modulation 572.8 Further reading 602.9
 Problems 602.9.1 Signals and systems 602.9.2 Complex baseband representation 622.9.3 Random processes 642.9.4
 Modulation 663 Demodulation 743.1 Gaussian basics 753.2 Hypothesis testing basics 883.3 Signal space concepts
 943.4 Optimal reception in AWGN 1023.4.1 Geometry of the ML decision rule 1063.4.2 Soft decisions 1073.5
 Performance analysis of ML reception 1093.5.1 Performance with binary signaling 1103.5.2 Performance with
 M-ary signaling 1143.6 Bit-level demodulation 1273.6.1 Bit-level soft decisions 1313.7 Elements of link budget
 analysis 1333.8 Further reading 1363.9 Problems 1363.9.1 Gaussian basics 1363.9.2 Hypothesis testing basics
 1383.9.3 Receiver design and performance analysis for the AWGN channel 1403.9.4 Link budget analysis 1493.9.5
 Some mathematical derivations 1504 Synchronization and noncoherent communication 1534.1 Receiver design
 requirements 1554.2 Parameter estimation basics 1594.2.1 Likelihood function of a signal in AWGN 1624.3
 Parameter estimation for synchronization 1654.4 Noncoherent communication 1704.4.1 Composite hypothesis
 testing 1714.4.2 Optimal noncoherent demodulation 1724.4.3 Differential modulation and demodulation 1734.5
 Performance of noncoherent communication 1754.5.1 Proper complex Gaussianity 1764.5.2 Performance of
 binary noncoherent communication 1814.5.3 Performance of M-ary noncoherent orthogonal signaling 1854.5.4
 Performance of DPSK 1874.5.5 Block noncoherent demodulation 1884.6 Further reading 1894.7 Problems 1905
 Channel equalization 1995.1 The channel model 2005.2 Receiver front end 2015.3 Eye diagrams 2035.4 Maximum
 likelihood sequence estimation 2045.4.1 Alternative MLSE formulation 2125.5 Geometric model for suboptimal
 equalizer design 2135.6 Linear equalization 2165.6.1 Adaptive implementations 2235.6.2 Performance analysis
 2265.7 Decision feedback equalization 2285.7.1 Performance analysis 2305.8 Performance analysis of MLSE
 2315.8.1 Union bound 2325.8.2 Transfer function bound 2375.9 Numerical comparison of equalization techniques
 2405.10 Further reading 2425.11 Problems 2435.11.1 MLSE 2436 Information-theoretic limits and their
 computation 2526.1 Capacity of AWGN channel : modeling and geometry 2536.1.1 From continuous to discrete
 time 2566.1.2 Capacity of the discrete-time AWGN channel 2576.1.3 From discrete to continuous time 2596.1.4
 Summarizing the discrete-time AWGN model 2616.2 Shannon theory basics 2636.2.1 Entropy , mutual
 information , and divergence 2656.2.2 The channel coding theorem 2706.3 Some capacity computations 2726.3.1
 Capacity for standard constellations 2726.3.2 Parallel Gaussian channels and waterfilling 2776.4 Optimizing the
 input distribution 2806.4.1 Convex optimization 2816.4.2 Characterizing optimal input distributions 2826.4.3
 Computing optimal input distributions 2846.5 Further reading 2876.6 Problems 2877 Channel coding 2937.1
 Binary convolutional codes 2947.1.1 Nonrecursive nonsystematic encoding 2957.1.2 Recursive systematic
 encoding 2977.1.3 Maximum likelihood decoding 2987.1.4 Performance analysis of ML decoding 3037.1.5
 Performance analysis for quantized observations 3097.2 Turbo codes and iterative decoding 3117.2.1 The BCJR
 algorithm : soft-in , soft-out decoding 3117.2.2 Logarithmic BCJR algorithm 3207.2.3 Turbo constructions from
 convolutional codes 3257.2.4 The BER performance of turbo codes 3287.2.5 Extrinsic information transfer charts
 3297.2.6 Turbo weight enumeration 3367.3 Low density parity check codes 3427.3.1 Some terminology from
 coding theory 3437.3.2 Regular LDPC codes 3457.3.3 Irregular LDPC codes 3477.3.4 Message passing and density
 evolution 3497.3.5 Belief propagation 3527.3.6 Gaussian approximation 3547.4 Bandwidth-efficient coded
 modulation 3577.4.1 Bit interleaved coded modulation 3587.4.2 Trellis coded modulation 3607.5 Algebraic codes
 3647.6 Further reading 3677.7 Problems 3698 Wireless communication 3798.1 Channel modeling 3808.2 Fading
 and diversity 3878.2.1 The problem with Rayleigh fading 3878.2.2 Diversity through coding and interleaving
 3908.2.3 Receive diversity 3938.3 Orthogonal frequency division multiplexing 3978.4 Direct sequence spread

spectrum 4068.4.1 The rake receiver 4098.4.2 Choice of spreading sequences 4138.4.3 Performance of conventional reception in CDMA systems 4158.4.4 Multiuser detection for DS-SS systems 4178.5 Frequency hop spread spectrum 4268.6 Continuous phase modulation 4288.6.1 Gaussian MSK 4328.6.2 Receiver design and Laurents expansion 4338.7 Space – time communication 4398.7.1 Space – time channel modeling 4408.7.2 Information-theoretic limits 4438.7.3 Spatial multiplexing 4478.7.4 Space – time coding 4488.7.5 Transmit beamforming 4518.8 Further reading 4518.9 Problems 453Appendix A Probability , random variables , and random processes 474A.1 Basic probability 474A.2 Random variables 475A.3 Random processes 478A.3.1 Wide sense stationary random processes through LTI systems 478A.3.2 Discrete-time random processes 479A.4 Further reading 481Appendix B The Chernoff bound 482Appendix C Jensens inequality 485References 488Index 495

章节摘录

The objective of this text is to convey an understanding of the principles underlying the design of a modern digital communication link. An introduction to modulation techniques (i.e. , how to convert bits into a form that can be sent over a channel) is provided in Chapter 2. We emphasize the important role played by the complex baseband representation for passband signals in both transmitter and receiver design , describe some common modulation formats , and discuss how they determine how much bandwidth is required to support a given modulation format. An introduction to demodulation (i.e. , how to estimate the transmitted bits from a noisy received signal) for the classical additive white Gaussian noise (AWGN) channel is provided in Chapter 3. Our starting point is the theory of hypothesis testing. We emphasize the geometric view of demodulation first popularized by the classic text of Wozencraft and Jacobs , introduce the concept of soft decisions , and provide a brief exposure to link budget analysis (which is used by system designers for determining parameters such as antenna gains and transmit powers) . Mastery of Chapters 2 and 3 is a prerequisite for the remainder of this book. The remaining chapters essentially stand on their own. Chapter 4 contains a framework for estimation of parameters such as delay and phase , starting from the derivation of the likelihood ratio of a signal in AWGN. Optimal noncoherent receivers are derived based on this framework. Chapter 5 describes the key ideas used in channel equalization , including maximum likelihood sequence estimation (MLSE) using the Viterbi algorithm , linear equalization , and decision feedback equalization. Chapter 6 contains a brief treatment of information theory , focused on the computation of performance benchmarks. This is increasingly important for the communication system designer , now that turbo-like codes provide a framework for approaching information-theoretic limits for virtually any channel model. Chapter 7 introduces error-correction coding. It includes convolutional codes , serial and parallel concatenated turbo codes , and low density parity check (LDPC) codes. It also provides a very brief discussion of how algebraic codes (which are covered in depth in coding theory texts) fit within modern communication link design , with an emphasis on Reed-Solomon codes. Finally , Chapter 8 contains an introduction to wireless communication , including channel modeling , the effect of fading , and a discussion of some modulation formats commonly used over the wireless channel that are not covered in the introductory treatment in Chapter 2. The latter include orthogonal frequency division multiplexing (OFDM) , spread spectrum communication , continuous phase modulation , and space-time (or multiple antenna) communication.

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媒体关注与评论

“进入通信行业多年，我已经成功设计了不少数字通信系统，可以说，如果不是受益于Madhow博士直观有效的讲解方式，我不可能这么牢固地掌握数字通信基础知识，甚至不可能像今天这样游刃有余地工作，” ——Amazin . com

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编辑推荐

近十年来，数字通信技术发展迅猛，已经深入人们日常生活的每个角落，如宽带上网、手机、数字电视等。

受这些应用的驱使，大量人才投身数字通信行业，但他们常常被通信理论所需的数学知识吓倒。

Madtlow博士拥有多年科研和教学工作经验，深知如何通过讲解实例来减轻这种恐惧。

《数字通信基础（英文版）》旨在保持知识严谨性的同时，通过各种方式让读者轻松掌握通信理论。书中首先建立了调制和解调的经典基础概念，接着介绍了同步、非相干通信、信道均衡、信息论、信道编码、无线通信等高级概念；此外，还涵盖了Turbo码和LDPC码的相关内容，读者既可以据此实现并进行性能评估，也可以仅仅以它们为性能基准进行性能对比。

《数字通信基础（英文版）》特色使用复基带表示作为收发机设计和实现的统一框架包括空时通信等不同调制样式的无线链路设计非相干通信和均衡的几何内涵。

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