Digital Communication Systems Using SystemVue

Dennis Silage

Da Vinci Engineering Press/Charles River Media

Preface

Chapter 1 Communication Simulation Techniques

Capabilities and Limitations of Simulation

Introduction to SystemVue

SystemVue Simulation Token Library

Source Token Library

Sink Token Library

Operator Token Library

Function Token Library

Communications Token Library

Logic Token Library

SystemVue Simulation Displays

Temporal Displays

Spectral Displays

Correlation Display

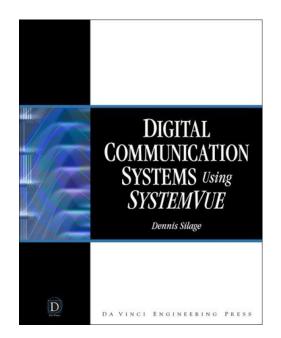
Dynamic System Probe

Analog Communication Systems Using SystemVue

Amplitude Modulation

Angle Modulation

Summary



Chapter 2 Baseband Modulation and Demodulation

Rectangular Pulse Amplitude Modulation

SystemVue Simulation of Rectangular PAM

Rectangular PAM Power Spectral Density

Performance of Rectangular PAM in a Simple Receiver in AWGN

Performance of Filtered Rectangular PAM in a Simple Receiver in AWGN

Sinc Pulse Amplitude Modulation

SystemVue Simulation of Sinc PAM

Performance of Sinc PAM in a Simple Receiver in AWGN

Raised Cosine Pulse Amplitude Modulation

SystemVue Simulation of Raised Cosine PAM

Raised Cosine PAM Power Spectral Density

Performance of Raised Cosine PAM in a Simple Receiver in AWGN

Optimum Binary Baseband Receiver: The Correlation Receiver

The Correlation Receiver for Baseband Symmetrical Signals

Probability of Bit Error for Baseband Symmetrical Signals

Performance of Symmetrical PAM for the Optimum Receiver in AWGN

The Correlation Receiver for Baseband Asymmetrical Signals

Probability of Bit Error for Binary Asymmetrical Signals

Performance of Asymmetrical PAM for the Optimum Receiver in AWGN

Multilevel (M-ary) Pulse Amplitude Modulation

SystemVue Simulation of M-ary Rectangular PAM

M-ary Rectangular PAM Power Spectral Density

The Correlation Receiver for M-ary Baseband Signals

Probability of Bit Error for M-ary Baseband Signals

Performance of M-ary PAM for the Optimum Receiver in AWGN

Partial Response Signaling

Duobinary PAM Signaling

SystemVue Simulation of Duobinary PAM

The Simple Receiver for Precoded Duobinary Signals

The Simple Receiver for Precoded Modified Duobinary Signals

Duobinary PAM Power Spectral Density

Performance of Duobinary PAM in a Simple Receiver in AWGN

Delta Modulation

SystemVue Simulation of Delta Modulation

Eye Diagrams

Summary

Chapter 3 Bandpass Modulation and Demodulation

Optimum Bandpass Receiver: The Correlation Receiver

The Correlation Receiver for Bandpass Symmetrical Signals

Probability of Bit Error for Bandpass Symmetrical Signals

The Correlation Receiver for Bandpass Asymmetrical Signals

Probability of Bit Error for Bandpass Asymmetrical Signals

Binary Amplitude Shift Keying

SystemVue Simulation of Binary ASK

Binary ASK Power Spectral Density

Performance of Binary ASK for the Optimum Receiver in AWGN

Binary Frequency Shift Keying

SystemVue Simulation of Binary FSK

Binary FSK Power Spectral Density

Performance of Binary FSK for the Optimum Receiver in AWGN

Binary Phase Shift Keying

SystemVue Simulation of Binary PSK

Binary PSK Power Spectral Density

Performance of Binary PSK for the Optimum Receiver in AWGN

Multilevel (M-ary) Amplitude Shift Keying

SystemVue Simulation of M-ary ASK

M-ary ASK Power Spectral Density

The Correlation Receiver for M-ary ASK Signals

Probability of Bit Error for M-ary ASK Signals

Performance of M-ary ASK for the Optimum Receiver in AWGN

Multilevel (M-ary) Frequency Shift Keying

SystemVue Simulation of M-ary FSK

M-ary FSK Power Spectral Density

Probability of Bit Error for M-ary FSK Signals

Performance of M-ary FSK for the Optimum Receiver in AWGN

Multilevel (M-ary) Phase Shift Keying

SystemVue Simulation of M-ary PSK

M-ary PSK Power Spectral Density

Probability of Bit Error for M-ary PSK Signals

Performance of M-ary PSK for the Optimum Receiver in AWGN

Quadrature Amplitude Modulation

SystemVue Simulation of QAM

QAM Power Spectral Density

Probability of Bit Error for QAM Signals

Performance of QAM for the Optimum Receiver in AWGN

Differential Phase Shift Keying

SystemVue Simulation of DPSK

DPSK Power Spectral Density

Probability of Bit Error for DPSK Signals

Performance of DPSK for the Optimum Receiver in AWGN

Differential Quaternary Phase Shift Keying

SystemVue Simulation of DQPSK

DQPSK Power Spectral Density

Probability of Bit Error for DQPSK Signals

Performance of DQPSK for the Optimum Receiver in AWGN

Noncoherent Demodulation of Binary Frequency Shift Keying

SystemVue Simulation of Noncoherent Binary FSK

Probability of Bit Error for Noncoherent Binary FSK Signals

Performance of Noncoherent Binary FSK in AWGN

Noncoherent Demodulation of Binary Amplitude Shift Keying

SystemVue Simulation of Noncoherent Binary ASK

Probability of Bit Error for Noncoherent Binary ASK Signals

Performance of Noncoherent Binary ASK in AWGN

Threshold for Demodulation of Noncoherent Binary ASK

Constellation Plots

Summary

Chapter 4 Synchronization and Equalization

Acquisition and Tracking of Synchronization

Carrier Frequency and Phase Synchronization

SystemVue Simulation of Carrier Synchronization

Symbol Synchronization

SystemVue Simulation of Symbol Synchronization

Equalization of Bandlimited Channels

Channel Models

Summary

Chapter 5 Multiplexing

Time Division Multiplexing

Frequency Division Multiplexing

BER Performance in Frequency Division Multiplexing

Code Division Multiplexing

Pseudo-Random Sequences

Direct Sequence Spread Spectrum

SystemVue Simulation of DSSS

Performance of DSSS with Interference

Signal to Noise Ratio in DSSS

Probability of Bit Error Bit in Multiple Access Interference in DSSS

Frequency Hopping Spread Spectrum

SystemVue Simulation of FHSS

Performance of FHSS in AWGN

Jamming in FHSS

Orthogonal Frequency Division Multiplexing

SystemVue Simulation of OFDM

Summary

Chapter 6 Sampling and Quantization

Sampling Baseband Analog Signals

Signal to Quantization Noise Ratio

Companding

Pulse Code Modulation

Line Codes

Power Spectral Density of Line Codes

Polar NRZ Line Code

Unipolar NRZ Line Code

Alternate Mark Inversion NRZ Line Code

Split Phase Line Code

Return-to-Zero Line Codes

SystemVue Simulation of Line Codes

Differential Pulse Code Modulation

SystemVue Simulation of DPCM

Sampling Bandpass Analog Signals

Summary

Appendix A

About the CD-ROM

References