

# FSK Modulation and Demodulation



# Matlab Code For Fsk Modulation

**Richard J. Tervo**



## Matlab Code For Fsk Modulation:

**Principles of Communications** Rodger E. Ziemer, William H. Tranter, 2014-03-17 Ziemer and Tranter provide a thorough treatment of the principles of communications at the physical layer suitable for college seniors beginning graduate students and practicing engineers. This is accomplished by providing overviews of the necessary background in signal system probability and random process theory required for the analog and digital communications topics covered in the book. In addition to stressing fundamental concepts, the seventh edition features sections on important areas such as spread spectrum, cellular communications, and orthogonal frequency division multiplexing. While the book is aimed at a two semester course, more than enough material is provided for structuring courses according to students' need and instructor preference.

**MATLAB/Simulink for Digital Communication** Won Y. Yang, 2018-03-02 Chapter 1 FOURIER ANALYSIS 1 1 1 CONTINUOUS TIME FOURIER SERIES CTFS 2 1 2 PROPERTIES OF CTFS 6 1 2 1 Time Shifting Property 6 1 2 2 Frequency Shifting Property 6 1 2 3 Modulation Property 6 1 3 CONTINUOUS TIME FOURIER TRANSFORM CTFT 7 1 4 PROPERTIES OF CTFT 13 1 4 1 Linearity 13 1 4 2 Conjugate Symmetry 13 1 4 3 Real Translation Time Shifting and Complex Translation Frequency Shifting 14 1 4 4 Real Convolution and Correlation 14 1 4 5 Complex Convolution Modulation Windowing 14 1 4 6 Duality 17 1 4 7 Parseval Relation Power Theorem 18 1 5 DISCRETE TIME FOURIER TRANSFORM DTFT 18 1 6 DISCRETE TIME FOURIER SERIES DFS DFT 19 1 7 SAMPLING THEOREM 21 1 7 1 Relationship between CTFS and DFS 21 1 7 2 Relationship between CTFT and DTFT 27 1 7 3 Sampling Theorem 27 1 8 POWER ENERGY AND CORRELATION 29 1 9 LOWPASS EQUIVALENT OF BANDPASS SIGNALS 30 Chapter 2 PROBABILITY AND RANDOM PROCESSES 39 2 1 PROBABILITY 39 2 1 1 Definition of Probability 39 2 1 2 Joint Probability and Conditional Probability 40 2 1 3 Probability Distribution Density Function 41 2 1 4 Joint Probability Density Function 41 2 1 5 Conditional Probability Density Function 41 2 1 6 Independence 41 2 1 7 Function of a Random Variable 42 2 1 8 Expectation Covariance and Correlation 43 2 1 9 Conditional Expectation 47 2 1 10 Central Limit Theorem Normal Convergence Theorem 47 2 1 11 Random Processes 49 2 1 12 Stationary Processes and Ergodic Processes 51 2 1 13 Power Spectral Density PSD 53 2 1 14 White Noise and Colored Noise 53 2 2 LINEAR FILTERING OF A RANDOM PROCESS 57 2 3 PSD OF A RANDOM PROCESS 58 2 4 FADING EFFECT OF A MULTIPATH CHANNEL 58 Chapter 3 ANALOG MODULATION 71 3 1 AMPLITUDE MODULATION AM 71 3 1 1 DSB Double Sideband AM Amplitude Modulation 71 3 1 2 Conventional AM Amplitude Modulation 75 3 1 3 SSB Single Sideband AM Amplitude Modulation 78 3 2 ANGLE MODULATION AGM FREQUENCY PHASE MODULATIONS 82 Chapter 4 ANALOG TO DIGITAL CONVERSION 87 4 1 QUANTIZATION 87 4 1 1 Uniform Quantization 88 4 1 2 Non uniform Quantization 89 4 1 3 Non uniform Quantization Considering the Absolute Errors 91 4 2 Pulse Code Modulation PCM 95 4 3 Differential Pulse Code Modulation DPCM 97 4 4 Delta Modulation DM 100 Chapter 5 BASEBAND TRANSMISSION 107 5 1 RECEIVER RCVR and SNR 107 5 1 1 Receiver of RC Filter Type 109 5 1 2 Receiver of Matched Filter Type 110 5 1 3 Signal Correlator 112 5 2

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*Hybrid Intelligent Systems* Anu Bajaj, Pooja Manghirmalani Mishra, Ajith Abraham, Cengiz Kahraman, 2025-07-14 This book presents 48 selected papers focused on Machine Learning Based Solutions from the 23rd International Conference on Hybrid Intelligent Systems which was held in five different cities namely Olten Switzerland Porto Portugal Kaunas Lithuania Greater Noida India Kochi India and in online mode The 23rd International Conference on Hybrid Intelligent Systems HIS 2023 was focusing on synergistic combinations of multiple approaches to develop the next generation of intelligent systems HIS 2023 had contributions by authors from 44 countries This book offers

a valuable reference guide for all industrial specialists scientists academicians researchers students and practitioners in the field of machine learning and industrial applications

**Information and Business Intelligence** Xilong Qu,Chenguang Yang,2012-04-25 This two volume set CCIS 267 and CCIS 268 constitutes the refereed proceedings of the International Conference on Information and Business Intelligence IBI 2011 held in Chongqing China in December 2011 The 229 full papers presented were carefully reviewed and selected from 745 submissions The papers address topics such as communication systems accounting and agribusiness information education and educational technology manufacturing engineering multimedia convergence security and trust computing business teaching and education international business and marketing economics and finance and control systems and digital convergence

*Modeling of Digital Communication Systems Using SIMULINK* Arthur A. Giordano,Allen H. Levesque,2015-03-03 A comprehensive and detailed treatment of the program SIMULINK that focuses on SIMULINK for simulations in Digital and Wireless Communications Modeling of Digital Communication Systems Using SIMULINK introduces the reader to SIMULINK an extension of the widely used MATLAB modeling tool and the use of SIMULINK in modeling and simulating digital communication systems including wireless communication systems Readers will learn to model a wide selection of digital communications techniques and evaluate their performance for many important channel conditions Modeling of Digital Communication Systems Using SIMULINK is organized in two parts The first addresses Simulink models of digital communications systems using various modulation coding channel conditions and receiver processing techniques The second part provides a collection of examples including speech coding interference cancellation spread spectrum adaptive signal processing Kalman filtering and modulation and coding techniques currently implemented in mobile wireless systems Covers case examples progressing from basic to complex Provides applications for mobile communications satellite communications and fixed wireless systems that reveal the power of SIMULINK modeling Includes access to useable SIMULINK simulations online All models in the text have been updated to R2018a only problem sets require updating to the latest release by the user Covering both the use of SIMULINK in digital communications and the complex aspects of wireless communication systems Modeling of Digital Communication Systems UsingSIMULINK is a great resource for both practicing engineers and students with MATLAB experience

**Digital Signal Processing with Matlab Examples, Volume 1** Jose Maria Giron-Sierra,2016-11-19 This is the first volume in a trilogy on modern Signal Processing The three books provide a concise exposition of signal processing topics and a guide to support individual practical exploration based on MATLAB programs This book includes MATLAB codes to illustrate each of the main steps of the theory offering a self contained guide suitable for independent study The code is embedded in the text helping readers to put into practice the ideas and methods discussed The book is divided into three parts the first of which introduces readers to periodic and non periodic signals The second part is devoted to filtering which is an important and commonly used application The third part addresses more advanced topics including the analysis of real

world non stationary signals and data e g structural fatigue earthquakes electro encephalograms birdsong etc The book s last chapter focuses on modulation an example of the intentional use of non stationary signals      *Innovations in Electronics and Communication Engineering* H. S. Saini,R. K. Singh,K. Satish Reddy,2017-11-08 The book contains high quality papers presented in the Fifth International Conference on Innovations in Electronics and Communication Engineering ICIECE 2016 held at Guru Nanak Institutions Hyderabad India during 8 and 9 July 2016 The objective is to provide the latest developments in the field of electronics and communication engineering specially the areas like Image Processing Wireless Communications Radar Signal Processing Embedded Systems and VLSI Design The book aims to provide an opportunity for researchers scientists technocrats academicians and engineers to exchange their innovative ideas and research findings in the field of Electronics and Communication Engineering      **Contemporary Communication Systems Using MATLAB** John G. Proakis,Masoud Salehi,2000 This supplement to any standard communication systems text is one of the first books to successfully integrate the use of MATLAB in the study of communication systems concepts and problems It has been developed for instructors and students who wish to make use of MATLAB as an integral part of their study The former will find the means by which to use MATLAB as a powerful tool to motivate students and illustrate essential theory without having to customize the applications themselves the latter will find relevant problems quickly and easily The book includes numerous MATLAB based simulations and examples of communication systems while providing a good balance of theory and hands on computer experience This Updated Printing revises the book and MATLAB files available for downloading from the Brooks Cole Bookware Companion Resource Center Web Site to MATLAB V5      **Communication Systems Principles Using MATLAB** John W. Leis,2018-07-31 Discover the basic telecommunications systems principles in an accessible learn by doing format Communication Systems Principles Using MATLAB covers a variety of systems principles in telecommunications in an accessible format without the need to master a large body of theory The text puts the focus on topics such as radio and wireless modulation reception and transmission wired networks and fiber optic communications The book also explores packet networks and TCP IP as well as digital source and channel coding and the fundamentals of data encryption Since MATLAB is widely used by telecommunications engineers it was chosen as the vehicle to demonstrate many of the basic ideas with code examples presented in every chapter The text addresses digital communications with coverage of packet switched networks Many fundamental concepts such as routing via shortest path are introduced with simple and concrete examples The treatment of advanced telecommunications topics extends to OFDM for wireless modulation and public key exchange algorithms for data encryption Throughout the book the author puts the emphasis on understanding rather than memorization The text also Includes many useful take home skills that can be honed while studying each aspect of telecommunications Offers a coding and experimentation approach with many real world examples provided Gives information on the underlying theory in order to better understand conceptual developments Suggests a valuable learn by

doing approach to the topic Written for students of telecommunications engineering Communication Systems Principles Using MATLAB is the hands on resource for mastering the basic concepts of telecommunications in a learn by doing format

*Detecting and Classifying Low Probability of Intercept Radar* Phillip E. Pace, 2009 This comprehensive book presents LPI radar design essentials including ambiguity analysis of LPI waveforms FMCW radar and phase shift and frequency shift keying techniques Moreover you find details on new OTHR modulation schemes noise radar and spatial multiple input multiple output MIMO systems The book explores autonomous non linear classification signal processing algorithms for identifying LPI modulations It also demonstrates four intercept receiver signal processing techniques for LPI radar detection that helps you determine which time frequency bi frequency technique best suits any LPI modulation of interest Publisher

**Data Management and Security** A. Bia, 2013 Containing the papers presented at the first International Conference on Data Management and Security with applications in Medicine Sciences and Engineering this book focuses on the modern techniques applied in data management and knowledge acquisition with applications in a broad variety of fields It also discusses recent developments in data security systems Papers in the book cover such topics as Data and text mining Ubiquitous devices Numerical modelling Expert systems Databases Cloud computing Sensors and optechtronics Heuristic methods and genetic algorithms Knowledge discovery Prediction modelling Data streaming Clustering Decision support systems Cryptography Information and codification Engineering Applications *Mechanical And Electronics Engineering - Proceedings Of The International Conference On Icmee 2009* Venkatesh Mahadevan, Jianhong Zhou, 2009-07-16 The 2009 International Conference on Mechanical and Electronics Engineering ICMEE 2009 will be held in Chennai India from 24 26 July 2009 The aim of ICMEE 2009 is to provide a platform for researchers engineers academicians as well as industrial professionals from all over the world to present their research findings and development activities in mechanical and electronics engineering This conference provides opportunities for the delegates to exchange new ideas and application experiences face to face to forge new business or research relations and to find global partners for future collaboration

Spread Spectrum and CDMA Valeri P. Ipatov, 2005-05-06 Spread spectrum and CDMA are cutting edge technologies widely used in operational radar navigation and telecommunication systems and play a pivotal role in the development of the forthcoming generations of systems and networks This comprehensive resource presents the spread spectrum concept as a product of the advancements in wireless IT shows how and when the classical problems of signal transmission processing stimulate the application of spread spectrum and clarifies the advantages of spread spectrum philosophy Detailed coverage is provided of the tools and instruments for designing spread spectrum and CDMA signals answering why a designer will prefer one solution over another The approach adopted is wide ranging covering issues that apply to both data transmission and data collection systems such as telecommunications radar and navigation Presents a theory based analysis complemented by practical examples and real world case studies resulting in a self sufficient treatment of the subject Contains detailed

discussions of new trends in spread spectrum technology such as multi user reception multicarrier modulation OFDM MIMO and space time coding Provides advice on designing discrete spread spectrum signals and signal sets for time frequency measuring synchronization and multi user communications Features numerous Matlab based problems and other exercises to encourage the reader to initiate independent investigations and simulations This valuable text provides timely guidance on the current status and future potential of spread spectrum and CDMA and is an invaluable resource for senior undergraduates and postgraduate students lecturers and practising engineers and researchers involved in the deployment and development of spread spectrum and CDMA technology Supported by a Companion website on which instructors and lecturers can find a solutions manual for the problems and Matlab programming electronic versions of some of the figures and other useful resources such as a list of abbreviations

**Optical Wireless Communications** Z. Ghassemloooy, W. Popoola, S. Rajbhandari, 2017-07-12 Detailing a systems approach Optical Wireless Communications System and Channel Modelling with MATLAB is a self contained volume that concisely and comprehensively covers the theory and technology of optical wireless communications systems OWC in a way that is suitable for undergraduate and graduate level students as well as researchers and professional engineers Incorporating MATLAB throughout the authors highlight past and current research activities to illustrate optical sources transmitters detectors receivers and other devices used in optical wireless communications They also discuss both indoor and outdoor environments discussing how different factors including various channel models affect system performance and mitigation techniques In addition this book broadly covers crucial aspects of OWC systems Fundamental principles of OWC Devices and systems Modulation techniques and schemes including polarization shift keying Channel models and system performance analysis Emerging visible light communications Terrestrial free space optics communication Use of infrared in indoor OWC One entire chapter explores the emerging field of visible light communications and others describe techniques for using theoretical analysis and simulation to mitigate channel impact on system performance Additional topics include wavelet denoising artificial neural networks and spatial diversity Content also covers different challenges encountered in OWC as well as outlining possible solutions and current research trends A major attraction of the book is the presentation of MATLAB simulations and codes which enable readers to execute extensive simulations and better understand OWC in general

**Proceedings of the 9th Brazilian Technology Symposium (BTSym'23)** Yuzo Iano, Osamu Saotome, Guillermo Leopoldo Kemper Vásquez, Maria Thereza de Moraes Gomes Rosa, Rangel Arthur, Gabriel Gomes de Oliveira, 2024-08-20 This book presents the proceedings of the 9th Brazilian Technology Symposium BTSym 23 The book discusses current technological issues on Systems Engineering Mathematics and Physical Sciences such as the Transmission Line Protein Modified Mortars Electromagnetic Properties Clock Domains Chebyshev Polynomials Satellite Control Systems Hough Transform Watershed Transform Blood Smear Images Toxoplasma Gondii Operation System Developments MIMO Systems Geothermal Photovoltaic Energy Systems Mineral Flotation Application CMOS Techniques



Frameworks Developments Physiological Parameters Applications Brain Computer Interface Artificial Neural Networks  
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 such as the Digital Transformation Data Science Hydrothermal Dispatch Project Knowledge Transfer Immunization Programs  
 Efficiency and Predictive Methods PMBOK Applications Logistics Process IoT Data Acquisition Industry 4 0 Cyber Physical  
 Systems Fingerspelling Recognition Cognitive Ergonomics Ecosystem Services Environmental Ecosystem Services valuation  
 Solid Waste and University Extension      **Practical Signals Theory with MATLAB Applications** Richard J.  
 Tervo, 2013-02-11 Practical Signals Theory with MATLAB Applications is organized around applications first introducing the  
 actual behavior of specific signals and then using them to motivate the presentation of mathematical concepts Tervo  
 sequences the presentation of the major transforms by their complexity first Fourier then Laplace and finally the z transform  
 The goal is to help students who can't visualize phenomena from an equation to develop their intuition and learn to analyze  
 signals by inspection Finally most examples and problems are designed to use MATLAB making the presentation more in line  
 with modern engineering practice      **Wake-up Receiver Based Ultra-Low-Power WBAN** Maarten Lont, Dusan  
 Milosevic, Arthur van der Roermund, 2014-05-28 This book presents the cross layer design and optimization of wake up  
 receivers for wireless body area networks WBAN with an emphasis on low power circuit design This includes the analysis of  
 medium access control MAC protocols mixer first receiver design and implications of receiver impairments on wideband  
 frequency shift keying FSK receivers Readers will learn how the overall power consumption is reduced by exploiting the  
 characteristics of body area networks Theoretical models presented are validated with two different receiver  
 implementations in 90nm and 40nm CMOS technology      **MATLAB/Simulink for Digital Signal Processing** Won Y.  
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Nonlinear Distortion in Wireless Systems Khaled M. Gharaibeh, 2011-12-30 This book covers the principles of modeling and simulation of nonlinear distortion in wireless communication systems with MATLAB simulations and techniques In this book the author describes the principles of modeling and simulation of nonlinear distortion in single and multichannel wireless communication systems using both deterministic and stochastic signals Models and simulation methods of nonlinear amplifiers explain in detail how to analyze and evaluate the performance of data communication links under nonlinear amplification The book addresses the analysis of nonlinear systems with stochastic inputs and establishes the performance metrics of communication systems with regard to nonlinearity In addition the author also discusses the problem of how to embed models of distortion in system level simulators such as MATLAB and MATLAB Simulink and provides practical techniques that professionals can use on their own projects Finally the book explores simulation and programming issues and provides a comprehensive reference of simulation tools for nonlinearity in wireless communication systems Key Features Covers the theory models and simulation tools needed for understanding nonlinearity and nonlinear distortion in wireless systems Presents simulation and modeling techniques for nonlinear distortion in wireless channels using MATLAB Uses random process theory to develop simulation tools for predicting nonlinear system performance with real world wireless communication signals Focuses on simulation examples of real world communication systems under nonlinearity Includes an accompanying website containing MATLAB code This book will be an invaluable reference for researchers RF engineers and communication system engineers working in the field Graduate students and professors undertaking related courses will also find the book of interest

Global Trends in Computing and Communication Systems P. Venkata Krishna, M. Rajasekhara Babu, Ezendu Ariwa, 2012-08-08 This two volume set CCIS 0269 CCIS 0270 constitutes the refereed post conference proceedings of the International Conference on Global Trends in Computing and Communication ObCom 2011 held in Vellore India in December 2011 The 173 full papers presented together with a keynote paper and invited papers were carefully reviewed and selected from 842 submissions The conference addresses all current issues associated with computing

communication and information The proceedings consists of invited papers dealing with the review of performance models of computer and communication systems and contributed papers that feature topics such as networking cloud computing fuzzy logic mobile communication image processing navigation systems biometrics and Web services covering literally all the vital areas of the computing domains

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### Matlab Code For Fsk Modulation Introduction

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