

QPSK Modulator and Demodulator Using FPGA for SDR

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ABSTRACT

A software-defined radio (SDR) allows for digital communication systems to simply accept more complicated coding and modulation technologies, which is enormously vital in meeting the ever-increasing demands of the wireless communication industry. An SDR has been constructed, using the Simulink tool, and implemented on the SPARTEN-3E Field Programmable Gate Array (FPGA) development kit. The modulation scheme used in the system is Quadrature Phase-Shift Keying (QPSK). In the first step to realize the whole modulation and demodulation schemes using MATLAB Simulink. The format of a VHDL program is built around the concept of BLOCKS which are the basic building units of a VHDL design. The results showed that the proposed method can greatly improve the developing efficiency, shorten developing period and reduce costs.

Keywords: - Demodulator, FPGA, Modulator, QPSK, SDR VHDL.

I. INTRODUCTION

The objective of this paper is to design a QPSK modem using FPGA for SDR (Software Defined Radio). In this paper the modulator and demodulator is implemented on single FPGA kit. In which mainly concentrates on QPSK modulation techniques. In QPSK, two successive bits sequence are grouped together, this reduces the bit rate of a signaling rate (f_s) and reduces the bandwidth of the channel.

Quadrature Phase Shift Keying (QPSK) modulation ordinary used modem chips or ASICs, to implement, but those chips usually do not have sufficient programming skill and its functionality cannot easily be changed or improved in the product development process. So those chips are not suitable the situation where the parameters changed frequently. The communication system based on FPGA is easy to implement the pipeline architecture and simple to upgrade. This is a very practical approach to implement the QPSK modulator and demodulator [1].

The FPGA implementation of nM QPSK modulator and demodulator is presented complete modulator and demodulator units will be modeled using VHDL and functionality will be verified using modelsim simulation tools. The code will be synthesized onto Xilinx FPGA kit. The modulator consists of various communication modules like phase calculator, I-Q mapper, frequency synthesizer, clock generator and COS-LUT. The demodulator consists of modules COS-LUT, Negative SIN-LUT, digital multiplier integrator and dump circuit and baseband differential detector. These digital modules

will be implemented as different modules and used as components in top level entities [2].

II. THE MODULATOR AND DEMODULATOR ARCHITECTURE

Principle of QPSK modulator— in quadrature phase shift keying (QPSK), two successive bits in the data sequence are grouped together this reduces the bit rate of a signaling rate (f_s) and hence reduces the bandwidth of the channel. QPSK Modulator—the modulator converts the input bit stream into an electrical waveforms suitable for transmission over the communication channel. Modulator is used to minimize the effect of channel noise and matching the frequency spread spectrum of transmitted signal.

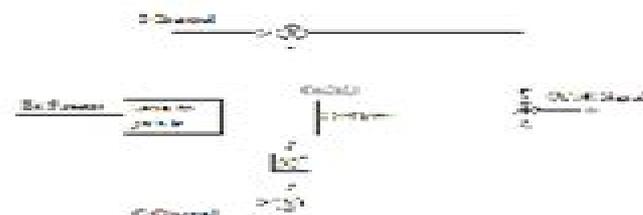


Fig (1): Block diagram of QPSK Modulator

The above fig (1) shows a block diagram of typical QPSK transmitter. The unipolar binary message stream has bit rate R_b and is first converted into a bipolar non-return-to-zero (NRZ) sequence using a unipolar to bipolar converter. The bit stream

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Design and Implementation of Discrete Multitone Modulator Using FPGA Hadi T. Ziboon, Ikhlas M. Farhan, 2014-04 The aim of the book is to design simulation and implementation of the Discrete Multitone DMT modulation for ADSL based on Software Defined Radio SDR using FPGA DMT divides the available bandwidth into parallel sub channels The main units of the DMT modulator are serial to parallel converter symbol mapping IFFT parallel to serial and cyclic prefix There are two techniques to transmit data namely complex transmission and real transmission Real transmission is preferred for DSL since it needs single wire but uses twice number of IFFT

M-ary Amplitude Shift Keying-orthogonal Frequency Division Multiplexing Modulator and Demodulator Implementation Using FPGA Haiying Deng, 2001

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half a life by v s naipaul summary analysis study com - Nov 22 2022

web jan 12 2022 v s naipaul s half a life is about the life of a man who comes from a family who rejects modernity and his journey to find purpose learn of his loneliness the desire to find a whole

asla devamı gelmeyen half life serisinin tüm hikayesi - Aug 20 2022

web dec 25 2021 half life tüm dünyada en çok bilinen en köklü oyun serilerinden biri 1998 yılında ilk oyunuyla görücüye çıkan oyun 23 yılını kutluyor olsa da hala ana akım kültürün büyük bir parçası kültürün büyük bir parçası olmasına karşın yaşının getirdiği bir sorun var half life hikayesini çoğu yeni oyuncu bilmiyor

half a life summary supersummary - Apr 27 2023

web half a life is darin strauss s award winning memoir about the tragic event that changed the trajectory of his life

half life - Jul 31 2023

web fizikçi gordon freeman hayatta kaldı ancak bütün dünya uzaylı istilasına uğramadan önce onu kurtarabilmek için gordon freeman ın hem hükûmet hem de uzaylı güçlerine karşı savaşması gerekiyor oyunu steam de görüntüle

half a life novel wikipedia - Oct 02 2023

web half a life is a 2001 novel by nobel laureate v s naipaul published by alfred a knopf the novel is set in india africa and europe london berlin and portugal half a life was long listed for the booker prize 2001 1 plot summary willie somerset chandran is the son of a brahmin father and a dalit mother

half a life naipaul v s amazon com tr kitap - Feb 11 2022

web half a life naipaul v s amazon com tr kitap Çerez tercihlerinizi seçin Çerez bildirimimizde ayrıntılı şekilde açıklandığı üzere alışveriş yapmanızı sağlamak alışveriş deneyiminizi iyileştirmek ve hizmetlerimizi sunmak için gerekli olan çerezleri ve benzer araçları kullanırız

star trek the next generation half a life tv episode 1991 imdb - May 17 2022

web half a life directed by les landau with patrick stewart jonathan frakes levar burton michael dorn counselor troi s mother visits the enterprise and becomes infatuated with a man whose culture forces him into a suicidal ritual called the resolution

half life vikipedi - Sep 20 2022

web half life 1998 yılında valve tarafından üretilen ve sierra studios tarafından yayımlanan birinci şahıs nişancı bilimkurgu video oyunudur oyun serinin ilk oyunu olmakla beraber aynı zamanda valve ın ürettiği ilk oyundur oyuncu bir ışınlanma deneyinin ters gitmesi sonucu xen olarak bilinen başka bir boyuttan black mesa araştırma tesisi ne ışınlanan

half life 2 episode two - Dec 24 2022

web half life 2 episode two Şehir 17 yok oldu fakat İttifak pes etmedi aynı şekilde gordon freeman ın da pes etmeye niyeti yok İnsanlık dört bir yana dağıldı uzaylı kuvvetleri dünya yı ele geçirme çabalarına devam devam ediyor fizikçi gordon freeman ve alyx vance insanlık yok olmadan önce bir İttifak mesajını ele

half life oyunu oyna savaş oyunları oyun kolu - Mar 15 2022

web half life oyununu bu sefer flash şeklinde oynayın oyun yüklendikten sonra sağ taraftaki start butonuna basın giriş görüntülerini atılmamak için sağ alt köşedeki skip butonuna basmanız yeterli İyi eğlenceler half life oyna puan ver 3 8 5 896 üyenin oyu savaş oyunları 95072 kere oynandı

half a life star trek the next generation wikipedia - Jul 19 2022

web plot the u s s enterprise takes aboard deanna troi s marina sirtis eccentric mother lwaxana majel barrett and dr timicin david ogden stiers of kaelon ii timicin is brought aboard to conduct an experiment which he hopes will save his threatened home planet as its sun is in a state of near collapse

half a life star trek the next generation youtube - Apr 15 2022

web half a life is the 22nd episode of the fourth season of the american science fiction television series star trek the next generation the 96th episode ove

half life alyx - Feb 23 2023

web İttifak a karşı savaş başlıyor half life ve half life 2 arasındaki olayları konu half life alyx te alyx vance ve babası eli İttifak ın dünya ya karşı gerçekleştirdiği acımasız işgale karşı bir direniş oluşturuyor yedi saat savaşı nın kaybı hâlâ insanların hafızasında taze Şehir 17 sakinleri İttifak ın