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Microelectronics, VLSI & Display Technology

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Title : *Study of partially depleted pin detectors for radiation detection*
Author(s) : *Huilgol Vinod*
Roll No : *9510453*
Supervisor(s) : *Sharan R Mazhari Baquer*

Abstract

PIN detectors are commonly used for the detection of radiation and these detectors are operated with reverse bias voltage applied to them. The exact value of the reverse voltage to be applied depends on conflicting requirements, and is the subject of study in the present work. If the reverse bias voltage is large the advantage is that the depletion width is large and most of the incident photons that are absorbed are detected. This advantage is not available lower reverse bias voltages. The disadvantage at large bias voltage is due to increased leakage current and inconvenience of applying large voltage. In the present work, an attempt has been made to model these contradictory requirements so that a guideline regarding the trade - off of performance versus lower applied bias voltage is obtained. Initially the device equations of PIN are solved to obtain an expression for the current pulse in case of partially depleted layers. These current pulses are then applied to amplifier - shaper combination and a 'SPICE' simulation is done and overall performance evaluated by optimizing the shaper time constant to get maximum signals to noise ratio, the lifetime of minority carriers for PIN has been assumed to be 600 μ sec in these calculations. In this case, it has been found that the detector performance remains to be constant from 20 V to 140 V when 1 MeV gamma ray is incident. In the case of gamma radiation of 100 KeV, the detector performance remains constant from 95 V to 140 V.

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Title : *Hyperelliptic Curves For Public Key Cryptosystems*
Author(s) : *Jain Nitu*
Roll No : *9510423*
Supervisor (s) : *Siddiqui M U*

Abstract

Security of some of the existing public key cryptosystems has been seriously threatened by the recent advances in computing discrete logarithms and integer factorization. In this thesis, we present the issues related to the implementation of a hyper elliptic cryptosystem. The discrete logarithm problem so far for these systems is intractable. The jacobian of a hyper elliptic curve defined over a finite field forms an abelian group. For a secure cryptosystem, the group order should have a large prime factor. We have selected certain curves and tabulated the order of their jacobian for varying n , when the ground field has characteristic two. An efficient algorithm for computing the multiple of a group element has been presented. Its effectiveness has been shown by tabulating the timing details. The concept of normal basis representation is introduced for enhancing the efficiency. Diffie Hellman key exchange and elgamal scheme has been described with reference to hyper elliptic curves. Attempt has been made to design a hyper elliptic curve analog of elgamal scheme, for the case of genus two.

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Title : *Auditory Spectrum And its Noise-Robustness*
Author(s) : *Jain Pratibha*
Roll No : *9510428*
Supervisor(s) : *Rao Preeti & Ray G C*

Abstract

In early auditory system, sound signal is processed physiologically in a series of complex operations along the auditory channels. These operations transform the signal into an internal representation, which is different from the conventional representations like short-time Fourier transform. It is called auditory spectrum. For obtaining this representation, an auditory model is developed to simulate the operations performed by auditory system. The model mainly consists of three stages i.e. analysis, transduction and reduction. Since this type of sound-processing has been developed in the process of evolution for better survival, it is expected that it should have high noise-immunity. In this work, that auditory spectrum possesses good robustness against noise and scaling i.e. it degrades at a slower rate as compared to other representations like 'LPC'. These properties make it a suitable representation for automatic speech recognition (ASR) systems.

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Title : *Performance Degradation Of WDM Fiber Optic Systems Due To Fiber Nonlinearity Effects, Optical Amplifier Noise And Switch Crosstalk*
Author(s) : *Sing Maninder Lal*
Roll No : *9510417*
Supervisor(s) : *Chatterjee P K*

Abstract

In this study, an attempt has been made to study the effects of the Stimulated Raman Scattering (SRS), Four Wave Mixing (FWM), in-line optical amplifier spacing, Amplified Spontaneous Emission (ASE) noise accumulation, number of channels, channel separation, coupled power and optical space switch crosstalk on the performance of WDM fiber optic systems using dispersion shifted optical fibers in the 1.55 μm window. It is observed that for a WDM signal consisting of 4 channels with 4 nm channel separation, the maximum achievable system length for BER = 10⁻¹⁰ is 1200 km, 1950 km, and 2600 km for the amplifier spacing of 100 km, 75 km and 50 km, respectively. On the other hand for the WDM signal consisting of 12 channels with 1 nm channel separation, for BER = 10⁻¹⁰, the system length achieved is about 1700 km for both the 50 km and 75 km amplifier separations. So the choice of amplifier separation is independent on both the number of channels and the channel separation in a WDM system. Also it is seen that increase in the coupled optical power does not always improve the system performance in terms of BER. Saturation in the BER value takes place for large coupled power. The effects of the switch crosstalk on the system performance is studied, and it has been noticed that for large number of space switches in an optical path, switches with crosstalk per cross point less than -25 db are preferable to keep the degradation of the system performance at acceptable limits

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Title : On Design Of Multicast ATM Switches
Author(s) : Shah Jayesh V
Roll No : 9510443
Supervisor(s) : Manjunath D & Roy Subir Kumar

Abstract

Asynchronous transfer mode (ATM) network technology is widely acknowledged as a key component of the emerging global information infrastructure. ATM is basically a connection oriented, packet switched technology, with very small packets called cells, used to transfer the information. However, to be useful in large networks. ATM technology requires a highly efficient switching system that allows networks that are more cost effective than is possible with most traditional design. Broadband integrated services digital networks (B-ISDN) based on ATM are expected to support new services like videoconferencing, video - on - demand, multiparty telephony, distributed computing, video distribution and broadcasting and tele - teaching which are inherently multicast in nature. To support such services multicast service should be provided by the underlying network in addition to the usual unicast service. Present thesis is devoted to providing multicast support in ATM switches. We propose a new architecture for supporting multicast in the ATM switches. Apart from the drastic reduction in the memory required for storing the connection information, the proposed architecture achieves better throughputs than achievable using the existing architectures. ATM switches and propose in architecture for its realization. We conclude the thesis with an example illustrating the design of a 1024x1024 switch.

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Title : *ECG Data Compression Using Adaptive Wavelet Packets*
Author(s) : *Moogi Suyog*
Roll No : *9510447*
Supervisor(s) : *Ray G C*

Abstract

The electrocardiogram (ECG) is a quasiperiodic signal and is extremely well studied for long term prediction (LTP). The signal is first segmented into beats and every sample within a beat is predicted from samples around the corresponding point in the previous beat. The residual signal after prediction has a much lower dynamic range and can be encoded with fewer bits per sample. This gives a first stage of compression. The residual signal is then subjected to an adaptive wavelet packet (AWP) decomposition using a pair of quadrature mirror filters. The coefficients within each packet are then selectively discarded using an energy threshold criterion and the zeros are run length coded. This gives a second stage of compression. The combination of the two methods gives very high compression ratios with very small reconstruction error. It also retains any abnormalities present in isolated beats.

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Title : *A Multiband Excitation Vocoder At 10-.5kb/S*
Author(s) : *Easow Nimesh*
Roll No : *9510422*
Supervisor(s) : *Rao Preeti*

Abstract

Algorithms for the implementation of a Multi band Excitation vocoder at 2.4 kb/s and 1.5 kb/s are presented. The MBE vocoder models the short time speech spectrum as the product of an excitation spectrum and a spectral envelope. Unlike in other vocoders where the excitation is specified by a fundamental frequency and a single v/uv decision, the excitation spectrum in MBE is represented by fundamental frequency and a v/uv decision for each harmonic of the fundamental frequency. The spectral envelope is represented by the samples at the fundamental frequency. During speech analysis the parameters of the spectrum are estimated in such a way that the synthetic spectrum is close to the original spectrum in the m.s.e sense. The excitation parameters are scalar quantised and the spectral envelope parameters are modelled using LPC spectrum and quantised in the LSF domain using an efficient split vector quantisation to obtain a speech coder operating at 2.4kb/s. we have used frame interpolation to further reduce the bit rate to 1.5kb/s. adaptive post filtering is applied to the reconstructed speech. The coder has been simulated using C language Informal listening reveals that the output speech is highly intelligible. While naturalness is well preserved at 2.4kb/s there is a perceptible particularly in female voices. The performance of the coder in the presence of additive noise is satisfactory. The 1.5kb/s coder provides a speech output that is slightly degraded in quality but otherwise comparable to that of the 2.4kb/s coder.

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Title : *Design Of Asynchronous Digital Circuits*
Author(s) : *Desai Sudhir K*
Roll No : *9510413*
Supervisor(s) : *Roy Subir Kumar*

Abstract

The asynchronous approach to realize digital systems has been known for as long as the synchronous approach> however< synchronous approach was the preferred choice because of its simplicity. With advances in VLSI device and fabrication technology resulting in high integration, the synchronous approach for realizing digital systems has to deal with the problems of critical path delay, clock skew and increased power dissipation. Besides technology migration is difficult in the synchronous approach. These problems can be taken care of by adopting the asynchronous approach. This is the reason why this approach has been a resurgence specially in the domain of mobile communications and handheld applications. Asynchronous design approaches are primarily based on the different delay models used. In the present thesis, we develop a new design methodology based on the delay insensitive model for asynchronous circuits which uniformly uses the 2 - phase non -return – to - zero transition signaling. We first develop a library of basic modules based on this approach. We also show how designs can be implemented using these elements through illustrative examples. To synthesize designs from their behavioral descriptions in a Hardware Description Language, we need to include additional interconnect elements for point to point and bus interconnection topologies. We study a few of these elements. Our approach is not amenable to synthesis based on the algorithms and approaches employed in the synchronous design paradigm. As such, in the latter part of the thesis, we hand synthesize a few designs from their HDL descriptions to study the various synthesis issues applicable to our approach.

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Title : *Parametric Modelling Of Burst-Type Signals*
Author(s) : *Sharma Rajneesh Kumar*
Roll No : *9510430*
Supervisor(s) : *Sircar Pradip*

Abstract

The complex amplitude modulated signal model with exponential functions as modulating signals as a representation of non stationary, burst - type signals, exhibiting certain pseudoperiodicity is studied. The estimation of model parameters is carried out using time correlations. The model is fitted on a noise corrupted computer synthesized marine type signals. The suitability of the model for a real signal is also studied by fitting a real electrocardiograph signals. The study demonstrates the suitability of the model, and elaborates the approach for estimation of parameters.

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Title : *A Window Based Package For Queueing Network Analysis*
Author(s) : *Umesh M N*
Roll No : *9510449*
Supervisor(s) : *Bose Sanjay Kumar & Manjunath D*

Abstract

Queueing Networks have been widely used to model and analyze the performance of complex waiting systems like communication networks, multiprogramming systems and even production job shops and vehicular traffic. Several algorithms exist for solving different types of queueing networks. This thesis deals with the design and implementation of a window based package for the analysis of queueing networks. Two of the well known algorithm – the GI/G/m technique and Mean Value Analysis have been incorporated into the package and have been tested for a wide variety of inputs. We have also developed the framework for further modifications of the package by leaving suitable provisions to include the other solution techniques as well.

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Title : A Highly Modular Architecture For Large ATM Switches
Author(s) : Shah Vipul
Roll No : 9510442
Supervisor(s) : Manjunath D & Roy Subir Kumar

Abstract

Asynchronous Transfer Mode (ATM) technology is widely accepted as a key component of the emerging Broadband ISDN. It is expected that there will be a requirement for ATM switches with less than ten ports to a few thousand ports. Therefore it is desirable to design an ATM switching system architecture, which is modular and can be upgraded over this range with ease and efficiency. In this thesis we propose a highly modular architecture to construct very large ATM switches. The architecture allows us to use smaller switching modules arranged in a network topology with buffers placed at intermediate levels. The architecture is self-routing, which obviates the need for complex routing protocols. Switching is performed at more than one level and each level functions independently of the others. This means that we will not need global synchronization across the modules. By providing a speedup in the link between the levels, the overall delay and buffer requirement inside the switching system is reduced. The modularity of the architecture allows us to implement a large switch of any dimension with a very low incremental cost per port. The small size of the switching module and the distributed routing capability simplifies the operation and maintenance of the switching system. Finally, performance comparisons with existing modular architectures have been made and it is shown that our architecture compares favorably in terms of performance and is much superior in terms of cost.

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Title : *A Methodology For Synthesis Of DSP Architectures*
Author(s) : *Arvind S*
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Supervisor(s) : *Gupta Sumana*

Abstract

The high level synthesis of dedicated architectures has become a crucial step in the design process. The present work tries to generate various architectural specifications for a dedicated system executing DSP algorithm. The crucial steps towards synthesis are scheduling of operations and allocation of hardware resources. Attempt has been made to generate specifications of the proposed architecture which has a minimum interconnection cost and reduced number of hardware resources.

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Title : ***Implementation Of Hierarchical Algorithms For Line Extraction, Texture Discrimination And Optical Flow Estimation On A Pyramidal DSP Architecture***
Author(s) : ***Shaikh Intekhab-e-Aalum***
Roll No : ***9510444***
Supervisor(s) : ***Sharma Govind&Gupta Sumana***

Abstract

Research in the area of high speed real-time image/video processing has emphasized the need for parallel processing i.e. parallel architectures and algorithms suitable for implementation. In this thesis we discuss the configuration of a TMS320C40 DSP based real time image processing system where the processors are connected to form a Pyramidal architecture. This thesis also includes the hierarchical algorithms, a class of algorithms suitable for implementation on a pyramidal architecture. The hierarchical algorithms for straight-line extraction, texture discrimination and optical flow estimation and their implementation on the hierarchical architecture are discussed. In the line extraction algorithm Hough transform is used for representing the edge pixels. Signal to-noise ratio of Hough transform is large for smaller image size. Thus in the hierarchical approach the image is divided into blocks and the results from the smaller blocks are combined and transformed to the higher in the pyramid. The processor at the apex (height level) thus contains the description of the largest and strongest edge in the entire image. The texture discrimination algorithm uses the T.E.M (Texture Energy Map) as the criteria to discern the different textured images into its main component approach. It uses the interval motion smoothness constraint than the local smoothness constraint. The use of image pyramid enables us to estimate large flow vectors. The multigrid technique is employed to speed up the convergence of the algorithm by solving the optical flow problem in different spatial frequency bands (pyramid levels). The results of the implemented algorithms are validated using different sets of images.

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Title : ***Simulation Studies Of An Energy Detection Scheme For Mobile Radio Channel***
Author(s) : ***Trivedi Aditya***
Roll No : ***9510403***
Supervisor(s) : ***Chatterjee P K***

Abstract

Intersymbol interference (ISI) is one of the major problems encountered in cellular mobile radio communication. In presently used mobile systems channel equalization is used which results in complex receiver design. To avoid the resulting complexities an energy detection scheme has been proposed. Simulation of an energy detection scheme using binary frequency shift keying (FSK) as the modulation technique has been carried out. Data rate used in the simulation is the same as used in GSM system. Multipath spread or mean -square delay spread is taken as 4.6 μ sec. as reported in literature. Probability of error has been calculated for different SNR values and for three different IF bandwidths. For 10 - 3 probability of error SNRs are found to be 18.5 dB, 10 dB, and 21 dB (approximately) for $2/T$, $1.5/t$ and $1/T$ IF bandwidth respectively.

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Title : ***Implementation Of A Standalone IP Router Using A Linux Based Development Platform***
Author(s) : ***Khedekar Vijay***
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Supervisor(s) : ***Srivathsan K R***

Abstract

The design and development of application specific systems involve fabrication of hardware and writing of boot time and application software depending on the desired target system. If the core hardware and software in such systems is designed to be reusable, then similar application specific systems can be developed with minimum of efforts using the same base hardware and software. This approach reduces the efforts and time in the design cycle of application specific systems. The methodology undertaken in this work has utilized the LINUX operating system over a PC platform for the development of standalone application specific system. The boot and runtime software for desired combination of hardware/software has been configured and compiled on a library machine which has the necessary modules and device drivers that LINUX offers, for the IP router implementation, as a sample case. To this, necessary runtime configuration utility for the router has been added. The compiled compressed code is then used with a standalone PC motherboard with necessary adapters as an IP router for network application. The IP router supports all essential functions such as IP forwarding, Dynamic routing, etc. the router has been tested over a Network test bed for functional and performance aspects.

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Title : ***Construction Of Elliptic Curves For Efficient And Secure Cryptosystems***
Author(s) : ***Bansal Pankaj***
Roll No : ***9510424***
Supervisor(s) : ***Siddiqui M U***

Abstract

Soon after Lenstra gave an algorithm for integer factorization using elliptic curves, Miller and Koblitz independently demonstrated the application of elliptic curves in public key cryptography. Initially the elliptic curve public key cryptosystems were thought to be impractical, but over the last 10 years, efforts of Menezes, Vanstone and Koblitz have changed the scenario. In contemporary cryptography, elliptic curve public key cryptosystems are being considered as a suitable alternative to existing RSA cryptosystems as they promise higher security with shorter keys. Shorter keys lead to reduction in storage requirements. Moreover, the complexity of hardware, required for implementation of elliptic curve public key cryptosystems, is relatively less as the size of working field is relatively small. Both of these factors make elliptic curves suitable for smart card implementation. Security, throughput and complexity of the system are three important aspects of a cryptosystem design. In this thesis, we discuss the theory of elliptic curves to develop algorithms for constructing non-supersingular elliptic curves over finite fields which are suitable for secure cryptosystems. The algorithms are based on Lay & Zimmer's scheme (which is modified version of Atkin & Morain's scheme) and have been generalized to include several different cases. Relevant theory for construction of elliptic curves suitable for public key cryptosystems has been given in detail. The elliptic curves have also been discussed for certain number theoretic problems, such as integer factorization and primality proving. Thesis also discusses various issues related to efficient implementation of cryptosystems in general and smart cards in particular. Our major emphasis is on optimizing the memory requirements and complexity of modules, performing arithmetic in underlying finite field.

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Title : *3-D Model Based Approach To Video Compression*
Author(s) : *Anandh P*
Roll No : *9510408*
Supervisor(s) : *Sharma Govind&Gupta Sumana*

Abstract

In this thesis we have attempted an implementation of an object based analysis-synthesis coder (OBASC), low bitrate video coder for videophone application. The method uses the concepts of a model-based approach. In this method the parts of the given sequence of image frames are separated out. They are referred to as objects. Each object is defined by a set of three parameters namely shape, motion and color respectively. For each frame they are estimated and transmitted. In the decoder the image is reconstructed using the transmitted parameters. Unlike the conventional hybrid coder, it has been shown that the use of shape information avoids the mosquito and blocking artifacts in the reconstructed image. The number of bits needed to code the motion and shape parameter of an object have been found to be 50 and 70 bits respectively for each frame. Coding of texture has not been attempted. Assuming the texture of an object requires 1.2 kb for each frame, it can be concluded that the overall bitrate required for a head and shoulder image sequence with a frame rate of 10Hz is approximately 64kb/sec.

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Title : *Slidetalk:Slide Display Implementation*
Author(s) : *Gupta Manoj*
Roll No : *9510419*
Supervisor(s) : *Srivathsan K R&Manjunath D*

Abstract

Many tools exist to support group communication on Unix platform. In this thesis we have implemented a teleseminaring tool, called slide talk for MS - Windows on PCs slideTalk enables speaker - audience interaction through PCs networked either on the same LAN or on an internet. The system software is designed using object windows. Slidetalk uses the IP group delivery model for communication among the group members. UDP is the transport protocol used. The complete implementation work of slidetalk has been done in two parts: display of slides and voice transmission. This thesis deals with the former, i.e. the display of slides in postscript format. The group members can view the slides and make annotations on them using the drawing and text capabilities . The complete development of slidetalk system has been done on top of whiteboard, which provides the functionality to exchange graphics and multifont text in a multicast environment. A primitive implementation for playing audio files (of WAV format) and video files (of AVI format) is also incorporated in this thesis work.

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Title : *Slidetalk : Voice Component Implementation*
Author(s) : *Kohli Sanjeev*
Roll No : *8570440*
Supervisor(s) : *Manjunath D*

Abstract

Proliferation of personal computers, explosive growth of internet, the changes in communication services and availability of inexpensive hardware on desktop has paved its way for group collaboration in distributed environments. Many computer tools have extended their support for effective group collaboration on Unix platform. In this thesis we have developed a PC based teleseminaring tool, Slide Talk, on MS -Windows platform. SlideTalk allows the speaker and the audience to interact during the conference through PCs networked either on the same LAN or on an internet. The system software is designed completely under Object Windows environment and uses IP group delivery model for communication between members, which works on top of UDP as the underlying transport protocol. The complete implementation work for SlideTalk has been done in two parts: Display of Slides and Voice Conferencing. This thesis work deals with the voice conferencing component. The speaker's voice is multicast in real - time to all the group members. The complete development of SlideTalk has been done on top of White Board, which provides the functionality to exchange graphics and multifont text in a multicast environment.

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Title : *Neural Network And Survival : Prediction Of Movements In 3-D Environment*
Author(s) : *Prasad D B N*
Roll No : *9510412*
Supervisor(s) : *Ray G C*

Abstract

Recognition of 3 -D objects on the basis of a 2 - D perspective view is performed effortlessly by many nervous systems, yet is not easily duplicated by machines. The present work presents a nonlinear dynamical approach to object recognition implemented by artificial neural networks. The behaviour of back propagation algorithm is studied. The selection of learning rate, number of hidden layers and number of nodes in each hidden layer are experimental. Back propagation network is applied for classification of two 3 - D objects. The behaviour and nonlinear mapping ability of polynomial perceptron and fractionally spaced bilinear perceptron (FSBLP) are studied. FSBLP is applied for prediction of movements of 3 - D object.

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Title : *Time Series Analysis For Medium Term Forecasting Of Network Load*
Author(s) : *Sonakiya Mohit*
Roll No : *9510420*
Supervisor(s) : *Manjunath D*

Abstract

With the advent of applications like teleconferencing, video on - demand etc., there is a growing need to address the problem of performance management of networks. As the performance of a network is highly dependent on the load on a network, traffic modelling is of considerable importance in the management of performance. In this thesis we use time series methods to address the problem of modelling of network traffic. We measured the network traffic on a LAN segment over a period of time and constructed a new time series as the number of intervals in a day that the network load exceeded a certain threshold. The time series is then analysed using Box - Jenkins method. We applied logarithmic transformation to make the time series stationary. We find that the transformed time series lends itself to seasonal ARIMA models with few parameters. The model that was found to be most suitable was $ARIMA(1,1,1) \times (1,1,0)$. Since the number of parameters is less, the model can be used to forecast traffic in practical applications. We have then used our model to forecast future network traffic over a period on one month.

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Title : ***A Versatile Simulator For Studying The Performance Of VP-
Based ATM Networks***
Author(s) : ***Rao Challa Srinivasa***
Roll No : ***9510410***
Supervisor(s) : ***Bose Sanjay Kumar***

Abstract

It is expected that ATM networks will carry multi - class traffic over the same network. Here different types of calls may have different bandwidth requirements and different service times. The arrival rate of calls may also change with time. Schemes which may be used to operate networks of this type will be of practical importance. For studying one such protocol, we have constructed a simulator with a simple graphical user interface GUI. The studied scheme operates in a distributed fashion at each node of the network and can handle situations where the network load changes dynamically at its nodes. In this scheme a virtual path (VP) based approach has been used with two algorithms operating at two levels. At the higher level, a distributed VP allocation (VPA) algorithm is used to allocate VPs between different O - D pairs in the network and assign appropriate bandwidths to them. The amount of allocated bandwidth may be subsequently increased or decreased or new VPs may also be established. At the lower level, a call bandwidth allocation (CBA) algorithm is used to handle a new call arrival. The CBA first decides whether or not to accept the call and if accepted, it then decides the VP to which this call can be assigned. Local estimation of traffic is required for both the algorithms. Different networks are configured by using the GUI and their performances has been studied.

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Title : *Queue Inferencing In M/M/1 Queues With Cumulative Departure Information*
Author(s) : *Sharma Vishal*
Roll No : *9510455*
Supervisor(s) : *ManjunathD*

Abstract

Packet deals and queue length are important indicators of the quality of service offered at a node in a telecommunications network. These parameters cannot be easily measured. This necessitates the estimation of these parameters from other more easily available information like the traffic rates to nodes, the departure instants of packets or the cumulative departure counts. Queue inferencing is a technique to estimate the queueing parameters using this kind of transactional data. Many queue inferencing algorithms have developed. All of these algorithms required detailed transactional data of the service initiation and termination instants of packets. In this thesis, we have proposed queue inferencing schemes that require less detailed data to estimate the packet deals and queue lengths. We concentrate on the queue inferencing using the cumulative departure count information. This information is more easily available from the network management information bases and is also less informative. This information is collected by the network manager by polling the node at regular intervals. In the first method that we study, we divide the polling interval into cycles composing of an idle period and its adjacent busy period. We then distributed the total departures among these busy periods and its adjacent. We then distributed the total departures among these busy periods to generate the kind of data required by existing queue inferencing algorithms. We then use this data in the queue inferencing algorithms and estimate the waiting times. We study the performance of this technique by evaluating the error and the bias in the estimates by comparing the estimates with the “real values” from simulation. Next we derive an $O(d)$ formula for estimating the queue length at the end of a given time interval, which we call as the “residual” queue length using the information of the cumulative departure count, d . We derive an expression for the joint probability distribution of the cumulative departures and the residual queue length and use this result to derive our estimation algorithm. We also present some numerical results for our algorithm.

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Title : ***An Enhanced Authentication Protocol For CDPD Network***
Author(s) : ***Tripathi Vipin***
Roll No : ***9510454***
Supervisor(s) : ***SiddiquiM U***

Abstract

Communication networks are the basic need of today's world. Thus, the security and authentication in a network have their own importance. This necessity increases as he people move towards wireless communication because now the channel is open to any -body's access. CDPD network is one of the emerging wide area data network. This and other wireless WAN have not experienced the rapid growth as two - way voice technologies have. Since CDPD technology is cost effective due to use to unused bandwidth of AMPS and sharing of existing base stations it is being developed and deployed. CDPD authentication protocol being used currently is not secure enough to bear the high -tech frauds. In this thesis we have given an new authentication protocol for CDPD net work and discuss its security aspects. This protocol is implemented in software. RSA cryptosystem is deployed for authentication and key distribution. Two conventional key cryptosystems DES and IDEA are implemented and incorporated in the protocol to show how secure data transmission can take place. A large number (150 - 200 decimal digits) arithmetic package is developed. These three encryption schemes are also developed to use as separate packages. Our major emphasis is on the optimization of the memory req uirements and also reduction in delay occurring in authentication.

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Title : *A Wireless Network For Distributed Monitoring And Control*
Author(s) : *Singh Alkesh Kumar*
Roll No : *9510405*
Supervisor(s) : *Srivathsan K R&Siddiqui M U*

Abstract

For monitoring and control applications, a reliable data communication network is a prerequisite. Since data acquisition often involves areas which are geographically dispersed or difficult to access, wireless networks are often preferred. The wireless networks, such as cellular and VSAT, are widely being used for voice and data communication services. However, there are many applications where the cost of such network systems is high, or the capacity and response requirements are not adequate. Therefore, it is necessary to develop an appropriate and economical network for monitoring and control of geographically distributed objects. In the thesis, an attempt has been made to develop a low cost communication network for monitoring and control applications which exploits the capabilities of the existing radiopaging communication. The parameters needed to arrive at the design specifications of this network are assumed from both the available communication capacity and typical scenario of power distribution on automation. Then, a network based on forward radiopaging and return walkie-talkie radio data link is proposed. Since the radiopaging standard used (POCSAG) is for one way communication, it has been modified to suit the requirements of the network. The roll-call polling scheme with a suitable timing control technique is used in the network to gather the system information. Issues related to error-recovery are also considered. The proposed communication scheme has been implemented and tested over a communication interface for a PC specially developed for this purpose.

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Title : *Design Of Resistively Mismatched Linear Active Two-Port*
Author(s) : *Namjoshi Vinod Purushottam*
Roll No : *null*
Supervisor(s) : *Venkateswaran Shankara*

Abstract

In high frequency tuned amplifiers of these oscillations while tuning the amplifier is a serious problem. These oscillations can be eliminated by unilateralization or by the operating gain is to be maximized during while a cubic equation results viz. $0 \sin \cos 1(3 = -++ nn qlql$ This work present simple and approximate expressions for calculating O_l and the maximum optimum power gain. The advantageous of mismatching design technique are studied viz. assurance of stability the independent nature of input in impedance w.r.t. Load impedance and the useful of this design method in broad band techniques.

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Title : ***Experimental Characterisation Of Image Line Discontinuities
And Realisation Of Band Pass Filter***

Author(s) : ***Choudhary P K***

Roll No : ***9510414***

Supervisor(s) : ***Biswas Animesh***

Abstract

Image line is a type of transmission line which is widely used as a transmission medium in microwave and millimetric wave regions. Two types of discontinuities in this type of line viz. air gap and notch have been experimentally characterized as a T - ne twork lumped element circuit using transverse resonance technique. The line has been assumed as lossless and phase constant βz has been experimentally obtained. Subsequently, a band pass filter based on air gap discontinuity reactance parameters has been d esigned which was found to work experimentally very close to its designed parameters

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Title : *Study Of Fiber Optic Gyroscopes*
Author(s) : *Swami S M*
Roll No : *9510439*
Supervisor(s) : *John Joseph*

Abstract

The principles of operation of fiber - optic gyroscopes are reviewed. The phenomenon which limit the performance of the fiber -optic gyroscope are discussed, along with methods to reduce their effect on the rotation rate signal. An attempt has been made to fabricate as open lop all fiber gyroscope. Various subsystems involved to make up this experimental set up are also described as well as their performance. A continuously guided optical path through the all fiber configuration of the gyroscope has been demonstrated. For the laser diode power of 0 dBm into the fiber pigtail, about -33dBm power could be obtained at the detector end.

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Title : *Simulation Of Buck-Boost Converter With Fuzzy Logic
Controllers*
Author(s) : *Malhotra Ruchi*
Roll No : *9510456*
Supervisor(s) : *Joshi Avinash*

Abstract

A detailed analysis of modeling and behaviour of the buck - boost converter is studied. The transfer functions are verified by simulation. The fuzzy logic controller is studied in detail. Equivalence between the fuzzy logic controller and the linear P.I controller is established. Two schemes for self - organization have been proposed to tune the process output to several desired responses. The response of FLC for a variation in load, line and reference value of voltage has been studied. The response of the system with various auxiliary controller along with the FLC against the variation in load has been discussed. The fuzzy logic controller is used alone with variable gain factor against load variation.

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Title : ***Design Of The Line Of Sight Stabilization Using LQG/LTR
Methodology For Mobile land Vehicles***
Author(s) : ***Marathe Rajeev***
Roll No : ***9510431***
Supervisor(s) : ***Hole K E***

Abstract

The stabilization of the line of sight (LOS), against all the disturbances, is an essential feature of electro - mechanical gimballed sighting systems, mounted on the mobile land vehicles. This thesis, describes the design of a controller for an electro - mechanical target tracking system with an optical sensor for sighting. The control law is obtained using a linear model of the electromechanical system, by applying the linear quadratic Gaussian with loop transfer recovery (LQG/LTR) methodology so as to control the rate of the line of sight.

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Title : *Investigation Into Coordinated Control Of TCSC Controlled Double Circuit Line*
Author(s) : *Sricharan P*
Roll No : *9510445*
Supervisor(s) : *Prabhu S S&Sachchidanand*

Abstract

In case of regulated transmission lines, which have controllers to regulate voltage, power flow, angle across line etc, if their operation is independent of operation of other surrounding controllers then their combined operation can lead to undesirable and even disastrous results without proper co-ordination. In order to increase the power transfer capability of transmission line and to have control on line power flows, thyristor controlled series compensators (TCSCs) are used. There is hardly any work reported in the literature about coordination of TCSC and other flexible AC transmission system (FACTS) controllers. In the future, when the use of FACTS devices becomes widespread, the control coordination problem is expected to emerge as one of the major problems in the operation of such systems. This thesis studies the coordination problems for a double-circuit line with TCSC on both lines. One of the TCSCs is used for controlling power flow on its line and the other is used to control the power angle across the lines. This scheme not only co-ordinates the operation of two controllers but also improves the transient stability of the system. Even under transient fault conditions, the angle across the lines is not allowed to depart much from the set value. Under steady state conditions, the changes made in power order of power controlling TCSC will not bring in any oscillations either on the lines or in the generator because of second controller. These aspects have been investigated and observed in a single machine infinite bus system connected by a double circuit line having TCSCs on both the lines. Simulation for step changes in power order of power setting controller and faults at receiving end of transmission line has been done using PSCAD/E MTDC package. It has been observed that in fault cases, there has been a tremendous improvement in transient stability of the system. And in case of step change in power order, with controllers on both the lines, there are no transients in generator power and the transients in line flows also die down quickly. Thus, not only is control over power flow achieved, but also significant improvement in transient stability is obtained.

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*Title : A Novel Control Strategy For A Variable Series Compensated
Ac Line Operating In Parallel With A Dc Line*

Author(s) : Mittal Alok Kumar

Roll No : 9510406

Supervisor(s) : Prabhu S S&Sachchidanand

Abstract

With increasing demands made on existing transmission systems, power systems are becoming highly stressed. This deteriorates the system's transient and dynamic performance. To deal with it, controllable devices like FACTS (Flexible AC Transmission Systems) and HVDC links will be increasingly utilized. Future power systems will have many such controllable devices. In an integrated system, their interaction will be critical. Without any co - ordination in their operation, the control interaction may be detrimental to system security. This thesis addresses such issues related to parallel operation of an HVDC link with a variable series compensated AC line, where the device used for series compensation is TCSC (Thyristor Controlled Series Capacitor). The control strategies possible are investigated. It is shown that if the controls of HVDC link and TCSC are not co -ordinated, no significant advantage will be obtained compared to an uncontrolled line. It may even have a negative effect on system operation. Here a control strategy is proposed for TCSC which does not come in conflict with HVDC controls. The controller proposed here can be realised with locally measurable signals. The suitable values of control parameters are found for this controller. System's performance is evaluated for a wide range of system disturbances, using PSCAD/EMTDC. The control strategy used here shows a marked improvement in transient stability compared to an uncontrolled line.

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Title : *Study Of Boost Rectifiers With Active Input Current Waveshaping*
Author(s) : *Srivastava S K*
Roll No : *9510438*
Supervisors(s) : *Doradla S R&Fernandes B G*

Abstract

Presented in this thesis is the analysis, simulation study and design of single - phase and three - phase rectifier topologies with the boost inductor either on the dc side or on the ac side. The control strategy involves constant frequency, fixed duty ratio and discontinuous current conduction mode of operation in the boost inductor. The hardware implementation of the three - phase ac - dc boost converts includes a feedback of output voltage control loop to account for fluctuations in the input voltage and load variation. In the simulation of the input current, harmonics upto the harmonic nine have been considered. The total harmonic distortion is found to be less than 4% and the supply power factor is around 0.97.

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Title : ***Slip-Power Recovery Control Of A Three-Phase Induction Motor Using PWM IGBT Inverter***
Author(s) : ***Rajaneesh***
Roll No : ***9510432***
Supervisor(s) : ***Doradla S R&Fernandes B G***

Abstract

The speed control of a three - phase slip ring induction motor using slip - power recovery scheme in the subsynchronous speed range is presented. Space vector modulation is employed for the IGBT inverter. Using the concept of quasi - duality which is well reported in the literature, the CSI modulating function is derived from the VSI modulating function. The torque - speed characteristics are obtained using hybrid model. The commutation overlap which is unavoidable due to the rotor leakage inductance is considered in the mathematical model. The three - phase inverter is built using insulated gate bipolar transistors (IGBTs). The complete subsynchronous speed rotor slip - power recovery scheme has been tested experimentally. Typical oscillogram from the experimental setup show good agreement with the simulated results from the overall mathematical model.

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Title : *Performance Evaluation Of A Class Of Neuro-Fuzzy
Controllers*
Author(s) : *Bajpai Ratan*
Roll No : *9510435*
Supervisor(s) : *Ghosh Arindam*

Abstract

Conventional control techniques do not sufficiently address the problem of control design for complex nonlinear systems. The field of intelligent control was developed for solving such problems by incorporating logic, reasoning and heuristics into the more algorithmic approach provided by conventional control theory. Fuzzy control and neural networks have become two important streams of intelligent control. Various approaches have been proposed in the literature to combine fuzzy and neural systems in order to utilize their synergetic relationship and to compliment each other thereby eliminating their respective drawbacks. This thesis attempts to evaluate the performance of a class of such neuro-fuzzy controllers. The fuzzy-neural system (ANFIS) studied here results on translating a fuzzy inference system into a connectionist network form. This controller is then applied to a simple linear system and two nonlinear control problems. In the first example (speed control of a permanent magnet dc motor), the system attempts to tack a specified speed trajectory. In the second example (disturbance rejection in a buck-boost converter system), the controller tries to make the average output voltage constant when some random disturbance is present in the input dc voltage. The simulation results reveal that the ANFIS controller performed well under certain specific conditions. For its general applicability to real control situations, more theoretical results are needed and some important problems are required to be addressed.

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Title : *Long-Term Stability Analysis Of Power Systems Experiencing Large Frequency Variations*
Author(s) : *Gupta Manoj*
Roll No : *9510418*
Supervisor(s) : *Varma Rajiv K*

Absract

This thesis presents an application of the singular perturbation method to power system simulations. The main focus is on interactions of the slow and fast states associated with the various dynamic devices used in power systems. Model of the network, the exciter, power system stabilizer (PSS), governor, turbines and static var compensator (SVC) are reformulated using singular perturbation technique. The study has been done for a two area power system using the conventionally employed constant reactance (CR) method, singular perturbation (SP) method and PSCAD simulation. A large disturbance is created by rejecting loads in both areas resulting in a 4 -5 percent variation in the system frequency. The results obtained by the SP method are shown to be quite close to those obtained by a detailed dynamic simulation package PSCAD. However, there is larger mismatch between the results of the CR method and the PSCAD simulation. Effect of changing the ratio of time scale of the slow and fast states are studied which reveal that higher the time separation between the slow and the fast states better will be the results from the SP method. The amenability of the SP method to variable time step of integration has been shown. Which results in substantial saving in computational time. The utilization of the SP method for modelling of static var compensators has been done for the first time. This thesis thus contributes an application of a fast and accurate method for analysing the dynamic behaviour of the power system under going large frequency deviations.

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Title : *Study Of Power Flow Control Over A Transmission Line Using TCSC*
Author(s) : *Srivastava Piyush Chandra*
Roll No : *9510427*
Supervisor(s) : *Ghosh Arindam*

Abstract

A thyristor controlled series compensator (TCSC) is one of the flexible AC transmission system (FACTS) devices, which has received very wide attention in the recent times. This device, which contains a fixed capacitor in parallel with a thyristor-controlled reactor (TCR), when connected in series in a transmission line can improve the power flow over the line. This device can enhance stability limits, damp sub synchronous oscillations and schedule power flow in parallel connected lines. The basic characteristic of this device is defined by the reactance of the versus the firing angle of TCR and is non-linear in nature. Most of the control systems employed in practice use a conventional type controller in which the firing angle of the TCR is obtained from a look-up table. However the behavior of the device is such that it has attracted many researchers to model its operation accurately. In this thesis we have studied the characteristic of this device in order to provide a guideline for optimum selection of parameters. Conventional P-I type controller is designed for the control of power flow in a single machine infinite bus (SMIB) system. A simplified state-space model of the TCSC compensated power system is derived and two different controllers are proposed based on this model. Both these controller place the closed-loop poles in desired locations through state feedback. Both MATLAB and EMTDC/PSCAD software packages are used for obtaining the system characteristic and controller validation studies. Finally, to implement the device in a laboratory set-up, a hybrid hardware-software power system simulator is conceptualized. Part of this simulator has been designed and tested.

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Title : *Redesign Of Autopilot For Launch Vehicle Using H /LTR Procedure*
Author(s) : *Gokhale Vikas*
Roll No : *9510451*
Supervisor(s) : *Hole K E*

Abstract

In the thesis, a robust optimal H^∞ /LTR based controller for a launch vehicle has been designed. The H^∞ /LTR method uses a loop transfer recovery procedure which recovers robustness properties at plant input to a specified degree of recovery. A weighted difference between the open loop transfer function of state feedback system by an LQR and that of an output feedback system by an LQR with an observer is estimated quantitatively by an H^∞ norm. The degree of recovery can be prespecified explicitly by this method not only for minimum phase plants but also for non minimum phase plants. An H^∞ /LTR based controller has been designed using 9th order reduced order model of the launch vehicle and is implemented on the 23 order full order model of the launch vehicle. Both the reduced order model as well as the full order model are non minimum phase and unstable. A comparison is made of the performance of the designed controller with the previously designed LQG/LTR controller for the nominal model as well as the two sets of perturbed models of the same full order system. The H^∞ /LTR controller designed with reduced order model for arbitrarily low degree of recovery stabilizes the reduced order model but it fails to stabilize even the nominal model of the full order system. On increasing the degree of recovery to a value such that the actual recovery error is equal to that of the LQR/LTR controller, the responses are as good as those with LQR/LTR controller. A study of variation in different performance measures on varying the degree of recovery is done.

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Title : *Study Of Variable Series Compensation For A Radial Line*
Author(s) : *Jacob Josephkutty*
Roll No : *9510415*
Supervisor(s) : *Prabhu S S&Varma Rajiv K*

Abstract

The ever increasing demand for power has to be met by increase in generation and transmission capacity. It is increasingly becoming difficult to build new transmission lines due to environmental factors. Power utilities are giving much importance to better utilization of the existing transmission system. New FACTS devices being developed are proving to be highly useful in this task. This thesis deals with a study of a Thyristor Controlled Series Compensator (TCSC) for a long radial transmission line connecting a generator source to a big load center. Appropriate shunt compensation has been designed for the system. Since a major concern in such systems is regulation of the load point voltage, TCSC, along with the shunt compensating devices, has been designed to aid in regulating this voltage. Detailed simulation using the PSCAD/EMTDC software has been done to assess efficacy of the design.

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Title : *Design And Analysis Of Six-Pulse Bridge Type Cycloconverter*
Author(s) : *Tambe S V*
Roll No : *510430*
Supervisor(s) : *Ramamoorthy M*

Abstract

A 3-phase to 1-phase, 6-pulse, bridge type cycloconverter is designed to operate in circulating current mode. The main advantages of this mode of operation are: (1) elimination of current discontinuity and (2) simple control circuitry. Firing angle is modulated using cosine crossover principle which results in minimum harmonic content in output voltage and current waveforms. Frequency and voltage can be varied independently. A trigger module and algorithm for digital computation is presented in the thesis to compute output voltage and current waveforms for different load conditions and at any frequency. The experimental waveforms are compared with those obtained from digital computations. Using this prototype, higher rating circuits can be designed for various applications such as variable source constant frequency supplies (VSCF), drives for speed control of synchronous motors and the like.

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