

M.TECH. THESIS ABSTRACT 1995

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Microelectronics, VLSI & Display Technology

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RF Microwaves and Photonics

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Signal Processing, Communication & Networks

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Title : ***Instrumentation Of Low Frequency Noise Through Wavelets***
Author(s) : ***Saxena Amit***
Roll No : ***9310403***
Supervisor(s) : ***Sharan R&John Joseph***

Abstract

Measurement of noise is important in engineering. A method to measure power spectral density (P.S.D.) of low frequency noise ($1/f^Y$) has been developed. In this method “Constant -Q” filtering of noise is done. For “constant - Q” filtering purpose Wavelet transform is used. Wavelet transform has perfect reconstruction and “Constant - Q” properties. All cases of noises (different Ys) are studied and algorithm is developed to give power spectral density of any type of noise. Perfect reconstruction property of Wavelet transform is used to synthesize $1/f$ noise from white noise.

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Title : ***Some Technology Aspects Of TV Deflection Transistors***
Author(s) : ***Prasad Pammi Kalee***
Roll No : ***9310432***
Supervisor(s) : ***Sharan R***

Abstract

High voltage power transistor have found applications in T.V deflection, various other switching circuits like inverter, choppers etc. The technology for metallization using lift off technique has been developed for these power devices. Another lift off t echnique for thin film metallization has also been optimized and its relevance for thick film metallization has been investigated. The limitations of these process has been studied. The power transistor role in normal T.V deflection and its future trends in fast approaching HDTV and its consequences are studied briefly.

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Title : ***A GTO-Based Three-Phase Ac-Dc PWM Converter Fed Dc Motor***
Author(s) : ***Jafar Jafar Jamal***
Roll No : ***9320401***
Supervisor(s) : ***Fernandes B G***

Abstract

The present work deals with designing of three - phase GTO AC - DC converter and its control circuit, snubber circuit and drive circuit. The GTO thyristors are switched employed programmed PWM technique to eliminate some lower order harmonics. The analysis of converter circuit is presented. Digital technique is used to implement the above PWM technique. The system is tested experimentally to verify the basic principles and analytical results

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Title : *Studies On Source To Fibre Coupling*
Author(s) : *Garg Roopam*
Roll No : *9310442*
Supervisor(s) : *Sharan R&John Joseph*

Abstract

Efficient coupling between source and fibre is a significant problem in optical fibre communication systems. An attempt has been made to study the basic couplings between source and fibre. The coupling problems of laser diode to single mode fibre is first considered. Hyperbolic microlenses are shown to be the ideal ones for the above problem. Coupling theory for these microlenses using various models are briefly presented, followed by comparison of results. Coupling studies of light emitting diodes (LEDs) to multimode fibres are then considered. Far field patterns for source and fibres are obtained experimentally based on which a few parameters of LED and fibres are calculated. Various theoretical coupling models for this coupling problem are considered. The theoretical results are then compared with the measured results for a source and two types of fibres in a butt coupling configuration, using and optical glue, to improve the coupling efficiency. Measured results of these microlensed fibres are presented.

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Title : *Design, Simulation And Algorithm Mapping For A DSP Multiprocessor Array - II*
Author(s) : *Venugopal B*
Roll No : *9310457*
Supervisor(s) : *Mahanta Anil & AggarwalSanjeev Kumar*

Abstract

In this thesis, a multiprocessor array of ADSP - 21020 superscalar floating point DSP processors has been proposed. The array proposed is a linear array, which is envisaged to be useful for a broad class of signal and low level image processing applications. The schematic level design of the array architecture is presented. A Single Cycle Multiple Destination transfer between the processor and its peripherals has been designed. This feature enhances the data transfer capability of the processor. A simulation package with an interactive user interface has been developed for the proposed architecture. Various signal and image processing algorithms have been parallelised and mapped on to the array. The performance evaluation of the proposed array for these algorithms has been done using the simulator. The algorithms chosen have been mapped so as to efficiently exploit the special features of the array architecture

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Title : ***Design Simulation And Algorithm Mapping For A DSP Multiprocessor Array-I***
Author(s) : ***Kamat Sanjay R***
Roll No : ***9310420***
Supervisor(s) : ***Mahanta Anil&Aggarwal Sanjeev Kumar***

Abstract

In this thesis, a multiprocessor array of ADSP - 21020 super scalar floating point DSP processors has been proposed. The array proposed is a linear array, which is envisaged to be useful for a broad class of signal and low - level image processing applications . The schematic level design of the array architecture is presented. A Single Cycle Multiple Destination transfer capability of the processor. A simulation package with an interactive user interface has been developed for the proposed architecture. Various signal and image processing algorithms have been parallelised and mapped on to the array. The performance evaluation of the proposed array for these algorithms has been done using the simulator. The algorithms chosen have been mapped so as to effeciently exploit the special features of the array architecture.

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Title : *Studies On Dielectric Resonators In Suspended Substrate Environment For Millimeter Wave Applications*
Author(s) : *ShuklaRajiv Kumar*
Roll No : *9310438*
Supervisor(s) : *Biswas Animesh*

Abstract

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Title : ***Design And Development Of C Band Mixer Using Dielectric Resonators***
Author(s) : ***Arora Major Pradeep***
Roll No : ***9310430***
Supervisor(s) : ***Biswas Animesh***

Abstract

A C Band Microwave Mixer has been designed using dielectric resonators. The design is suited for MIC environment. The design makes use of dielectric resonators as series resonating elements for realizing signal and LO band pass filters. Modal analysis has been used to derive the field expressions for the suspended substrate structure. Information thus obtained has been used to calculate transmission characteristics of the microstrip line. Already available coupling information on microstrip line to dielectric resonator and dielectric resonator to dielectric has been used in this design. A schottky barrier junction diode in self bias mode has been used as the mixer diode. The fabricated mixer is housed in a copper housing. A very sharp IF response has been obtained at the desired frequency using above design

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Title : *Windows Based Block Diagram Simulation For DSP Systems:
Ii-Implementation Of Simulation Blocks*
Author(s) : *Warrier Suresh*
Roll No : *9310451*
Supervisor(s) : *Mahanta Anil*

Abstract

.In this thesis a library of DSP and mathematical functions have been developed and implementation of simulation of blocks to form part of a windows based block diagram simulation package has been done. The graphical user interface for the same has been implemented concurrently in another thesis. The software is capable of simulation of a variety of DSP functions and the output can be viewed on a graphical display. The software developed is user friendly with on - line help. The software is intended to be u sed as a teaching aid for conceptualization and experimentations of DSP systems

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Title : ***Windows Based Block Diagram Simulation For DSP Systems:
I-Implementation Of Object Windows Interface***
Author(s) : ***Sharma V P***
Roll No : ***9310450***
Supervisor(s) : ***Mahanta Anil***

Abstract

In this thesis, a windows based package for block diagram simulation of DSP systems has been developed. It is intended to serve as a training aid for conceptualization and experimentation of DSP systems. It can be viewed as a software breadboard which offers a flexible environment to rapidly test and verify the efficacy of a particular design using discrete functional building blocks. The software has been simultaneously developed in two parallel theses. In this work, the visual user interface and graphic module for the package has been developed. The visual user interface is responsible for all the interaction with the user. It is an interface between the visible actions on the screen and their actual execution for simulation. The software is menu driven and has all the standard features of a windows package.

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Title : *Analysis Of Cavity Backed Microstrip Slot Antenna*
Author(s) : *Sridhar Pulikonda Venkata*
Roll No : *9310437*
Supervisor(s) : *Sachidananda M*

Abstract

A microstrip slot antenna which radiates only on one side is very useful in many planar array applications. In this thesis, a method of suppressing the radiation and mutual coupling on one side of the microstrip slot antenna is presented. A cavity is placed on the slot and is allowed to radiate from the microstripline side only. The antenna is analysed using the reciprocity theorem. Exact Green's functions are used to find the necessary field components from the electric and magnetic currents in the presence of dielectric slab. Expressions are derived for the amplitudes of the reflected and transmitted waves on the microstripline and an equivalent circuit representing the slot discontinuity is found. The slot field is solved for, using the Method of Moments with a number of expansion modes in the slot. Impedance curves calculated experimentally and theoretically, for various cavity depths, are presented. These curves show that the above structure can be used for planar array applications, since it successfully suppresses the mutual coupling on the non radiating side.

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Title : *Study Of Electromagnetically Coupled Patch Antenna*
Author(s) : *Sriharsha C*
Roll No : *9310409*
Supervisor(s) : *Sachidananda M*

Abstract

In this thesis the properties of electromagnetically coupled rectangular patch antennas are studied. Cavity model is used to analyze this antenna. These antennas are modelled as a cavity with two electric walls at the top and the bottom of the cavity and four magnetic walls along the sides. The different cavity modes that can exist in this structure for the given electromagnetic excitation is considered and important characteristics like input impedance and radiation pattern of this antenna are calculated analytically. The feed of the antenna was also suitably modelled. This antenna is then fabricated and experiments were conducted on it. The theoretical results are then compared with the experimental results. The theoretical results satisfactorily matches with the experimental results.

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Title : *A Neural Network Based Decoder For Fiber Optic Code Division Multiple Access System*
Author(s) : *Oommen Paul P*
Roll No : *9310435*
Supervisor(s) : *Ghosh Anjan Kumar*

Abstract

In a fiber optic code division multiple access communication system, the function of each users' decoder is to extract the data with the desired optical code sequence in the presence of all users' optical code sequences. In this thesis, a new method for de coding, based on a neural network, specifically a perceptron, is proposed for a fiber optic code division multiple access system. Optical implementation of perceptron based on fiber optic delay lines is presented. In comparison with conventional fixed delay line based decoders, perceptron based decoder has the advantage that all the users' decoder can have the same implementation except for the weight values. The added advantage of the possibility of learning a new code sequence and the possibility of optical implementation makes the perceptron suitable for present day fiber optic code division multiple access system. Since a perceptron is a decision making device, the best parameter to evaluate the performance is the probability of decision error. Upper and lower bound on the probability of decision error are derived, considering various errors in the optical implementation and the interference due to undesired users', when the perceptron acts as a decoder in a fiber optic code division multiple access system employing optical orthogonal codes. The result from simulation agrees with the theory. It is found that for low values of error variance. The performance of the perceptron based decoder is limited by the undesired interference inherent in the system and not by the implementation errors.

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Title : ***Fabrication Of A Fiber - Optic Transversal Filter***
Author(s) : ***Ray Tapan***
Roll No : ***9310452***
Supervisor(s) : ***Ghosh Anjan Kumar***

Abstract

A fiber - optic finite impulse response transversal filter is fabricated using fiber bundles. The structure is designed to provide low pass filtering action with a bandwidth of 10 MHz. The effects of non - uniform illumination of fibers in the bundle and bending losses on the frequency response of the filter are studied. The frequency response of the fabricated filter is measured and is found to be in good agreement with the theoretical frequency response.

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Title : *Visualisation Of The Optical Field Patterns In Transmitter Packages*
Author(s) : *Jit Satyabrata*
Roll No : *9310445*
Supervisor(s) : *Ghosh Anjan Kumar*

Abstract

Visualization of the optical field characteristics within the source - fiber region in transmitter package is presented using the Finite Difference - time Domain (FD - TD) method in two dimensional configuration. The reflection characteristics of the optical field from the fiber end face and the coupling efficiency are studied for three coupling arrangement schemes viz. centering a flat fiber end face directly over the light source; using a taper - end fiber; and placing a microsphere in between the light source and the flat fiber end face. Finally, the effect on the field pattern and the coupling efficiency due to the misalignment is studied only for the third coupling scheme.

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Title : *A Frame Synchronization Scheme For High Speed Tactical Communication*
Author(s) : *Burman Sanjay*
Roll No : *9310407*
Supervisor(s) : *Siddiqui M U*

Abstract

Frame synchronization is required for proper demultiplexing in case of bulk data time division multiplexed links, in a tactical communication environment poorly engineered links (which lead to high bit error rate) are frequently encountered. Rugged and reliable frame synchronization in this environment is a difficult and often expensive task, this thesis proposes a frame synchronization scheme for the tactical communication environment. The scheme is based on recursion - aided majority logic correction. It does not require any operation to be performed at faster than the symbol rate, as opposed to the conventional synchronizers which need to operate at speeds well in excess of the symbol rate. Performance analysis of the proposed scheme has been carried out. The theoretical results have been validated using software implementations. Finally, a typical firmware realization on an erasable programmable logic device is presented. Good error correction capability along with the operation at symbol rate makes the proposed scheme suitable for high speed bulk data links of the tactical communication networks,

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Title : *Neural And Memory Network Classifiers For Passive Sonar Source Classification*
Author(s) : *Krishnamurthy V*
Roll No : *9310456*
Supervisor(s) : *Rao P R K*

Abstract

In this thesis two (Neural and memory network) classifiers for passive SONAR source classification have been developed. A procedure to realistically simulate passive SONAR sources, to facilitate testing and validating of these strategies has also been developed as part of this thesis. The first, called the memory network classifier, uses a binary feature vector derived from averaged power spectral coefficients rule based classifiers, is its simpler implementation and ease of training. Apart from the preprocessing it requires only memory read operation during recall. In the second approach the problem of source classification has been treated as a stochastic sequence identification problem. Viewing a Multi-Layer Perceptron trained with back propagation as a stochastic approximator, we first derive a Neural Network that represents the observed time sequence generated by an arbitrary underwater source. We then differentiate between networks representing different sources using a simple forward only counter propagation network. This approach differs from traditional including the memory network classifiers in its capacity to treat the broadband noise component of the SONAR signal as relevant information. This is advantageous in situations where the broadband noise component is significant. The other major distinction is that the entire classifier strategy is developed within the neural network paradigm. Efficacy of these classifiers is demonstrated by test on simulated as well as real datasets. Further relevant comparisons have been made between the memory network and the two stage neural classifiers

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Title : *A Selection Tool For Linear Block Codes*
Author(s) : *Mangal Lal Chand*
Roll No : *9310425*
Supervisor(s) : *Siddiqui M U*

Abstract

Proper use of error control coding in a digital communication system can improve its performance significantly. However, selecting a coding scheme for specific applications is often a complicated process. This thesis describes an application software which has been developed for aiding a system designer in selecting a linear block code for error correction on random error channels. Based on a combination of parameters given by the designer, this package searches codes from different families of linear block codes and forms a list of codes meeting the input constraints. The package suggests an optimum code with respect to given constraints and upon selection of a code from the list by the designer the package generates desired implementation details useful for implementing encoding and decoding algorithms for the selected code. Implementation details of some of the encoding decoding algorithms, which have been written in assembly language of ADSP2100 family of digital signal processors are discussed and instruction complexity computations of the implementation are carried out.

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Title : *Image Reconstruction Using Wavelet Transform*
Author(s) : *Varadarajan G*
Roll No : *9310416*
Supervisor(s) : *Gupta Sumana*

Abstract

In this thesis work some applications of wavelet transform in the area of image reconstruction from projections have been studied. The process of data collection in computer aided tomography, introduces noise in the projections. One of the major sources of noise is the statistical nature of photon emission and detection. The wavelet transform is used to reduce the effect of the reconstructed image by preprocessing the noisy projections. This methods is compared with the existing technique and its advantages and disadvantages are discussed. It is shown that reconstruction of images from the 1D wavelet transform of the projections gives the 2D wavelet transform of the original image. The 2D wavelet corresponding to this wavelet transform is shown to be the inverse radon transform of the 1D wavelet. These two are combined to produce the noise suppressed analysis images from the noisy projections. The above results are verified through simulations using computer generated images

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Title : *Sequential Detection Of A Change In Distribution In Non-Parametric Framework*
Author(s) : *Goswami Dhiraj*
Roll No : *9310412*
Supervisor(s) : *Bansal Rakesh K*

Abstract

A problem on sequential detection of a possible change in distribution in non - parametric framework is considered. Observations are assumed to be independent. Initially observations are identically distributed with cdf F . At an unknown instant of time, the distribution changes from F to G . The possibility of the change being active from the very beginning is included. F is assumed to be known, but G belongs to a certain class of cdf's defined in terms of Kolmogorov - smirnov distance from F . the objective is to detect this change as quickly as possible with a certain constraint on false alarm rate. A sequential test based on the Kolmogorov - smirnov distance between F and the empirical cdf, is proposed. A lower bound on the expected sample size under no change condition (a measure of false alarm rate) and an upper bound on the expected delay in worst case (as defined in Lorden [13]) are theoretically derived. Computational feasibility of the test procedure is also considered. Comparisons with page's algorithm which addresses the problem in parametric setup and existing non - parametric algorithms are made through Monte Carlo simulation

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Title : *A Linux Based Asymmetric IP Router For Hybrid Networks*
Author(s) : *Maheedhar G*
Roll No : *9610421*
Supervisor(s) : *Bose Sanjay Kumar&Manjunath D*

Abstract

This thesis aims at the development of a cost-effective high speed data transmission system. Most internet traffic is asymmetric in nature. Usually a user machine accessing the internet, will send very little data in the forward direction but will tend to download much larger volumes of data in the reverse direction. In case the forward and return paths can be split, with high speed links provided in the reverse direction while using the much lower speed links in the forward direction, significant improvements in the overall download rates may be obtained. A hybrid network of this type, using a combination of two or more communication channels will provide high speed internet access. A PC-Linux platform has been used to develop an asymmetric router for use in such a system. This thesis presents the design and implementation of this router and studies its performance in a test set-up designed by us

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Title : *Mac Protocols Proposed For SCM/WDMA Multihop Star Based Fiber Optic Networks*
Author(s) : *Kundu Gora C*
Roll No : *9310415*
Supervisor(s) : *Chatterjee P K*

Abstract

The large bandwidth of a single mode optical fiber can be partitioned into several channels by implementing wavelength division multiplexing (WDM) technique. Again each wavelength sub carrier can accommodate a number of RF sub carriers following sub carrier multiplexing (SCM) scheme. Each such sub carrier is modulated by a data stream having a rate of several hundred Mb/s. this thesis presents two media access control (MAC) protocols for such SCM/WDMA multihop star based networks. A regular topology “ bus -mesh” has been used to provide logical connectivity between any two nodes. One of the protocol avoids collision but the other is subject to receiver conflict. This conflict is resolved by a centralized controller with the help of arbitration strategy. Two such strategies – (1) random choice among the requesting nodes, and (2) assigning priority to a certain class of traffic, have been introduced. Analysis and simulation for both the protocols have been carried out, and it is seen that at low loads (less than 0.28) the protocol assigning priority produces better results compared to the collision free protocol. Whereas the random choice protocol is better upto a load of 0.18 only. At high loads the performance of the collision free protocol shows superior results compared to both of them.

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Title : *Perceptual Transform Coding Of Speech Using Lapped Transforms*
Author(s) : *Hegde Madhusudan R*
Roll No : *9310426*
Supervisor(s) : *Mullick S K*

Abstract

Transform coding is one of the efficient methods of signal compression. We have used the Lapped Orthogonal Transforms for coding the speech signal. The advantage of the lapped transforms is that the blocking effects in the coded speech are reduced. The transform coefficients are coded using the perceptual criteria of human auditory system. The psychoacoustical results are used to calculate the noise masking pattern in the frequency domain and the resulting noise thresholds are used to code the lapped coefficients. In the actual coder, the transform coefficients are vector quantized, using the noise thresholds as the weights of minimum mean square error distortion measure. The coder is tested at 16 kbits/sec, 9.6 kbits/sec and 8 kbits/sec bit rates and the performance is evaluated.

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Title : *Image Compression Using Subband Coding*
Author(s) : *Kaloty Sanjeev*
Roll No : *9310446*
Supervisor(s) : *Gupta Sumana*

Abstract

Image compression is now considered as an essential tool in applications such as transmission and storage of the image data. Since the final viewer of an image is a human being, the psychovisual features both in frequency and spatial domain play an important role in the compression. In this thesis Subband Discrete Cosine Transform (SBDCT) is carried out in order to improve image reconstructions by removing the blocking effect. In addition it results in remarkable reduction in computation time. In this technique, the sensitivity of the Human Visual System in terms of the eye's response to spatial patterns is exploited. An appropriate strategy for bit allocation among the subbands is also proposed for flexible design of the coding schemes

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Title : *Parameter Estimation Of Transient Signals*
Author(s) : *Shankar M Ravi*
Roll No : *9310440*
Supervisor(s) : *Sircar Pradip*

Abstract

Accurate estimation of parameters of a noise corrupted transient signal is a problem faced in many signal processing applications, e.g., in system identification problem. In this thesis a method has been presented which preprocesses the noisy signal using the orthogonal polynomial approximation (OPA) and then used the statistical properties of the colored approximation noise in the linear prediction (LP) model to give accurate estimates of parameters. the estimation procedure uses total least Squares (TLS) technique and calculates the parameters in the noise subspace. Also, the constrained total least Squares (CTLS) method, which uses the algebraic interrelations among the elements of the noise matrix, is extended to include preprocessing by OPA. Simulation results prove the superiority of the methods proposed

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Title : ***ATS Method : Periodogram Smoothing By Non-Parametric Regression***
Author(s) : ***Pai Narasimha G***
Roll No : ***9310431***
Supervisor(s) : ***Sharma Govind***

Abstract

Many well known techniques exist for smoothing the periodogram estimate of power spectrum viz Bartlett's and Windowing methods. ATS is a three step procedure for the same. First a small amount of local averaging ('A') is carried out on the periodogram. Then a variance stabilizing transform is applied ('T') and finally the result is smoothed ('S') using a non-parametric regression procedure. This method works well even when data distributions are not necessarily Gaussian. Simulations were carried out on different data distributions using ATS and Bartlett's method, Simulation results show that in a number of cases the proposed ATS method is superior to the Bartlett's method

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Title : *Linear Prediction Analysis Of Certain V-CV Utterances Of Hindi*
Author(s) : *Pradyumna Joshipura Bhushit*
Roll No : *9310418*
Supervisor(s) : *Mullick S K*

Abstract

The linear prediction (LP) analysis yielding PARCOR coefficients for V - CV utterances for a fixed V/ ∂ / is carried out for the first 25 consonants of Hindi alphabet. The area functions calculated thereby are compared with the articulatory phonetic classification of the consonants. The work also includes implementation of the SIFT algorithm for pitch determination. And corresponding speech synthesis. It is concluded that the traditional LP model of speech analysis is unable to capture the articulatory phonetic pattern of Hindi alphabet.

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Title : ***Study Of Serial Line Protocols And Design Of PPP-IP Interface***
Author(s) : ***Kamat Vinod***
Roll No : ***9310459***
Supervisor(s) : ***Srivathsan K R***

Abstract

Wide Area Networks (WANs) are formed by interconnection of several geographically distant, independently managed Local Area Networks (LANs) and hosts. Routers with serial links are often used to interconnect these LANs or hosts. The serial links are prone to errors and the data transmitted may be corrupted by noise. In order to provide reliable data transmission over the serial links, link control protocols are employed at the data link layer of the OSI model. This thesis presents a study and comparison of some of the widely used serial line data link protocols such as HDLC, LAPB, LAPD, LAPF, PPP and SLIP. The thesis reviews in detail the evolution of LAPF, the link layer protocol for accessing the Frame relay networks, its protocol structure and discusses the features available for congestion management. The design of a PPP - IP interface is discussed. An attempt has been made to enhance the existing PPP protocol implementation so as to enable the routers in use at IITK to handle the data arriving on the serial link

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Title : *Directions Of Arrival Estimation*
Author(s) : *Ramulu M*
Roll No : *9310427*
Supervisor(s) : *Sharma Govind*

Abstract

An attempt has been made to find out the Directions Of Arrivals (DOA) of narrow band signals (which are non-coherent) received over a uniform linear array. The DOA algorithms, like Multiple Signal Classification (MUSIC) are critically dependent on computation of noise eigenvectors. The MUSIC algorithm involves any of the matrix iterative procedures of the complex Hermitian matrix (auto correlation matrix of the process) is bound to have the limitations posed by the particular matrix iterative procedure, both in terms of computational time and complexity. For fast real time applications alternatively Direct Noise Subspace Basis (DNSB) method has been studied for real data. DNSB method is simple and computationally efficient. Unlike the above methods the Subspace Based Approach which directly uses information from both the noise and signal subspaces has been verified. Comparisons with the above three methods are made. For the source case the CR bound has been derived and verified.

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Title : *Limited -1 Cyclic Service System As An Imbedded Markov Chain At Server Arrival Instants*
Author(s) : *Rao Thirumalasetty Srinivasa*
Roll No : *8910452*
Supervisor(s) : *Rao P R K*

Abstract

There is renewed interest in the study of cyclic service systems arising from their suitability to model diverse modern communication networks such as token-passing LAN systems. When service 'fairness' is of importance such systems with limited $-K$ service discipline are preferred. However, due to the non-availability in literature of exact methods of analysis of these systems, one often resorts to various approximations and numerical studies. In this thesis, a limited -1 cyclic service system is modeled as an Imbedded markov chain at server arrival instants. Calculation of the average waiting time at queue i requires the knowledge of probability that queue i is empty when the server arrives there and also of the expected number of customers waiting at queue i when the server arrives there. Using the probability state equation which is based on Imbedded markov chain property at server arrival instants, for a system with $(N+1)$ -queues, a set of $(N+1)$ simultaneous equations in $(N+1)$ unknowns, is derived whose solution gives the probability of queue i (for $i = 0, 1, \dots, n$) being empty when the server arrives there. Expressions for the expected number of customers at a node when the server arrives there are also derived. These expressions contain, besides the above probabilities, terms, which can be interpreted as the expected number of customers waiting at queue i when the server arrives at queue j and finds it empty ($j = 0, 1, \dots, N; j \neq i$). As these terms are not known, a numerical approach appropriate for systems with small number of nodes is proposed to calculate these. Average waiting times so obtained are compared with results based on simulation and other approaches available in the literature

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Title : *Well -Posedness And Stability Of Linear Partial Differential Equations*
Author(s) : *Kumar Anand*
Roll No : *9310404*
Supervisor(s) : *Sule Virendra Ramakant*

Abstract

The problem of closed loop system stability is studied in time domain when input and outputs are in Schwartz space and at least continuous in time. The system, being studied, consists of a plant and a controller in feedback interconnection, which are model led by partial differential operators of a particular class. An attempt is also made to formulate the Stabilization problem in a more general frame -work by giving a new definition of stability, termed as Topological Stability, when input and outputs are i n arbitrary Topological vector space. It has been shown that BIBO stability and V - Stability are special cases of Topological Stability

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Title : *Embedded Image Coding Using Wavelet Transform*
Author(s) : *Ranganadham D*
Roll No : *931041*
Supervisor(s) : *Gupta Sumana*

Abstract

Image compression is now essential for application such as transmission and storage in database . Much of the recent work in image coding has centered on wavelet transforms, which can be used to generate multiresolution of image. Image coding techniques using wavelet transform have been shown to achieve high compression ratios while maintaining very good image quality , due to the fact that the edge characteristics of images can be well preserved at low bit the same time preserving the image quality. In order to achieve this an algorithm called embedded zero tree wavelet has been implemented. The property of this algorithm is that it generate bits in the bit stream in order of importance, so that algorithm is that it generates bits in the bit stream in order of importance, so that the decoder can cease decoding at any point in the bit stream. The compression algorithm is based on four key concepts. 1. Discrete Wavelet Transform, which decorrelates the source image very well. 2. Zero tree coding, which provides significant maps, indicating the position of significant coefficients. 3. Successive approximation quantization of the significant coefficients. 4. Adaptive arithmetic coding which provides a fast and efficient method for entropy coding the strings of symbols and requires no training and pre-stored tables. The algorithm runs sequentially and stops whenever a desired bit rate is met. The result is hierarchical image compression suitable for embedded coding. The reconstructed image quality is dependent on the number of significant coefficients in the encoded bitstream

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Title : *A Combined CDMA/SCM/WDM Communication System*
Author(s) : *Shukla, Suman Lata*
Roll No : *9310448*
Supervisor(s) : *Chatterjee P K*

Abstract

The multichannel CDMA/SCM/WDM system has been studied where several optical carriers are wavelength division multiplexed (WDM), and each such carrier is modulated by eight multiplexed microwave subcarriers received through line-of-sight free space links. The subcarriers are modulated in BPSK or QPSK by the spread spectrum sequences. Both phase modulation/coherent detection and intensity modulation/direct detection schemes have been studied for the fiber optic link. Different code sequence lengths, $N=127, 255$ and 511 , have been used. Microwave bands of $2-18$ GHz and $26-30$ GHz have been considered for free space transmission. Signal-to-noise ratio and probability of error (P_e) have been calculated for different sequence lengths, number of sequences K , and input signal power P_s . The effects of thermal noise, shot noise, intermodulation noise and multiple-access interference have been considered for these calculations. $P_e = 10^{-9}$ is obtained for $N=127$ and $K=10$ at a received signal power of -41 dBm for coherent detection. It is not possible to obtain an error probability of 10^{-9} for $N=127$ and $K=10$ using direct detection. An error floor occurs in this case at $P_e = 10^{-5}$, whereas an error floor for coherent detection occurs at $P_e = 10^{-10}$. However, in the $26-30$ GHz band for direct detection $P_e = 10^{-9}$ is obtained for $P_s = -28$ dBm, $N=127$ and $K=5$. On the other hand, for coherent detection in this band $P_s = -48$ dBm is found to be adequate.

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Title : *Design, Modeling And Control Of A 8-Step Inverter Based S3c*
Author(s) : *Kumar L Sunil*
Roll No : *9610457*
Supervisor(s) : *Ghosh Arindam*

Abstract

This thesis discusses the design, modeling and control of a 48-step dc to ac GTO based S3C. the magnetic circuit design of a 48-step dc to ac inverter is presented that has a harmonic spectrum which only contains $(n48\pm 1)$, for $n = 1, 2, \dots$ order harmonics in the ac side and $(n48)$, for $n = 1, 2, \dots$ in the dc side. A systematic approach for deriving a mathematical model of the 48-step inverter is presented next. The mathematical model is converted into D-Q frame for control design and eigenvalue analysis. A simple proportional-plus-integral (PI) controller is proposed whose basic function is to retain the charge on the dc capacitor. The S3C model is then interfaced with rest of the power system for eigenvalue analysis. The power system contains generator, transmission line, infinite bus and 6 mass shaft. From the eigenvalue analysis the zone of stable operation of controller is determined. The model, control design and eigenvalue analysis is verified through digital computer simulation studies using PSCAD/EMTDC package

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Title : ***Kansys: A Cad Tool For Analog Circuit Synthesis***
Author(s) : ***Gupta Sandeep Kumar***
Roll No : ***9310443***
Supervisor(s) : ***Hasan Mohammad Mozaffarul***

Abstract

A CAD tool for the synthesis of analog circuits from element level (say a transistor) to a macrocell (say an active filter) has been developed. A topdown knowledge intensive, hierarchically structured framework is adopted which demonstrates the feasibility of attacking tightly coupled analog design problems in highly stylized, hierarchical fashion. Exploiting hierarchy permits the design process to be recast as a sequence of smaller of design tasks, alternating between design style selection and translation , and permits the sub - blocks to be reused in different contexts. A flattened view of the design is not, however, lost sight of and some of the design tricks that jump across many levels of hierarchy are used. KANSYS synthesizes sized transistor schematics for CMOS OPAMPs from performance and process specifications. Detailed circuit simulation demonstrates that KANSYS is capable of synthesizing functional circuits.

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Title : *Computer Aided Design Tools For Implementing The Loop Gain-Phase Shaping Scheme For SISO Robust Controllers*
Author(s) : *Srivastava Krishna Mohan*
Roll No : *9310423*
Supervisor(s) : *Hole K E*

Abstract

Loop gain phase shaping technique is an approach to design robust control systems for plants with both parametric and unstructured uncertainties. The basic idea behind the Loop Gain Phase Shaping (LGPS) is that in addition to gain, it also uses the phases information both in describing the plant uncertainties as well as in designing the loop gain function. The traditional Loop Gain Shaping (LGS) schemes like Linear Quadratic Regulator (LQR), Loop Transfer Recovery (LTR) and H_∞ control theory used in designing robust control systems do not make use of the phase information and hence give inferior results in comparison to the results obtained with LGPS. Though LGPS is superior to the LGS techniques, it is not a very popular technique among the control community since it can not be implemented using traditional CAD tools. Therefore a need to develop an efficient software for implementing the LGPS technique has been identified and in this thesis the same has been attempted. In this thesis, algorithms have been elaborated for implementing the LGPS and later they have been tested with numerical examples and found to work satisfactorily

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Title : Frequency Domain Analysis Of A LCC Type Resonant Converter

Author(s) : Thakur Tripta

Roll No : 9310454

Supervisor(s) : Fernandes B G& Doradla S R

Abstract

In this thesis the steady state analysis of LCC resonant converter is carried out using the frequency domain model. Pulse width modulation is employed to control the output voltage. Based on the analysis, a simple design procedure is given. Detailed SPICE simulation results are presented for the designed converter to evaluate its performance for load variation. The converter presented operates in lagging power factor mode for a very wide variation in the load. This converter is suitable for high voltage out put applications

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Title : *Analysis And Simulation Of A Capacitor-Diode Voltage Multiplier*
Author(s) : *Kumar Atul*
Roll No : *9310405*
Supervisor(s) : *Joshi Avinash*

Abstract

Present work deals with the analysis of a capacitor – diode voltage multiplier. The full wave doubling rectifier has been chosen for this purpose. Analysis and simulation has been done for the rectifier fed by ideal and non ideal sine and square wave voltage sources. Analysis has also been done for the multiplier fed by ideal sine and square wave current sources. Later in the thesis, a modification has been suggested to the classical doubling rectifier circuit, in which diodes have been replaced by switches. This has been done with a view to controlling the average output voltage. Also studied is the voltage doubling rectifier fed by a square wave voltage is not very sensitive to the variations in the pulse width of the square wave input voltage. Another scheme in which the classical doubling rectifier fed from PWM current and voltage sources, has been studied. Simulation results have been presented

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Title : *Investigation Of Energy-Function Based Control Laws For Robot Manipulators*
Author(s) : *Gopal Kartik*
Roll No : *9310421*
Supervisor(s) : *Prabhu S S*

Abstract

The property that robots belong to the class of natural systems has been used in the past to generate control laws from total energy considerations. The performance of these non -adaptive and adaptive controllers is studied through computer simulation studies. Robustness analysis of the non - adaptive controllers to parameter uncertainties is performed and conditions for stability under parameter uncertainty are developed. A simpler adaptation algorithm which does not involve explicit estimation robot par ameters is developed by combining the energy -fuction approach with the MRAC approach and a comparative study of all the control laws is presented

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Title : *Investigations Into Control Strategies For Variable Series Compensation Of Transmission Line*
Author(s) : *Bhat Sudhir V*
Roll No : *9310408*
Supervisor(s) : *PrabhuS S*

Abstract

Recently much attention has been focused on the greater utilization of the existing AC transmission lines for supplying an ever increasing load demand by means of power electronic devices. The consequence of this interest is the concept of Flexible AC Transmission Systems (FACTS). A fundamental notion behind this concept is to have a fast and continuous control over the apparent impedance of a line so as to have the corresponding control over the power flowing through that line. This impedance modulation of line can be utilized in improving its transient and small signal stability. In this thesis application of one of the most important FACTS devices, viz., Variable Series Compensation (VSC) for transmission lines is considered. Various control strategies for VSC are developed for a double circuit line connecting a generator to an infinite bus. Power flow and angle regulations have been described for the lines. Improvement in transient stability achievable is demonstrated. Furthermore, auxiliary stabilizers have been developed using various signals for improvement of small signal stability. The performance of the controllers are assessed

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Title : *Speed Control Of Induction Motor By Slip-Power Control Using GTO PWM Inverter*
Author(s) : *Kumar P Shesh*
Roll No : *9310433*
Supervisor(s) : *Doradla S R& Fernandes B G*

Abstract

Speed control of three - phase slip – ring induction motor using slip - power control is presented. The study is restricted to sub synchronous speed range with a diode bridge and GTO inverter in the rotor circuits. The GTO thyristors are switched employing synchronized sinusoidal and PWM control technique. The open loop analysis of the drive system is presented using dc and ac equivalent circuits. A combination of analog and digital techniques is used for the design of complete control circuits. The use of self commutating devices such as GTO thyristors makes the scheme simpler than for the thyristor based inverter besides improving the overall performance. The slip - power recovery scheme is tested experimentally to verify the basic principles and analytical results

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Title : *Digital Protection Of Transmission Line*
Author(s) : *Siyaram*
Roll No : *null*
Supervisor(s) : *Singh L P*

Abstract

The present day EHV/UHV power system network requires highly reliable, sensitive, selective and fast protective schemes. The over current relays were replaced gradually by distance relays for transmission line protection due to their inherent drawbacks . The static relays using solid state components were installed in sixties. The first idea of employing digital computer for the protection of power system networks was proposed during 1969. till today, a number of computer oriented real - time protection al gorithms have been proposed. In this thesis, the overview of the digital computer distance relaying algorithms developed uptill now has been presented in brief. The predictive calculating of the impedance from the relay location to the point of fault is p resented and tested for several faults. A good accuracy has been obtained in the impedance calculation. Different types of protective schemes have been realized and tested by digital simulation

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