

M.TECH. THESIS ABSTRACT 1996

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Title : ***Charge Sensitive Preamplifier Cum Shaper For Radiation Detection***
Author(s) : ***Yadav Ashok Kumar***
Roll No : ***9410401***
Supervisor(s) : ***Sharan R & Mazhari Baquer***

Abstract

A “Charge Sensitive preamplifier cum shaper” for amplifying the signals generated in semiconductor radiation detector is developed. The important features of such a system are high conversion gain, low noise, small rise time, small peaking time and high count rate. The performance of the circuit is evaluated for noise, linearity, conversion gain etc. and is compared with theoretically predicted values. One must note that low noise and high count rates are conflicting requirements and peaking time must be chosen depending on various component values in order to minimize the noise. The optimization of various components for a particular design is thus essential to achieve the best performance. Two design examples are given for measuring high and low intensities of radiation based on such optimization. The shaping amplifier produces output signals with peaking times from 500 ns to 10 μ s for energy measurements. The typical conversion gain of the system is 1.92 V/MeV (adjustable). The typical output noise corresponds to 2.14 keV (FWHM) which is equivalent to an equivalent input noise charge (ENC) of 242 rms electrons.

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Title : ***Charge Pumping Based Capacitance Measurement Technique For Sensors***
Author(s) : ***Prasad Guru***
Roll No : ***9410415***
Supervisor(s) : ***SharanR &Mazhari Baquer***

Abstract

A capacitance measurement technique based on charge pumping principle has been investigated for sensor applications. It is shown that this approach offers the advantage of both simplicity as well as sensitivity. It is demonstrated that the technique can be used for measuring changes in capacitances as low as 0.02%. A novel Successive Approximation based approach for automatic cancellation of offset capacitances was implemented and its usefulness is demonstrated through a capacitive transducer. It is also shown that the present approach can be used for measurement of capacitance with very low Q - factors

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Title : *An Expert System Approach To Analog Circuit Synthesis*
Author(s) : *Babu Venigalla Ravindra*
Roll No : *9410455*
Supervisor(s) : *Mazhari Baquer& Hasan Mohammad Mozaffarul*

Abstract

An analog design methodology that used the assistance of an expert system is presented. A top - down analytical knowledge based design that fully exploits any inherent hierarchy in the system, is first generated. Exploiting hierarchy permits the design process to be recast as a sequence of smaller design tasks and permits the sub - blocks to be reused in different contexts. The initial design is further refined by making use of an expert system that learns rules as it gains experience. The design methodology is demonstrated through the example of a CMOS operational amplifier

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Title : ***Characterization Of Parasitic Resistances In Bipolar Transistors***
Author(s) : ***Rana Subhash Chandra***
Roll No : ***9410447***
Supervisor(s) : ***Mazhari Baquer***

Abstract

Parasitic emitter, base, and collector resistances have a significant impact on the performance of small geometry Bipolar Junction Transistors. Three different DC methods for estimation of these resistances were experimentally compared. The results obtained were found to differ widely, casting doubt on each one of them. One of the methods, namely saturation method used widely for estimation of emitter and collector resistances was investigated in detail. The sources of error in this method were identified and a methodology for more accurate estimation of these resistances was developed

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Title : *An Improved Subthreshold Region Model For Short Channel Mosfets*
Author(s) : *Deshpande Devendra Ramakant*
Roll No : *9410410*
Supervisor(s) : *Dutta Alope*

Abstract

Strides in fabrication technology and lithography techniques have possible extremely short channel MOSFETs, with channel lengths less than a hundred nanometers. At such short channel lengths predicting the behaviour of the device becomes a demanding task. In this work here we present a model for the subthreshold region of operation for short channel MOSFETs which retain its validity even at extremely short channel lengths. We have also adapted an existing model for the strong inversion region operation of the MOSFET with some modifications in order to make our model valid for all regions of operation. The model developed in this method the strong inversion component of the drain current is retained in the subthreshold region with its value much less than the weak inversion component. Similarly the weak inversion component of the drain current is retained in the strong inversion region with its value much less than the strong inversion component. In order to achieve this a modified gate voltage is defined for use in the expression for the strong inversion component. This approach preserves the continuity of the drain current and its derivatives with respect to the applied gate voltage at the boundary between the weak and the strong inversion regions of operation of the MOSFET, which is important for the simulation of analog circuit using these devices. In order to accurately model the sub threshold slope, two parameters a_1 and a_2 are introduced in its expression. Also to account for the channel length modulation effect, a parameter l_1 is introduced in the strong inversion model. In particular the model is tested for the continuity in the current-voltage characteristics (both I_d - V_{DS} , where I_d is the drain current, V_{GS} is the gate-to-source voltage and V_{DS} is the drain-to-source voltage), the drain conductance (g_{ds}), the transconductance (g_m) and the transconductance to current ratio (g_m/I_d). The performance of our model is tested with recently reported experimental results for devices having channel lengths less than a hundred nanometers. The results show a good match. Also a comparison of our model with other existing models is made

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Title : ***Simulation And Realization Of Vector - Controlled Induction Motor Drive Based On Mcs-80c196kc Microcontroller***

Author(s) : ***Agrawal Hemant***

Roll No : ***9410417***

Supervisor(s) : ***Fernandes B G***

Abstract

Progress in the fields of power electronics and microelectronics has made it possible to realize high - performance control - techniques for a.c. machines. Vector control is such a technique with which, it is possible to operate a.c. machines with dynamic performance comparable to that of d.c. machines. Among various vector - controlled a.c. machines, squirrel -case induction machine is of particular interest because of its ruggedness and low cost. In this work, transient and steady - state performance of vector - controlled induction motor drive is investigated by digital simulation. The drive is realized with a 3 - phase, 4 - pole, 1.5 hp squirrel -cage induction motor fed by IGBT - based current - controlled PWM voltage - source inverter. Indirect rotor - flux oriented control - scheme is implemented using MCS - 80C196 microcontroller. Four - quadrant operation of the drive is presented

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Title : ***Polynomial Perceptron And It's Use In The Recovery Of Noisy Bioelectric Signals***
Author(s) : ***Saini Jai Prakash***
Roll No : ***9410418***
Supervisor(s) : ***Ray G C***

Abstract

We have investigated the problem of reconstructing the ECG signal, which is corrupted with additive noise. The noise appears when the signal passes through a dispersive channel such as in long distance medical telemetry system. We have used neural network for suppression of noise. Polynomial perceptron and fractionally spaced recursive polynomial perceptron are used as nonlinear classifiers to reconstruct the ECG signals. The behaviour of backpropagation algorithm and complex backpropagation algorithm is investigated. It is shown that the both algorithms are powerful, but faces some practical difficulties. The selection of learning parameters, number of hidden layers and number of nodes in each hidden layer are experimental. Polynomial perceptron is the alternative nonlinear architecture to approximate the optimal equalizer solution. The behaviour and nonlinear mapping ability of polynomial perceptron and fractionally spaced bilinear perceptron are investigated. It is shown that these techniques can approximate any continuous function within a specified accuracy. The manner in which these neural network algorithms can be utilized is described. The complex neuron structure is used to modify the above methods for complex input sequences. The performances of these two methods are compared and their relative features and limitations are discussed. The applications of these methods to 16-level quadrature amplitude modulation are considered for reconstruction of ECG signals. Simulation results suggest that the fractionally spaced bilinear perceptron network recover the ECG signal in the high noise environment

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Title : *Performance Comparison Of Multispectral Data Compression Techniques*

Author(s) : *Srivastava Vineeta*

Roll No : *9410457*

Supervisor(s) : *Gupta Sumana*

Abstract

It is well known that present day remote sensing satellite systems are often constrained by downlink communication bandwidth. To meet this challenge collected image data need to be compressed efficiently. As the collected images exhibit a high degree of spatial and spectral redundancy, in the present work exploitation of these redundancies are utilized to achieve high compression. A 3-D transform based compression technique is developed and its performance is compared with other reported algorithms, [28] [1] The compression system used comprises of two subsystems: a spectral dcorrelation subsystem followed by a spatial decorrelation subsystem. The spectral decorrelation is carried out in three stages (a). data partitioning for terrain adaptive approach only (b). The optimum KL transform for energy compaction of data and (c). mapping of the eigen planes to eigen images. The decorrelated eigen images are fed to the spatial decorrelation module which consists of embedded zero tree coder based on wavelet transform. Wavelet transform exploits human visual perception deficiencies and offers the opportunity for high compression ratios. Compression system has been evaluated on two typical test image sets having 4 bands ranging from 0.45 μm to 0.8 μm and 7 bpp. These test images contain a large variety of natural and urban terrains. Spectral decorrelation subsystem results in two significant eigenbands out of four i.e. two eigen bands have negligible variance or information content. Spectral fidelity of the images is also preserved after reconstruction. The maximum loss in correlation coefficient matrix is only 7 percent. These eigen bands are further spatially decorrelated using embedded zero tree coding method. The reconstructed image fidelitieranges from near loss less a about 10:1 compression ratio i.e. 0.7 bpp to visually loss less upto 80:1 compression ratio i.e. 0.09 bpp. Compared to the compression ratio obtained in [24] based on KLT/DCT methods, the performance of the present techniques is far superior. In this compression system spectral and spatial modularity allows EZW or KLT to be replaced by any other spatial or spectral coding procedure. The embedded zero tree coding used, have further advantages. There is no training of any kind and no ensemble statistics of the images are used in any way. An interesting property of embedded coding is that when the encoding and decoding is terminated during middle of a pass or in the middle of the scanning, there are no artifacts produced that would indicate where the termination occur.

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Title : ***Image Reconstruction Using HAAR Filter And Wavelet Pre-Processing***
Author(s) : ***Joshi Sanjay G***
Roll No : ***9410445***
Supervisor(s) : ***Ray G C***

Abstract

Among all the tomographic reconstruction techniques, convolution – backprojection is the most widely used technique. The low pass window function used in this method plays an important role in the overall quality of the reconstructed image, as the noise suppression and spatial resolution are determined by the window function. The Haar filter is a recent development in the filters used for image reconstruction. In this work, we have used the Haar filter in combination with wavelet transform based space variant noise suppression techniques. Computer simulation results show that the Haar filter gives better results as compared to conventional filters like Ram - Lak, Shepp - Logan, Generalized Hamming, etc

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Title : *Local Feature Extraction Using Wavelet Packets*
Author(s) : *Shukla Sharad*
Roll No : *9410449*
Supervisor(s) : *Gupta Sumana*

Abstract

Feature extraction forms a very important part of image processing. In this thesis we have considered various aspects of feature extraction, viz, compression, noise removal edge characterization and local rescaling. Emphasis here has been on image compression and noise removal. We have used wavelet packets as the tool for achieving the same. For the purpose of image compression, we have used best basis algorithm using entropy as the cost function. Selection of the 'best - basis' is followed by a thresholding based on an energy criterion. A variety of mother wavelet functions have been used and it has been observed that the compression ratio achieved using the above algorithm depends on the wavelet function. For noise removal, we make use of 'visual analysis' technique. The noise on the channel is modeled and analysed using wavelet packets. The noise energy distribution is calculated in the various subspaces and at various levels. The subspace -energy plot so obtained gives a clear picture of noise distribution in various subspaces. The noisy signal received on this channel is analysed in the similar fashion and a similar plot is obtained. The subspaces which correspond to high noise energy and low signal energy can be discriminated visually. To the rest of the sub spaces we apply a threshold and drop all the coefficients below that threshold. The above threshold is calculated using hypothesis testing technique. The noise removal upto 75 percent has been achieved. The wavelet packet decomposition of an image has also been used for edge enhancement and edge detection by rescaling average signal' or 'detail signal' depending on the requirement

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Title : *Cipher Systems Based On Cyclic Difference Sets*
Author(s) : *Sethuraman M*
Roll No : *8410426*
Supervisor(s) : *Siddiqui M U*

Abstract

Design of block cipher systems, that are cryptographically strong and are easily translated into hardware, is studied. Full permutation networks, realising all the symmetric group permutation S_N , are known to have the desired cryptographic strength. Three specific methods, i.e. degree vector representation, cyclic shift vector representation of permutations, that lead to a mapping of integers in the range 0 to $(N-1)$ to specific permutation of S_N are proposed. Implementation of these three schemes requires excessive hardware. Keeping in view the required key space size only, quasi-random permutation networks are studied. It is established that these could be constructed by the use of 2^n length 'white' sequences. Using the tools of cyclic difference sets, it is shown that acceptable 2^n length sequence, possessing near-ideal properties, are obtainable from (2^n-1) length near-ideal sequences. Construction procedure of these sequences leads to $GF(2^n)$ computation as the cipher transformation. A final scheme is shown to be achievable using reasonable size hardware. The proposed system based on available size hardware. The proposed system based on available MSI/LSI chips, is shown to support a throughput of 125 k bits for a low-power schottky TTL version and 250 k bits for a schottky TTL version

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Title : *On Certain Computations Related To Elliptic Curves*
Author(s) : *Chakravarthy K P P Kalyan*
Roll No : *9410423*
Supervisor(s) : *SiddiquiM U*

Abstract

Computations related to elliptic curves over finite fields have in recent years gained much attention not only because elliptic curves over finite fields are a rich source of abelian groups which can be used to implement public key cryptosystems but also because they have stimulated a new direction of research in computational number theory. Common to all the computational problems is the design of suitable elliptic curves e.g. primality proving. For the implementation of elliptic curve cryptosystems, we need to construct non singular curves which have the given large group order over large finite fields. The finite fields which are of practical interest are the prime fields and those extensions of $GF(2)$ which have an optimal normal basis in them. In this thesis, we will see the computations involved in the design of such suitable curves and those related to the implementation of cryptosystems using those curves

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Title : ***Identifying Common Issues And Proposing A Common Format For Multimedia Storage/Retrieval And Communication***
Author(s) : ***Anasuya T***
Roll No : ***9410453***
Supervisor(s) : ***SrivathsanK R&Manjunath D***

Abstract

Storage/retrieval and communication of multimedia information differ from that of traditional data because of their delay sensitive properties and the need to preserve the temporal relationships between several media. This is in addition to their large storage space requirements. Multimedia storage issues are considered different from multimedia communication issues and there exist independent formats for the two. In this thesis, the existing multimedia file formats and the communication protocols are studied and by developing the mapping that exists between the issues concerning both, a common format for multimedia storage and communication is designed. The traditional way of sending the multimedia information by using separate streams for different media is contrasted by allowing a single stream to contain multiple media. This done to improve the quality of reproduced information at the receiver in terms of synchronization between several media. Providing for multiple media in a single stream also has the advantage of reducing the overhead requirements. However, this unified stream method may require, comparatively, larger buffers. With the availability of fast and cheap memory, the larger buffer requirement is not expected to be a limitation

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Title : *Implementation Of Ms - Windows Based SNMP Manager*
Author(s) : *Bhar Bhaskar*
Roll No : *9410408*
Supervisor(s) : *Srivathsan K R*

Abstract

Management of large networks, consisting of many interconnected network segments, is done by collecting traffic statistics, gathering routing information, reporting errors, monitoring link equipments, servers, systems, and locating faults. A management station is used to collect the necessary information from the different systems on the network and display suitably relevant processed information. The communication between the manager and managed systems uses special network management protocols. SNMP (simple Network Management Protocol) is currently the most popular network management protocol for TCP/IP based networks. SNMP was originally targeted at the TCP/IP based networks, but its rapid adoption and easy extensibility have caused its use to spread into proprietary environments. Earlier implementation of SNMP in the "ERNET" Lab were PC based SNMP manager with basic functionalities by Barari [barari93] and Micro Vax (Ultrix) based SNMP manager with user interface by Bansal [bansal94]. A proxy agent was implemented on the same machine by Bansal to poll machines without an SNMP agent. In this thesis, an MS-Windows based SNMP manager has been successfully implemented. The manager uses 'winsock' library functions for communication with agents and proxy agent(s). This network manager displays the status of the network by probing the different hosts via remote proxy agent(s) and can directly fetch MIB values from hosts with SNMP agents. In this thesis, the manager has been implemented with an added feature of polling remote proxy agent running on Linux environment. This enables the manager to distribute the polling schedules to proxy agents on systems located in different segments, thereby significantly reducing intersegment management traffic.

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Title : *Region Identification And Classification Of Multitextured Images Using Wavelet Packets*
Author(s) : *Prasad B V B*
Roll No : *9410409*
Supervisor(s) : *Gupta Sumana*

Abstract

Textures provide important characteristics for a large number of applications in image processing. The two important characteristics of texture are coarseness and directionality. Though various statistical and structural techniques have been in use for long time, the multiresolution approach is now being increasingly applied for texture analysis. In multiresolution analysis the wavelet theory is an effective tool as it can effectively emulate the human visual system. In this thesis wavelet packet transform has been applied for texture classification. Two approaches have been studied. The progressive classification approach and the complete energy map. It was found that the complete energy map approach gave a 100% classification at level $L - 1$ and L level respectively for an L level decomposition of the given image. An algorithm for region identification and classification, for multitextured images has been proposed. An attempt has been made to combine the region identification and classification of the various textures in an image, by exploiting the wavelet packet energy subspaces of a of the textures. As the textures have distinct signatures, the dominant subspaces of a texture present in the image are utilized to identify the region of the chosen texture. To confirm the correctness of the region, we extract the region and classify it. The advantage with this algorithm is that it is computationally simple. In region identification though the reconstructed region is of inferior resolution, this algorithm effectively identifies the region of the chosen texture if it is present

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Title : ***Region Of Interest Tomography Using 1D Multiresolution Analysis***
Author(s) : ***Gomathi Sankar S***
Roll No : ***9410414***
Supervisor(s) : ***Gupta Sumana***

Abstract

In this thesis region of interest image reconstruction from projections using wavelet transform has been studied. The convolution back projection operator, used for reconstruction of images from projections, has a non - local filter which requires global projection data. This increases the objects exposure time to harmful radiation. It is proved that this filtering operation can be done on the chosen wavelet function instead of the projections. This localizes the filter and leads to the region of interest image reconstruction. In this thesis one - dimensional multiresolution analysis is used for region of interest image reconstruction and verified through simulations using computer generated images. The performance of the algorithm is compared with the other reported algorithms

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Title : *An Improved Multicast Scheme And VLSI Analysis For A New Layered ATM Switch Architecture*
Author(s) : *Gupta Sanjay*
Roll No : *9410446*
Supervisor(s) : *Manjunath D& RoySubir Kumar*

Abstract

An ATM switching system has to perform a variety of call processing and control functions apart routing the cells to the appropriate outputs. These functions are admission control, network routing, cell scheduling, buffer management, flow control, congestion control and switch management. Most of these functions have been studied individually and algorithms proposed to describe their mechanisms. However, little has been done in the way of describing how these functions can be integrated in a switching system and the attendant implementation issues. This thesis considers a layered architecture which provides a means to integrate these functions into an ATM switching system. A three layer architecture comprising of the hardware, control and call processing layers, is proposed and the details of the hardware layer are discussed. We also study the problem of providing efficient and cost effective multicast support at a switch. We propose a modification to Lee's [7] copy network based scheme of providing multicast support and present a performance analysis of this proposed scheme. The hardware layer is expected to be the most complex of the three layers. Hence, we study its VLSI implementation complexity through an equivalent transistor count analysis. From this analysis we show that an ATM switch is memory dominated and that providing real time multicast support is expensive

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Title : ***Implementation Considerations In Real Time Monitoring And Control Systems***
Author(s) : ***Singh Vikram***
Roll No : ***9410456***
Supervisor(s) : ***Srivathsan K R***

Abstract

This thesis discusses a real time system from various viewpoints like consequences of failure, representation of time, design and implementation considerations etc. the thesis reviews the various scheduling schemes and algorithms. A software has been developed to perform the schedulability test based on rate monotonic algorithms. This also deals with an architecture and characteristics of real time system and how these features can be used in real time applications like monitoring and control. Subsequently the communication interface between master terminal unit and multiple RTU (remote terminal unit) simulator has been developed as a part of the thesis

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Title : *The Multiresolution Based Shape Modelling Using Super Quadrics*
Author(s) : *Parashari Yash Veer*
Roll No : *9410461*
Supervisor(s) : *Gupta Sumana*

Abstract

3D shape modeling has received enormous attention in computer graphics and computer vision over the past decade. Several shape modeling techniques have been proposed in past. Some are local while other are globally distributed in the terms of parameters required to describe the shape. Hybrid model that combine both ends of these parameter spectrum have been in vogue recently. However they do not allow a smooth transition between the two extremes of this parameter spectrum. We global models or viceversa. The modeling scheme utilizes a hybrid primitive called the deformable superquadric constructed in an orthonormal wavelet basis. The multiresolution wavelet basis provides the power to continuously transform from local to global shape deformations and thereby allow for a continuum of shape models, from that with local to global shape descriptive power. We embed these multiresolution shape models in a probabilistic framework and use them for our modeling scheme. Beside these we have developed an package having p reprocessing as well as recognition facility.

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Title : *Evaluation Of Circuit Model For Pin Diode*
Author(s) : *Kumar Sandeep*
Roll No : *9410444*
Supervisor(s) : *Patil M B*

Abstract

The reverse recovery of p - i - n diode is studied using a previously reported circuit model for the diode. The transient current is compared with that obtained by numerically solving the drift - diffusion semiconductor equations together with the constraint imposed by the circuit. It is found that the time of the charge storage phase is different in the two cases. The major reason behind this discrepancy is found to be the assumption of a constant carrier lifetime in the circuit model. To improve the circuit model, a variable lifetime has been included, and this has been shown to produce a much better agreement with the device simulation results

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Title : *Data Compression Using Boolean Function Formulation*
Author(s) : *Reddy P Balakrishna*
Roll No : *9410434*
Supervisor(s) : *SiddiquiM U*

Abstract

A novel approach for lossless as well as lossy compression of monochrome images using partitioning of Boolean functions by Walsh - Hadamard Transform and by minimizing Boolean functions in Reed Muller representation form is presented. The image is split into bit planes, and the bit - planes are divided into blocks. Each block is transformed into a Boolean switching function, treating the Pixel value as output of the function. In Walsh -Hadamard case compression is performed by mapping the Boolean function to a Prototype Boolean function and coding the operations required for it using adaptive block coding method by treating the operations as blocks. In Reed - Muller case, compression is achieved by minimizing the switching function by selecting the appropriate basis and by coding the coefficients and the basis. Our technique of lossless compression involves linear prediction or indexing method as a preprocessing step, and has compression ratio greater than block coding lossless compression technique. Lossless compression technique has been extended to text files also. Our lossy compression technique involves reducing the number of bit planes as a preprocessing step, which incurs minimal loss in the information of the image. The bit planes that remain after preprocessing are compressed by using lossless compression technique. Qualitatively one cannot distinguish between the original image and the lossy image and the value of the mean square error is kept low. The compression scheme is slower while the decompression is comparable to that of block coding

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Title : *Explorations In Analysis Of Stop Consonants Using Wavelet Transform*
Author(s) : *Hashmi Shazi*
Roll No : *9410429*
Supervisor(s) : *MullickS K*

Abstract

We present some explorations in the analysis of six stop consonants /k, p, t, b, d, g/ using wavelet transform domain information in their acoustic manifestation. Three different strategies are tried, they are analysis via classification, wavelet gram and reconstruction from modulus maxima. The main difficulties of the stop consonant problem lie in the nonstationary and nonlinear statistical structure of the acoustic signal in the burst and transition regions. Nonstationarity renders the application of the Fourier Transform (FT) methods questionable. Wavelet Transform has demonstrated good - time frequency localization properties and is therefore appropriate tool for the analysis of non -stationary signals like speech. Moreover, unlike LPC and HMM modeling , we do not assume here any model for input speech. The discrete wavelet transform (DWT) may also be implemented as fast, pyramidal algorithm. The analysis via classification produces 83% correct classification for unvoiced stop consonants /k, p, t/. We we re looking for some explicit time information like voice onset time, place of occurrence of burst etc from the wavelet gram but it fails to give explicit result. Mallat's algorithm for signal reconstruction from the value of modulus maxima and their positions is successfully implemented in an effort to characterize the signal in terms of these features.

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Title : *Simulation Study Of A Mobile Satellite System*
Author(s) : *Katiyar Mukul*
Roll No : *9410421*
Supervisor(s) : *BoseSanjay Kumar*

Abstract

Mobile communication networks encompass the terrestrial cellular networks and the satellite mobile networks. The recent advances in satellite technology have stimulated the development of Universal Mobile Telecommunication systems. These mobile satellite networks can provide global or regional coverage of urban as well as sparsely populated (oceanic) areas. This is in contrast to the cellular mobile systems, coverage for which is limited to densely populated urban areas. In this thesis an attempt has been made to analyze the protocols and evaluate the performance characteristics for such a system, proposed by the Indian Space Research Organization (I.S.R.O) and called as the INSAT Mobile Satellite System. Discrete time event type of simulation was adopted as the technique for analyzing the system. Simulators were developed for the circuit switched Class - A type of system, providing voice, data and Fax services using demand assigned SCPC channels and the store and forward Class - B type of system. Analysis is performed based on data generated from simulations carried out under different traffic conditions. Finally some modifications to the proposed scheme have been suggested based on the analysis

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Title : *Speech Coding Based On The Cs-ACELP Algorithm*
Author(s) : *Sankar K Ravi*
Roll No : *9410424*
Supervisor(s) : *GuptaSumana&RaoPreeti*

Abstract

Speech coding has been an active field of research for over a couple of decades. Recent activity in speech compression is dominated by research and development of a family of techniques commonly described as code - excited linear prediction (CELP) coding. These algorithms exploit models of speech production and auditory perception and offer a quality versus bit rate tradeoff that significantly exceeds most compression techniques for rates in the range of 4 to 16 kb/s. Currently ITU - T (international telecommunications union - telecommunication standardization sector) is working on the standardization of 8 kb/s speech coder. In this thesis we have studied and implemented a speech coding algorithm based on the CS -ACELP (conjugate - structured algebraic - CELP), as per the available draft recommendation (G.729) from study group 15 of ITU - T, which is aimed at producing toll quality speech at 8 kb/s. The algorithm is evaluated by conducting subjective and objective tests

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Title : *Implementation Of Public Key Elliptic Curve Cryptosystems*
Author(s) : *Kumar S*
Roll No : *9310424*
Supervisor(s) : *Siddiqui M U*

Abstract

Cryptography, as a means for sending secret information over insecure communication channels, is thousands of years old. Since the birth of public key cryptography in 1976, many public key cryptosystems have been proposed and many have been broken. Security of some of these schemes has been seriously threatened by the recent advances in computing discrete logarithms and integer factorization. Elliptic curve cryptosystems seem to be an efficient and viable alternative for the conventional systems. Security of these cryptosystems depends on the difficulty in finding discrete logarithm on an elliptic curve, called elliptic curve discrete logarithm problem (EDLP). Protocols implemented using elliptic curves have the advantage of having smaller keys than the existing systems for the same level of security. In this thesis we have studied the issues involved in the implementation of cryptosystems, with specific reference to elliptic curve cryptosystems. Methods for optimising various computations in cryptosystems have been implemented and their timing details have been tabulated. The speed-up obtained by these optimisations has been demonstrated by implementing the well known RSA algorithm. A library for performing elliptic curve computations has been built. Finally elliptic curve analog of RSA and ElGamal schemes have been implemented and their throughput tabulated

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Title : *Morphological Skeleton Representation And Coding Of Binary Images: A Study*

Author(s) : *Sinha Nitish*

Roll No : *9410432*

Supervisor(s) : *Sinha V P*

Abstract

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Title : *Study Of ATM Networks And Implementation Of Isa Bus ATM Interface Card*
Author(s) : *Singh Navpreet*
Roll No : *9310429*
Supervisor(s) : *Srivathsan K R&Sinha Vishwanath*

Abstract

ATM (Asynchronous Transfer Mode) technology is currently emerging as the universal transport mechanism for the next generation of networks for all types of traffic. ATM based networks are expected to offer significantly more capability and better performance than existing networks. Whether in LAN or WAN, ATM provides the quality of service that other technologies cannot provide. Fixed length packets, cell in ATM terminology, form the fundamental unit of transport in these networks just as the bits and characters do in today's network. ATM relies on high speed packet switches as the means of interconnection and allows traffic streams with a wide range of service characteristics and bandwidth requirements to be multiplexed and transported on the same network. This thesis consists of a comprehensive study of concepts involved in design and implementation of ATM networks and an implementation of a ISA bus ATM interface card. ATM protocol is described in detail and implementation issues in ATM networks are discussed at length. In order to design and implement network elements and study network functions in a network environment consisting of different high speed networking techniques, a high speed network testbed is required. A typical configuration of such a high speed network testbed has been suggested. In order to implement this testbed, a 155.52 Mbps UNI interface card for ISA bus has been developed. ATM protocol stack consisting of ATM and AAL5 layer functionalities has also been developed. This work is an effort to study ATM networks design a high speed network testbed to be used for developing and testing network elements and develop a user interface card in order to understand these design issues and implement the testbed. This project is intended to be the ground work for all the ATM related activities in future

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Title : ***Time-Frequency Analysis Of Stop Consonants Of The Speech Signal***
Author(s) : ***Nagaraju N***
Roll No : ***9420408***
Supervisor(s) : ***Mullick S K***

Abstract

This thesis is an attempt to check the validity of alias - free reduced interference distributions (AFRIDs), and their performance as applied to the analysis of the speech signal, invariant acoustic patterns are believed to be present in the speech signal in the form of time - varying spectral properties. Conventional time - frequency analysis methods have been used with partial success. It has been reported that Wigner distributions (WD) has provided more information than conventional methods. In this present work an attempt has been made to utilize AFRID for the identifications of the invariant acoustic cues in stop consonants, but without much success. A user friendly software has been developed for the implementation of AFRID and WD. The software calculates the AFRID and the WD using alias - free definition. The displays are obtained on the HP 9000/834 in the form of 2 - D time - frequency plots with energy density mapped on to a color code

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Title : *Synthesis Of Grasp For Planar Polygonal Objects With Neural Networks*
Author(s) : *Pandey Sanjay Kumar*
Roll No : *9420410*
Supervisor(s) : *Rao P R K&Mukerjee Amitabha*

Abstract

This thesis investigates synthesis of grasp for planar polygonal objects using Artificial Neural Networks. A large set of grasps on planar polygons (convex and non - convex) is used to train two different ANN methodologies – Multi - Layer Perceptron and Functional Link Network. The training set has been generated using a computational geometry approach, which resembles human planar grasps in a simple experiment. Both approaches are several orders of magnitudes faster than the more efficient of the computational grasp synthesis methods. Error rate in MLP is less than that using FLN, which is quicker both at runtime and also in learning. The speed of the trained network is likely to be of great value in real time grasp synthesis

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Title : *Neural Network Based Leak Localization In Pipelines*
Author(s) : *Kulkarni Jayesh R*
Roll No : *9420406*
Supervisor(s) : *Rao P R K&Sharan R*

Abstract

Pipelines carrying water, oil, petroleum products, sewage etc. form the arteries and veins of modern civilization. Leakage in these pipelines leads to wastage of natural resources, environmental damage, health hazard etc. locating leaks in pipelines thus becomes an important activity. In this thesis, Artificial Neural Networks (ANNs) have been used to solve the problem of leak localization in pipelines. Two strategies have been suggested for the solution. The first strategy involves use of Multi - layer Perceptron (MLP) for classifying correlation patterns of pressure signals associated with different leak locations. This strategy was used for the single leak case. In the second approach Time Delay Neural Network (TDNN) have been used to extract the temporal as well as the spatial variations of pressure signals. This strategy was used for single leak and double leak cases. Both MLP and TDNN follow supervised learning. They need large amount of data for their training. Due to non - availability of such data from real life situations, evaluation of the performance of the proposed strategies was carried out with simulated data sets. Performance of MLP was tested on a limited set of real data as well.

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Title : *A Low Sidelobe Notch Antenna Array*
Author(s) : *Sehgal Arun*
Roll No : *9410407*
Supervisor(s) : *Sachidananda M*

Abstract

This thesis records the effort made in developing a linear array of notch elements, which was envisaged as one component of a larger 2 - D airborne surveillance radar antenna. The specifications of the antenna were arrived at based on the requirements of the airborne antenna which requires a low side lobe level and thin cross section. Thin cross section was one of the major considerations in the design of this antenna, which is to be mounted outside the aircraft with a suitable radome. Based on the requirements, a notch antenna was selected as the basic radiator. The design approach has been completely experimental and the aim was to demonstrate the feasibility only. The work was carried out under certain constraints, major constraints being the high cost of microwave substrate. A low cost glass epoxy substrate was used for the fabrication, whose loss factor is high resulting in low gain for the antenna. However, the pattern characteristics is not affected by this. The parameters of a single notch antenna element were finalized first. Several feed structures were tried and finally a shielded microstrip feed line, on glass epoxy substrate was selected. The antenna was fabricated using Aluminium plate to provide high power handling capacity and structural rigidity. The bandwidth obtained was about 500 MHz at 3.2 GHz with a VSWR less than 1.85 in the band. The mutual coupling evaluation amount the elements of the array was done experimentally. The measured mutual coupling was found to be very low (< -20 dB) between adjacent elements. The array excitation coefficients were designed to give a Taylor pattern with -30 dB side lobe level. A 2 meter long array with 32 elements was fabricated. The active impedance computation of the elements was carried out and a corporate feed network designed, in microstrip form, based on this. A combination of glass epoxy substrate, coaxial cables, and glass epoxy substrate was used for the complete feed network, to reduce the cost. The array was mechanically constructed in 8 pieces for ease in fabrication, and assembled together to form the array. Near - field measurements were performed on the array since far - field testing facility was not available. With limitations in the testing procedure and precise fabrication of the array, an average side lobe level of -25 dB was achieved, with VSWR at centre frequency of 3.2 GHz being 1.22. With a better feed network and sophisticated fabrication facility it is possible to achieve a side lobe level as low as -35 to -40 dB.

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Title : *Microstrip-Fed Slot Array*
Author(s) : *Paliwal Pradeep Kumar*
Roll No : *9410435*
Supervisor(s) : *Sachidananda M*

Abstract

In the last few years, rural radio network has been one of the major concepts that is being implemented in India, to take telecommunication to remote areas where laying of telephone line is not factual, in terms of cost and maintenance. Rural radio uses a central base station and several sub-station which communicate to the central base station. Each sub-station is connected to several subscribers via local telephone network. The base station needs an antenna with a normal gain and omni directional coverage so that it can communicate with any of the sub-station in the region. The work is an attempt to design such a base station antenna at 3.2 GHz with a bandwidth of about 200 MHz. The design approach has been entirely experimental. After a survey of the feasible configuration for the base station antenna, a microstrip-fed slot array was selected. A set of three such arrays arranged around a circle to obtain omni directional coverage. One such linear array is designed, fabricated and tested in the laboratory. This thesis is the study of this development effort. One of the major constraints in this work was the availability of the microwave substrate and the cost involved in importing the substrate. For building an efficient antenna, low loss microwave substrate is a must. However, to demonstrate the concept and prove the feasibility, we studied a locally available glass epoxy substrate which has a much high loss factor. The major effect of the lossy substrate would be a reduction in the overall gain of the antenna but would not affect the pattern characteristics. Based on the requirements of a base station antenna, the specification for the antenna were worked out first and then the configuration was arrived at. Once the array configuration was decided upon, the design involved fabricating a single slot radiator and characterization. Evaluation of mutual coupling among the array elements, design of corporate feed network in microstrip form and then integration of the complete array. To make the slot radiation unidirectional, a reflector plate was introduced on one side. The slot dimensions and reflector plate spacings were optimized for best performance of individual slot radiator. Then for this slot configuration mutual coupling was experimentally evaluated by fabricating three slots on one substrate with appropriate feed network. From the measured data on a single slot and mutual coupling array feed network was designed on microstrip. The complete linear array with reflector plate was fabricated and tested in the laboratory for input VSWR and the pattern. Measured array directivity was about 15 dB at 3.2 GHz with 1200 5dB beam width in the horizontal plane and 3 dB beam width is at about 1000. The input minimum return loss in the band from 3.1 to 3.3 GHz -7.0 dB. At the center frequency it is -11.0 dB. However, the measured gain was much less than the required gain because of the lossy substrate. This work only demonstrates the feasibility of the concept and actual usable antenna one needs to use the microwave substrate in place of glass epoxy substrate, to achieve the required gain.

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Title : *Dispersion Characteristics Of Optical Fibers With Laser Etched Taps In Cladding*
Author(s) : *Basha M Mahaboob*
Roll No : *9410426*
Supervisor(s) : *GhoshAnjan Kumar*

Abstract

Radiative taps can be made in the cladding of optical fibers using the process of laser etching. Study is being carried out on the effect of such taps on the dispersion characteristics on an equivalent planar dielectric waveguide. A hybrid spectral/mode -matching method has been adopted to calculate the electromagnetic fields guided by such a structure. The advantage of the spectral method is that the Fourier transform automatically enforces the boundary conditions on the taps, and the mode - matching method is straight forward and the solution lends itself to physical interpretation easily. The method thus combines advantages of both the methods. The results show a strong dependence of tap parameters on the dispersion characteristics. This can be utilised in the making of dispersion shifted and dispersion flattened fibers

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Title : *Studies On Light Emitting Diode To Multimode Fibre Coupling*
Author(s) : *Veer Prakash*
Roll No : *9410437*
Supervisor(s) : *John Joseph*

Abstract

Efficient power coupling between different stages of an optical fiber communication system is a major problem, especially in the source - fiber stage. An attempt has been made to study the coupling between light emitting diodes and multimode fibers which are commonly used for moderate data rate applications. Two coupling models have been considered. Far field pattern of sources and fibers have been obtained experimentally to evaluate some of the parameters that influence coupling efficiency. Theoretical results of coupling efficiency are compared with measured ones for flat ended (without lenses) multimode fibers. Theory for coupling between light emitting diodes and Bulb - ended multimode fibers has also been developed using a ray tracing approach. A bulb was formed on fiber tip using an optical glue. Theoretical and experimental results for this coupling configuration are also compared

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Title : *Identification Of Higher Order Modes In Shielded Dielectric Resonator Using Hybrid Mode Analysis*
Author(s) : *Kumar J*
Roll No : *9420404*
Supervisors(s) : *Biswas Animesh*

Abstract

Resonators are important components of microwave circuits, which server to generate and filter microwave frequencies, hence forming a important part of oscillator, filter and amplifier circuitry. Of recent dielectric resonators have gained in popularity be cause of their small size, high temperature stability and low loss. In this thesis the characteristics of low and higher order modes of shielded high permittivity dielectric resonators have been studied, employing rigorous axial mode -matching technique fo r analysis. The variation of resonant frequencies of various modes with different parameters of the resonator configuration have been computed

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Title : *Optimum Suspended Stripline Configuration*
Author(s) : *Subbarayudu M*
Roll No : *9420407*
Supervisor(s) : *Sachidananda M*

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Title : *Analysis Of Thick Conductor Wide Slot Line*
Author(s) : *PatniAshish Kumar*
Roll No : *9420402*
Supervisor(s) : *Sachidananda M*

Abstract

A slot line is a planar transmission structure which is widely used in microwave integrated circuits along with micro strip and coplanar wave guides to produce mixers, filters etc., in ferrite components such as differential phase shifters, premagnetized switched phase shifters etc. and is especially convenient for connecting shunt elements. Now - a - days it is attracting interest towards antenna applications. For these applications slot line with thick metal conductor and wide slots on low dielectric substrates is being used. But the main factor interfering with this application is the non - availability of data but its performance as an antenna element. In the present work a rigorous analysis of such configuration is being carried out spectral domain analysis procedure and the dispersion characteristics and characteristic impedance of the structure is determined.

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Title : *Experimental Procedure For Determination Of Q_U , Q_{EXT} Q_L And Coupling (B)Of Dielectric Resonator (Dr)And Development Of Dr Oscillator*

Author(s) : *Kumar Pavan*

Roll No : *9420409*

Supervisor(s) : *Biswas Animesh*

Abstract

An analytical formulation for determination of Q - factor of dielectric resonator (DR) placed in suspended substrate environment has been presented. Frequency dependent conductor and dielectric losses in the different regions have been calculated to determine the unloaded Q - factor (Q_U) Experimental procedure to measure the coupling between DR and microstrip ($\hat{\alpha}$) has also been presented. An experiment has been performed using HP8410 network analyzer and $\hat{\alpha}$, Q_{EXT} , Q_L , Q_U has been measured to evaluate equivalent circuit parameters of DR. finally, DR oscillator has been designed and fabricated

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Title : *Static Voltage Stability Predication And Margin Enhancement*
Author(s) : *Tyagi Alok Kumar*
Roll No : *9410403*
Supervisor(s) : *Srivastava S C& Varma Rajiv K*

Abstract

With ever increasing interconnections and loading in the modern power system network all over the world, power utilities are facing a major challenge in maintaining the desired voltage profile in the system. Several cases have been reported where the low voltage profile has led the system to instability. In most of the cases, the instability has been observed in the form of slow decrease of voltage lasting for several minutes. It has been studied as static voltage instability phenomenon. However with increase in loading on a system, voltage instability or angle instability can be experienced. Before taking any preventive measure one should know whether the lack of real power (angle instability) or that of reactive power (voltage instability) is causing the system to go into of instability. An attempt has been made in the present work to establish conditions to distinguish between voltage and instability. To maintain system security with respect to voltage instability, a specified reactive power margin has to be maintained in the system. If the system is not having this required margin (i.e. insecure state) some reactive power sources should be placed at appropriate locations to bring the system back into secure region. An optimization problem has been solved in the present work, which minimizes the distance of an operating point to closet point in secure region. A method has been proposed to use the results of this problem to calculate the amount and location of reactive power support. Only capacitor as a reactive power device has been considered in the present work

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Title : *Voltage Stability Margin Prediction Using Artificial Neural Network*
Author(s) : *Venkataraman D*
Roll No : *9410413*
Supervisor(s) : *Srivastava S C*

Abstract

Voltage stability has become a major concern in planning and operating power systems. Several major system failures have taken place due to voltage instability and collapse. Thus power system networks have become voltage stability limited. The proximity of a system state to the voltage stability boundary can be quantified in terms of an energy margin. A fast method to predict this margin can prove to be an effective tool for the system operator to plan control actions to alleviate this problem. The main goals of this thesis was to develop a fast and accurate method to predict the voltage stability margin. Two different ANN based models are proposed for time series prediction of short term loads in a power system. The performance of Radial Basis Function network and Multilayer Perception Network have been compared for short term load forecasting. For the determination of the energy based voltage stability indicator an ANN based model has been proposed. Also, a combined ANN based model for load forecasting and voltage stability margin prediction has been proposed for estimating the system stability required for planning the control actions. The results have been obtained for a practical Gujarat Electricity Board system data and a sample five bus system

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Title : ***Active Power Filter With Constant Switching Frequency For Reactive Power And Harmonic Compensation***
Author(s) : ***Sundar Shyam***
Roll No : ***9410448***
Supervisor(s) : ***Srivastava S C& Fernandes B G***

Abstract

The wide use of nonlinear loads controlled by converter/inverter has resulted in a number of undesirable effects such as increased reactive power demand and harmonic pollution in the operation of power system. This results in reduction of overall supply power factor, the active power filters are used for reducing harmonic content and reactive power demand from the source. In this thesis the performance of single phase and three phase active power filter with fixed switching frequency is analysed. The proposed active power filter uses a PWM voltage source inverter. It operates with almost constant switching frequency and can compensate the reactive power and the current harmonic components of nonlinear loads. The fixed switching frequency operation of the device is obtained using adaptive hysteresis band current controller. The reactive power compensation and harmonic reduction is done without analyzing the load current. This results in simplified control system. The compensation is done in time domain in order to improve the response, instead of frequency domain correction. The performance of the active power filter compensating the various nonlinear loads is predicted by off line simulation studies. Results show that there is significant improvement in the supply power factor and harmonic content, thereby reducing the burden on the power generator.

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Title : *Dynamic Equivalents For Power Networks : A Study*
Author(s) : *Singh Desh Raj*
Roll No : *9410411*
Supervisor(s) : *Prabhu S S*

Abstract

The work presented in the thesis concerns reduced order modeling and analysis of large power systems using a procedure suggested by U.DI Caprio. The reduction begins with partitioning the full system into study area and evidenced area. The evidenced area is defined as consisting the group of generators along with their associated and other buses for which a dynamic equivalent is sought. The reduction algorithm is based on the assumption that a disturbance within the study area causes very small relative motion among generators of the evidenced area. The method does not require the machines of the evidenced area to behave coherently. But the equivalent formed behaves same as the coherency based theoretical equivalent as soon as the machines observe the coherency. Other important thing is that the closeness of the equivalent obtained, to the theoretical equivalent can be assessed a priori without even calculating the parameters of the equivalent. The method used is easy and simple to implement. The validity of the algorithm is checked for a fairly large power network and the results found are satisfactory

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Title : ***Study Of Buck-Boost Converter Using State Space Analysis Technique***
Author(s) : ***Moghe Prasad M***
Roll No : ***9410436***
Supervisor(s) : ***Joshi Avinash***

Abstract

The state space analysis technique is employed to investigate the dc - to - dc Buck - boost Converter. This technique reveals two distinct families of state trajectory. The use of these state trajectories, for studying the dc - to - dc power converters has been shown to be a valuable method for analysis. A method has been proposed to simulate the state trajectories and find their intersection. The analysis carried out with these trajectories results in performance curves of the converter. The normalized performance curves have been obtained, which can be used for variety of converter operations. Further a design example based on these performance curves has been given. Finally the converter operation under three different control strategies has been studied. Also the computer simulated response of controllers based on these strategies has been presented

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Title : *Investigation Of Lightning Protection*
Author(s) : *Verma Narendra Kumar*
Roll No : *null*
Supervisor(s) : *Arora Ravindra*

Abstract

Lightning has serious destructive effect on property, material and life. Most of the research work has been to improve the protective systems against lightning. In this thesis, results of experimental investigations in the laboratory for the protection of structures and power systems against Lightning strikes have been presented that is: -- To study the effect of shape and size of the Air Terminal of a lightning rod used for protection of structures against lightning.- The effect of Atmospheric Pollution and corrosion on the performance of the Protective Spark Gaps for the protection of insulator strings and bushing in Power Systems. The present investigation of air terminal have been done in long air gaps in the range of a few meters to simulate the natural process of lightning strike as closely as possible./The effective performance of Point shape has been experimentally verified. The effective performance of point shape has been experimentally verified. Parameters like breakdown voltage breakdown strength of air and the statistical time lag have been compared for different shape of Air Terminals. The correlation of shorter static time lag and greater attraction to lightning have been studied. Experiments were performed with standard shape of lightning impulse voltage of negative polarity.- The effect of atmospheric pollution and corrosion of the protective spark gap electrodes on their performance have been studied by artificially subjecting different spark gap electrodes to pollution layers. The breakdown characteristic was studied using standard lightning impulse voltage of both polarities. Corrections for the variation in atmospheric conditions have been applied to study the deterioration of the spark gap performance. In addition to the pollution layers, the electrodes were also subjected to sea water salt spray in a fog chamber for exposing them to corrosion .It was found that corrosion layer on the electrodes severely deteriorates the performance of the spark gap by increasing the withstand voltage level. On the other hand, thin volatile insulating polluting layer reduces the withstand level due to rupturing of the layer during partial discharge and availability of particles for predominance and initiating the breakdown.

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Title : ***Implementation Of Microcomputer Based Controller For HVDC Simulator***
Author(s) : ***Zinabhai Vekaria Manojkumar***
Roll No : ***9210445***
Supervisor(s) : ***Sachchidanand& Joshi Avinash***

Abstract

A microcomputer based controller is designed in this thesis work for controlling HVDC simulator. All necessary interfacing cards to generate the required signals for implementation of microprocessor based digital control have been developed. The system is designed to operate from the serial port of a PC. The system is designed in the way so as to provide a very flexible, programmable platform on which HVDC simulations can be carried out and new converter control algorithms can be developed

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Title : *Alternative Formulation And Solution Of Static Output Feedback Regulator Problem*
Author(s) : *Purwar Ashish*
Roll No : *9410406*
Supervisor(s) : *Hole K E*

Abstract

In this thesis, one -dimensional search along the descent direction in the descent Anderson - Moore algorithm for the design of the static output feedback regulator has been automated and some examples have been worked out. An alternate formulation of the static output feedback regulator problem has also been given. This formulation obviates the need for generating stabilizing initial guess for the output feedback gain matrix. Two algorithms which incorporate the better features of some of the available algorithms for solving the problem have been given. The effectiveness of the alternate formulation has been illustrated by working out several numerical examples.

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Title : *Analysis And Design Of Single Switch And Push-Pull Class-E Amplifier*
Author(s) : *Tiwari Amar Nath*
Roll No : *9420401*
Supervisor(s) : *Joshi Avinash*

Abstract

Class -E amplifier operations are based on zero voltage, zero current switch turn - on. Forced turn - off of the switch is required, but the build - up of voltage across the switch is delayed. At “optimum operation” and under damped “suboptimum operation” its efficiency is ideally 100% analysis of basic class - e amplifier have been done by (i) using state equations, (ii) assuming constant input current and sinusoidal output current & (iii) assuming constant input current & non - sinusoidal output current. The second analysis gives approximate design values of the amplifier and the last analysis gives more design of basic class - E amplifier. The pushpull class - E amplifier have been analyzed by two methods, (i) using state equations and (ii) assuming constant input current and sinusoidal output current. The design equations obtained by the second method of analysis gives sufficiently accurate design values

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Title : *Design Of Robust Controller For Robot Under Varying Payload*
Author(s) : *Shrivastava Vibha*
Roll No : *9420412*
Supervisor(s) : *Hole K E*

Abstract

In this thesis, a robust controller for a robot system having PUMA type manipulator has been designed. The design is based on Linear Quadratic Regulator theory with prescribed degree of stability. Lagrange - Euler equation of robot arm motion has been linearized about a trajectory point using recursive lagrangian technique and a state space model of the system has been obtained. Based on this model, the robust controller has been designed for the matching uncertainties in the system. The designed controller is tested for robustness properties and has been found to offer excellent robustness properties under varying payloads.

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Title : *Redesign Of Digital Autopilot For Launch Vehicle Considering FWL Implementation*
Author(s) : *Tomar Jaipal Singh*
Roll No : *9420405*
Supervisor(s) : *Hole K E*

Abstract

The digital control algorithms are usually designed under the assumption that the implementation will involve no arithmetic errors. In practice, both coefficients and state round - off errors will always be present, and for high sampling rates and /or s hort word length designs, these effect can lead to significant loss in performance. In this thesis an optimal controller for the launch vehicle designed earlier assuming infinite precision arithmetic, is redesigned taking into consideration the arithme tic errors due to the finite precision of the digital computer. Also, the controller with minimum round - off errors is designed for the same model. The controllers are designed using the reduced order model of the launch vehicle and implemented on the full order model. A comparison is made of the performances of the designed controllers with the previously designed controller for the same system. The comparison clearly indicates the benefit of taking finite word length effects into consideration during desig n itself

Title : *Application Of Singular Perturbation Method In Long-Term Stability Analysis Of Series Compensated Power Systems*
Author(s) : *Ananth C*
Roll No : *9420403*
Supervisor(s) : *Varma Rajiv K*

Abstract

This thesis presents a study of long term stability evaluations for series compensated power systems undergoing large frequency deviation and torsional interaction. Five different simulation methods, namely constant reactance method, variable reactance approach, two time scale method employing singular perturbation, full network simulation and electromagnetic transients simulation using EMTDC/PSCAD are utilized for performing the stability analysis. The study systems considered are an SMIB system very similar to the IEEE First SSR Benchmark model system and a two system interconnected by a series compensated transmission line. It is shown that the two time scale method and the variable reactance method predict the system behaviour accurately as long as there are no torsional intersections due to series compensation. However, two time scale method is demonstrated to be computationally more efficient and easier to implement. In the presence of decaying torsional oscillations, a switching strategy which switches back and forth between full simulation and two time scale method is developed and is shown to save significant computational time

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Title : ***Design Of Robust Reduced Order Digital Autopilot For Launch Vehicle***
Author(s) : ***Sinha Veena***
Roll No : ***9420411***
Supervisor(s) : ***Hole K E***

Abstract

In the thesis, a robust optimal controller for the launch vehicle is designed. Also, performance of a hybrid closed loop system containing continuous time plant and discrete time controller with and without lifting is considered. Two cases are considered: Case I: Controller designed for discrete-time model of the plant. Case II: Controller obtained by discretizing the continuous time controller. The controllers are designed using the reduced order model of the launch vehicle. Controller order is further reduced by balanced realization truncation and frequency weighted balanced realization truncation techniques. A comparison is made of the performance of the system for different controllers with and without lifting the system. Also, a comparison is made of the performance of the various reduced order controller with the previously designed controller for the same system. The comparison clearly indicates the benefits of lifting the system. It is found that performance with the 2nd order controller in frequency weighted balanced realization for case II is better than any other controller in two different realization presented for different order. Bounds on allowed perturbations in system matrices are determined. Bounds are calculated with and without lifting the system. Larger perturbation bounds are obtained with lifting than without lifting.

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