M.TECH. THESIS ABSTRACTS 1999

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Microelectronics, VLSI & Display Technology

RF Microwaves& Photonics

Signal Processing, Communications & Networks

Power and Control

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Title   *: Validation Of The Text-Book Model For Capacitance Of A Forward-Biased P-N Junction*
Author(s)   *: Papineni Ravi Kumar*
Roll No   *: 9710434*
Supervisor(s) : Patil M B

Abstract

The small - signal model of an abrupt p - n junction is studied. The analytical results, given in text - books, are compared with numerical results obtained by solving the drift - diffusion and Poisson's equations. It is found that the depletion approximation is i nadequate, and, as a consequence, the text - book small - signal equivalent circuit is substantially different from the numerically obtained equivalent circuit.

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Title   **:**   *Design, Synthesis And Optimization Of Single-/Two-Stage CMOS OP-AMPS*
Author(s)   **:**   *Dwivedi Pawan Kumar*
Roll No   **:**   *9710436*
Supervisor(s)   **:**   *Dutta Aloke*

Abstract

As a consequence of the emergence of a number of mixed-signal ap plications such as in telecommunication, signal processing, voice recognition, artificial vision, computer interfaces etc., more and more thrust is being put currently on the analog design. It is because of the kind of complexity involved in analog design, the need for automating several parts of the analog design in the overall design, comprising of both analog and digital parts onto a single chip, is being felt. At the start of the 1990's, a number of analog synthesis tools came into existence, which are mainly knowledge-based, however, they failed to deliver the required objectives. In our work, we have considered a very basic analog building block, i.e., the op-amp, which is an indispensable ingredient in most of the complex analog blocks. Their design and synthesis proccduies under various specifications and constraints, such as minimum power and area, high bandwidth, high gain and high unity gain frequency, and high slew rate have boon considered in this work. These design methodologies and synthesis algorithms may be extended to other analog blocks as well, with proper mod ifications. For each design of the op-amp considered in this work, synthesis starts with a set of input specifications. An optimization routine developed in this work equip the user with the probable values of the design variables (e.g., channel lengths and widths of individual transistors, bias currents, compensat ing capacitoi values, etc.), which would satisfy the constiaints. These design variables aic then fed to a SPICE file for the veiification of the design. The u\sults obtained from the designs showed an excellent match when compared with the SPICE results for each such design.

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Title : *Modeling Of Substrate Current And Transconductance Overshoot In Ultra-Short Channel Mosfets*
Author(s) : *Kolhatkar Jay Sudhir*
Roll No : *9710424*
Supervisor(s) : *Dutta Aloke*

Abstract

Rapid developments in the fabrication technology have resulted in the scaling down of MOSFET device dimension to ultra-small sizes. Thus, MOSFET models which accurately incorporate the various short-channel effects, are becoming important. The abnormal increase observed in the Tran conductance of ultra-short channel length MOSFETs is not phenomenon which needs to be modeled accurately, as the Tran conductance parameter of the MOSFET is extremely important from analog as well as digital circuit point of view. Previous authors have modeled this abnormal increase in the Tran conductance by assuming that there is an overshoot of the electron velocity beyond the saturation value in Silicon for ultra-short channel length devices. However, in their models, they assumed that the mobility is pinned to its low-field value, which is highly inaccurate, since the electric field present in the channel for ultra-short channel MOSFETs is very large, and the assumption of the low-field mobility to be applicable for such high channel fields may not hold true. In this work, the abnormal increase in the Tran conductance with decreasing channel lengths has been accounted for by proposing a new expression for the electron mobility, which is a function of the critical electric field, the channel length, the oxide thickness, the applied drain-to-source voltage, and the applied gate-to-source voltage. The results obtained from our model have been compared with those reported experimentally, and a good match between the two is seen. Another effect which becomes significant with shrinking dimensions is the substrate leakage current caused by the impact ionization of high energy carriers in the surface depletion region near the drain. Previous authors have modeled the ionization length near the drain in a totally empirical manner. In this work, a simple and accurate approximation of the ionization length, based on a calculation of the electric field distribution near the drain region has been developed. Our model results are compared with the experimental results reported in literature and a good correlation between the two is obtained. This improved model for the ionization length has been used in the substrate current model developed in this work. A comparison of our simulation results with the one reported experimentally shows a good match between the two. Prior to modeling these ultra-short channel effect, an existing physics based MOSFET model available in literature is simulated in order to gain a better understanding of MOSFET device physics and simulation problems.

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Title   *:*   ***One Dimensional Transient Simulation Of PN Junction***
                        Diodes
Author(s)   *:*   ***Sharma Pratul***
Roll No   *:*   ***9710440***
Supervisor(s)   *:*   ***Patil M B***

Abstract

A numerical simulation of diode using finite difference method is carried out for turn ON and turn OFF transient conditions. The method is applicable to long-base and short-base diode for any type of doping profile. For a specified input waveform of current or voltage as a function of time, the program yields terminal currents and various quantities of interest in the interior of the device such as minority carrier density, different current components, electric field, electrostatic potential etc, as a function of time and position. The effect of changing external voltage, load resistance and the lifetime of the carriers on the turn OFF transient is investigated and comparison with analytical results is made. The comparison between simulated and SPICE results for the turn OFF transient is also presented.

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Title : ***A Fuzzy Logic Based Approach For Parametric Optimization Of Analog Circuits***
Author(s) : ***Sahu Biranchinath***
Roll No : ***9810414***
Supervisor(s) : ***Dutta Aloke***

Abstract

The growing requirements for the single chip mixed - signal designs of very large scale integration (VLSI) together with the continuous trend towards smaller feature sizes and an even higher scale of integration have brought about new dimensions in the analog circuit design complexity. Because of the steady increase in the number of new application specific integrated circuit (ASIC) design that include analog functions and their increasing complexity, the need for computer- aided- design (CAD) tools is being felt. Over the years, a number of CAD tools have come into existence automating various parts of the analog design. The optimization approaches used for the design of analog circuits are found to be very much rigid in terms of capturing human intentions. In this work, we have used the concept of fuzzy membership functions in order to build a CAD tool for the parametric optimization of analog circuits. In order to capture human intentions in expressing the requirement for a particular application, e.g., minimize power, maximize gain, etc., for each of the performance specifications of a given topology, a membership function is assigned to each of them to measure the degree of fulfillment of the objectives and the constraints. A number of objectives are optimized simultaneously by assigning weights to each of them representing their relative importance, and then by clustering them to form the objective function, which is solved by Powell's direct search algorithm. Using the approach, some of the basic circuit topologies in bipolar and MOS technologies are optimized. The topologies considered for the bipolar circuits are the emitter- follower as an output stage, the common- emitter as an amplifier, and the common- base as an amplifier. A wide variety of MOS current sources (e.g., simple, cascode, Wilson, modified Wilson, and regulated cascode) and the common- source amplifier as a gain- stage have been optimized. The optimization routimes for three basic CMOS op- amp topologies, e.g., the simple operational transconductan ce amplifier (OTA), the basic two-stage (BTS) op- amp, and the symmetrical OTA have been developed. The channel length modulation parameter ($\ddot{e}$) is exclusively taken into account both in the DC operating point calculations and the small signal parameter comp utations for the MOS circuit topologies. Once the optimization is done, the program creates a SPICE netlist of the circuit topology for the verification of the design. The design results obtained from our optimization program showed an excellent match with those obtained from SPICE simulation for each of the topologies

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Title   :   Application Of Kalman Filter In Air Force-A Tutorial
Author(s)   :   Ramesh T O
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Supervisor(s) :   SuleVirendra Ramakant &Sharan R

Abstract

APPLICATION OF KALMAN FILTER IN AIR FORCE - A TUTORIAL The Indian Air Force has a large number of modern, sophisticated weapon and support systems in its itenary. Various modern techniques are utilized in these systems; particularly a survey of the published literature has shown that Kalman filter and Artificial Neural Networks are being widely used in solving many of the problems encountered by these systems. The techniques of Kalman filtering and Artificial neural networks use certain concepts which a general air force engineer may not be exposed to. Hence an attempt has been made in this thesis to develop a tutorial discussion of Kalman filter and Artificial neural networks; keeping the background of an air force engineer, in field units, in view. To aid in furnishing the desired perspective, simplified explanations of the background needed to understand the Kalman filter and the Kalman filter algorithm are presented along with a few simple example for easy familiarization. A target tracker using the conventional system and the one using a Kalman filter are presented. In addition, a brief introduction to Artificial Neural Networks is also presented

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Title   :   ***Package Design For A Low Cost Optical Liquid Level Sensor***
Author(s)   :   ***Bedi Major Navjot Singh***
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Supervisor(s)   :   ***Ghosh Anjan Kumar***

Abstract

Sensors are also the key components in condition monitoring and measurement systems which are important for automatioa Optical sensors are increasingly becoming popular over the conventional measuring devices due to the possibility of non contact methods of measurement and the ability to reach inacessible places when used in conjunction with optical fibres Sensors are also the key components in condition monitoring and measurement systems which are important for automation. There is a need for an optical sensor design and development in India. The optical sensor design has to be cost effective for it to be acceptable to the Indian market. We have anlysed various components of a low cost optical liquid level sensor using geometric optic and physical optic considerations and proposed a feasible design for the optical sensor. The detailed analysis of this sensor has been carried out in this thesis and guidelines for parameter selection have been evolved. The design guidelines of an optical liquid level sensor which uses an annular ring shaped detector has been proposed and its response has also been analysed in this thesis

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Title : **Multi Layer Neural Networks For Pattern Recognition**
Author(s) : **Chandra Major Anurag**
Roll No : **9710403**
Supervisor(s) : **Ghosh Anjan Kumar**

Abstract

Pattern recognition is an important aspect of all communication systems and a fast, accurate and efficient method of pattern recognition is essential for error free functioning of the communication network. Besides communication systems, pattern recognition is required for a number of other applications like processing of pictures, handwritten character recognition and in fact a host of other similar applications. Neural networks offer a method of pattern recognition and can be used for applications which are highly computation intensive and which cannot be easily carried out on the computer. In this thesis we have studied multi-layer neural network models capable of pattern recognition with the aim of deciding which model suits our application of recognition of bit-patterns with the aim of finally recommending one of the models available for implementation on hardware

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Title : ***Electomagnetically Coupled Patch Antenna Array***
Author(s) : ***Belapurkar Amit***
Roll No : ***9710401***
Supervisor(s) : ***Sachidananda M***

Abstract

The microstrip antennas have notable advantages as compared to the conventional microwave antennas. The light weight, small volume and low planar configuration of the microstrip antennas has made them very popular. Narrow bandwidth is however the most significant disadvantage of the microstrip antenna. The bandwidth increases considerably by using a thicker substrate, this however increases the mutual coupling. In order to utilize the larger bandwidth of the thicker substrate but at the same time reduce the mutual coupling EM coupled rectangular patch antenna is proposed in this study. In this the patch radiator is kept over the microstrip line and the coupling between the patch antenna and the microstrip line takes place electromagnetically. To test the design of the EM coupled patch antenna and its suitability for array application it was decided to make an eight element broad side array with side lobe level below 25 dB and operating at 9.25 GHz.

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Title   :   *Design Of An All Optical Clock Recovery System Using Non Linear Optical Loop Mirrors*
Author(s)   :   *Kumar Major Kamesh*
Roll No   :   *9710423*
Supervisor(s)   :   *Ghosh Anjan Kumar*

Abstract

Clock recovery is an important part of all communication system. To use the enormous bandwidth provided by optical fiber, and to meet requirement of high speed switching in the next generation of photonic networks, all optical processing is essential All optical clock recovery system is an important part of all optical regeneration of signals to perform, both amplitude and timing restoration. All optical clock recovery is also required in other all optical processing for demultiplexing and wavelength translation. Actively mode locked fiber lasers using Nonlinear optical loop mirror (NOLM) offer a novel method of all optical clock recovery with a high data rate in excess of Gbit/s. In this thesis we have studied all optical clock recovery using nonlinear optical loop mirror scheme proposed by British Telecom and derived the design equations (which were not disclosed by British Telecom group in their publication) with the aim of validating the experimental result and modeling the optical clock recovery circuit.

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Title   :   Characterization Of Complex Planar Structure Formillimeter Wave Application Using 3-D TLM Technique
Author(s)   :   Valibabu Saladi
Roll No   :   9710449
Supervisor(s) :   Biswas Animesh&Das Utpal

Abstract

Two dimensional and three dimensional TLM EM simulation methods have been studied and the software code for characterization of guided wave structures h as been developed. Formulation has been done for cylindrical node in elliptic coordinates. Using the TLM technique, propagation characteristics, i.e., frequency dependent dispersions and impedance characteristics, of the rectangular wave guide, co - axial t ransmission line, shielded micro strip are obtained and compared with results available in literature. Propagation characteristics of edge coupled micro strip lines, in semicircular cross section wave guide has been analyzed using TLM technique. It has be en shown that performance of coupled line components can be improved by using the anisotropy of certain substrate materials or the step in homogeneity (groove) in the substrate to equalize the even and odd mode phase velocities in the edge coupled microstr ip lines.

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*Title : **Development Of 3-D Em Simulator For Designing Microwave Circuits Using Material Independent Perfectly Matched Layers As ABC***

*Author(s) : **Chowdhary Amitabh***
*Roll No : **9710404***
*Supervisor(s) : **Biswas Animesh&John Joseph***

Abstract

An improved version of unsplit perfectly matched layers (PML), which is material independent, has been formulated for the simulation of microwave circuits embedded in lossy, isotropic or an isotropic. Dielectric and magnetic 3 - D media. Advantage of using PML is that it provides virtually reflection free absorption which gives highly accurate solutions for circuit parameters. It has been d emonstrated that because of accuracy of material independent perfectly matched layers (MIPML), the usual oscillatory behavior observed in dispersion relations of characteristic impedance and relative effective dielectric constant in FDTD analysis is drasti cally reduced. The other advantage of MIPML formulation is that for various types of geometries and material, there is no modification in the algorithm for the calculation of flux components in perfectly matched layers and in working domain. By adding a li ttle structural details in the subroutines responsible for setting up PEC in working domain, for calculating E and H fields from flux components and for specifying source stimulus, the program can calculate circuit parameters. This greatly enhances potent ial for calculating responses of complex circuits and radiating structures without any major changes in the program. Though the scheme, which has been adapted here requires more memory but it lends itself for uniformity of the algorithm throughout the comp uting domain, reduces number of subroutines and makes it easier for developers to debug the program. A collection of sample problems have been included to demonstrate the working potential of the program and to validate calculated results with published da ta. Samples include patch antenna on an isotropic substrate, propagation of a Gaussian pulse in a micro strip, wave propagating in a uniform an isotropic 3 - D medium. It has been found that calculated and published results are in excellent agreement. Dispe rsion relationships of characteristic impedance and relative effective dielectric constants of micro strip on an arbitrary an isotropic substrate, which are very useful for CAD have been worked out. Here these responses have been calculated by both, conven tional method of multiple cells and a new single cell method developed in this thesis further analogy. It has been successfully demonstrated that new method developed in this thesis further reduces oscillations observed in dispersion relations. Improvement is quite distinctive at lower frequency side.

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Title : ***High Speed Laser Transmitter For Fiber Optic Communications***
Author(s) : ***Mehta Vivek***
Roll No : ***9810459***
Supervisor(s) : ***John Joseph***

Abstract

A high -speed laser transmitter circuit has been implemented in hardware using discrete components (BJTs) in differential switching mode capable of working up to 120Mbps. The transmitter incorporates a laser threshold current stabilization circuit in order to take care of the possible threshold variation due to temperature and ageing. The circuit has been simulated using Pspice. In order to facilitate accurate simulation of the driver circuit, the relevant parameters of all the active devices were extr acted and used. The measured node voltages, output voltage waveforms and other results agreed well with the ones achieved through Pspice simulations. An inexpensive visible laser diode (without monitor photodiode) was used for the circuit implementation. T he capability of the driver circuit to correct threshold current variations was tested using an LED source and an external photo detector.

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Title   : *Performance Evaluation Of A Digital Fiber Optic Link*
                 With PFMB((M+1)B Line Code
Author(s)   : *Dighe Archana*
Roll No   : *9710411*
Supervisor(s) : *John Joseph&Chatterjee P K*

Abstract

The main objective of this work is to investigate the performance of a line code namely, PFmB(m+1)B code in a digital fiber optic communication link using simulation. Several line codes are available for fiber optic communication, such as AMI, mBnB block codes, bit insertion codes etc. PFmB(m+1)B code, which falls in the category of bit insertion codes, has favorable spectral characteristics besides other common advantages of line codes. It gives balanced code sequence and is relatively easy to encode and decode. This code is suitable for higher data rates and longer word lengths. In the present work we assumed data rate to be 150 Mbps, and a word length of 7 bits. The link considered for simulation comprises a pigtailed laser diode, single mode dispersion shifted fiber, either a p-I-n photo diode or an APD and a transimpedance amplifier. This bit-error-rte, corresponding to different values of received power and signal-to-noise ratio, is calculated for a receiver with p-i-n photo detector and that with APD. The APD is found to improve the receiver sensitivity. Considerably lower received power is required to maintain the same BER in case of receiver with APD. Comparison of link with and without PFmB(m+1)B code is done. The transmission data rate is maintained same in both the cases. It is observed that the use of this code causes SNR deterioration in the link. In practice, the optical source available may not be having zero extinction ratio, hence, the effect of non-zero extinction ratio is compared with the zero extinction ratio case. It is observed that for non-zero extinction ratio case, slightly higher received power is needed to maintain the same BER. Analytical result for Gaussian approximation is compared with simulation results. The two are found to be in close agreement

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*Title   :   **Development Of A System For Content Based Indexing And Retrieval In Large Image Databases***

*Author(s)   :   **Roy Joysree***

*Roll No   :   **9710420***

*Supervisor(s) :   **Gupta Sumana***

Abstract

In this thesis work we are concerned with development of a content based indexing and retrieval system This is based on -wavelet decomposition and quad tree segmen tation Since the computational complexity has been one of the mam barriers towards the use of similarity measures m large image databases we propose a hierarchical in dexing scheme where computationally efficient features are used to subset the images before more sophisticated techniques are applied for precise retrieval Database sys terns which support indexing searching and retrieval have great demand Large visual database systems require effective and efficient ways of indexing and accessing visual data on the basis of content In our work we use 3 level wavelet transform to extract image features, significant features must first be extracted from image data in their pixel format Feature vectors of images are then constructed These feature vectors of database image segments are classified using clustering algorithm Hierarchical tree structure namely Bucket PR k d tree is used for efficient storage and searching of the clusters Content based image retrieval is performed bj comparing the feature vectors of the query image and the mean feature vector of clusters With the large volume of visual data stored in a visual database image classification is a critical step to achieve efficient indexing and retrieval Our experiment illustrates that the proposed block oriented image representation offers a novel decomposition structure to be used to facilitate effective and efficient image retrieval

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Title : *Sinusoidal Modelling Of Music Signals For Audio Coding*
Author(s) : *Sira Sandeep P*
Roll No : *9710448*
Supervisor(s) : *Rao Preeti*

Abstract

SINUSOIDAL MODELING OF MUSIC SIGNALS FOR AUDIO CODING Transform based perceptual coding schemes have been widely used in the standards for high quality audio coding. However transform based coders do not continue to be perceptually loss less at low bit ra tes. This is especially true for certain classes of music signals which are characterized by a high tonal content. Motivated by the success of sinusoidal modeling techniques in the analysis and synthesis of musical sounds, a parametric coding approach is i nvestigated. The basis for this approach is the model of the signal as the sum of widely varying sinusoids and a noise like residual. An algorithm to identify and extract the tonal component of monophonic, single instrument pieces of music is presented. Se veral issues relating to the choice of analysis and synthesis parameters are addressed. A study of some possible considerations that would help to eliminate redundancy in the set of parameter estimates has been carried out. In order to reduce the average b it rate the potential of a variable synthesis frame rate method is investigated. A coding scheme that switches between two synthesis frame sizes is presented. The encoding of the amplitude, frequency and phase parameters of the tonal component has been att empted and estimates of the number of bits required to encode each data set are presented

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Title   :   *Discrete-Time Analysis Of Finite Buffer Capacity Open Queuing Networks*
Author(s)   :   *Singh Naresh Kumar*
Roll No   :   *9710430*
Supervisor(s) :   *Bose Sanjay Kumar &Singh Yatindra Nath*

Abstract

ATM (Asynchronous Transfer Mode) is considered to be the most promising transfer technology for implementing Broadband networks. These networks support diverse applications like voice, video and data transfer. Techniques for the analysis of discrete queues and queuing networks may be used for the modeling and performance analysis of ATM switches, which are the integral part of ATM Broadband networks. This thesis presents a scheme which may be used for the performance evaluation of ATM switching networks where an ATM switch is modeled as a discrete-time finite buffer queue. Approaches have been proposed for the performance analysis of discrete-time, finite buffer capacity open queuing networks by decomposition of each queue and then individually analyzing them. Cell arrivals to the networks is modeled as a two-state Markov modulated Bernoulli Process (MMBP). An approximation method for fitting a two-state MMBP to the departure processes of queues has been presented. The results obtained from this analytical algorithm have been shown to be acceptably close to those obtained through simulations.

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Title : *Simulation Of Queuing Networks In QNAT*
Author(s) : *Dubey Shiva*
Roll No : *9710447*
Supervisor(s) : *Bose Sanjay Kumar&Srivathsan K R*

Abstract

Queuing Networks have proven to be useful models for performance evaluation and performance prediction of real life systems. Queuing Network Analysis Tool (QNAT) is a versatile, user friendly software package developed by us at the Indian Institute of Technology, Kanpur for the analysis and simulation of a large variety of open and closed networks of both finite and infinite capacity queues. This thesis deals with our efforts of successful addition of simulation feature to QNAT. The main objective was to design a software tool which will provide the user to study the performance of queuing networks by either an analytical approach or through simulations. The technique followed in the simulation of complex networks of queues is discrete event type. This simulation option of QNAT allows the user to simulate open and closed queuing networks with single class jobs and open, closed and mixed networks with multiple class jobs in infinite capacity queues. QNAT does not allow jobs to change classes. The typical blocking mechanisms that have been incorporated by us in QNAT are Transfer blocking, Repetitive Service blocking (Fixed or Random destination) and Rejection blocking. In this thesis we have configured different complex queuing networks by using the GUI and studied their performance through simulations. The results of simulations of different queuing networks are verified with that of analysis and are found to be fairly close.proportionate selection is the best. For a multimodal function, a large population with a large crossover probability is needed. This study suggests that before trying to solve a problem using GA, the procedure presented in this thesis may be applied to get consistent performance of GAs, by making the obtained solutions independent of initial population. This thesis has also outlined a methodology to obtain GA parameters which will produce consistent performance.YDES UNDER AEROBIC CONDITIONS : SCOPE AND MECHANISM

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*Title   :   **Design Considertions For Mpeg-2 Transport Over Atm Networks***

*Author(s)   :   **Gupta Rishi***
*Roll No   :   **9710441***
*Supervisor(s) : **Srivathsan K R***

Abstract

Fast growing distributed multimedia applications, such as video-on-demand, video conferencing, distance learning, and telemedicine all demand cost-effective transfer of multimedia information across networks. Two dominant factors control the efficiency of information transfer. First is the coding and compression of the audio, video, and data, second is the speed and the Quality of Service (QoS) guarantees provided by the underlying network. Motion Picture Experts Group-2 (MPEG-2) is an efficient coding, compression and transport mechanism for multimedia. Asynchronous Transport Mode (ATM) is a promising network standard which may satisfy the above requirements. In this thesis a review of MPEG-2 and ATM standard is first carried out. Then a detailed study of the issues that are to be addressed in order to ensure satisfactory transmission of MPEG-2 streams over ATM networks is presented. Finally, an ATM Adaptation Layer is proposed for efficient transfer of real time interactive multimedia services and its performance is compared with that of AAL-5.

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Title : ***Design Of Low Bitrate Video Coder Using 3d Motion Estimation***
Author(s) : ***M Karthik***
Roll No : ***9710422***
Supervisor(s) : ***Gupta Sumana***

Abstract

In this thesis we describe the design of a low bit rate video coder using a 3-D motion estimation algorithm-based on thftE-matrix method. 1 The error between the current frame and the motion compensated previous frame was transformed using the shape adaptive DCT(SADCT). This method is specially suitable fur coding boundary regions in an image. The transform coefficients using SADCT is considerably less compared to DCT for such regions. The transform coefficients were quantised into levels varying from -127 to +127 which were subsequently VLC coded. The motion parameters were FLC coded. Both codes were sent as serial bits to the receiving side where they are decoded-Reasonably good quality reconstructed image sequences at bit rates of the order of 03kbps* 61kbps and 57kbps were obtained by suitably changing the dmid mim and step size of the quantizer. The coder was tested using the stan dard Claire, Miss America and Salesman sequences. The PSNR obtained in each case ranges from 37 to 31 indicating good quality of reconstructed images. The model failure areas varies from 4% to 7%. v

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Title : **Real Time DSP Based Identification System Using Content-Based Imaging Techniques**
Author(s) : **Kumar Ashok**
Roll No : **9710413**
Supervisor(s) : **Gupta Sumana**

Abstract

In this thesis work we propose a new technique for the design and develop ment of an automatic visual identification system The proposed system is implemented using an interconnection of four subsystems: (1) sensing, (ii) data acquisition, (lii) feature (content) extraction and (iv) feature analysis. This system is based on identification of images using content based match ing of a query image with those of the database images Query image is the on-line grabbed image by the area scan CCD cameras. Database (off-line) is prepared for all the expected query images by extracting relevant features. Image histogram (gray level) is used for feature extraction. The com putational complexity & storage requirements are reduced by decomposing the histogram using Wavelet Transform. First and second moments of these wavelet coefficients is used as features. The root mean square (rms) metric is used to compute the distance between the query image with that of the database images Although the system is designed to inspect steel slab for surface defects but laboratory evaluation of this system gives excellent performance with general textured and non-textured images also. A setup of high speed Digital Signal Processors is used to keep up with the required real time throughput rates of 1024 Kpixels/sec (1 m wide steel slab moving at the rate of 1 m/sec)• v

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Title   :   *Performance Evaluation Of Multiple TCP Circuits With The Help Of Semaphore Queues*
Author(s)   :   *Kumar Pawan*
Roll No   :   *9710435*
Supervisor(s)   :   *Bose Sanjay Kumar &Singh Yatindra Nath*

Abstract

This thesis presents an approach for approximately analyzing the performance of multiple TCP connections over a network with partially shared links. In t his kind of network, two or more TCP connections may be forced to share the bandwidth of a common link. The number of packets for a TCP connection is modeled as being controlled through a semaphore queue whose performance depends on the window wide of the connection. This window size will also control the traffic flow contributed by this connection to the overall network. The network can then be modeled as a multiple – class closed queuing network, which has then been solved using a Mean Value Analysis (MVA) approach. We have used this approach to analyze the performance of a network with multiple TCP connections over shared links and have compared our analytical results against those obtained through simulations. We find that as long as the network is operated without congestion, our analytical approach can predict system performance with reasonable accuracy

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Title　　　　*:*　*2-D Phase Retrieval : A Wavelet Approach*
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Roll No　　　*:*　*9710446*
Supervisor(s)　*:*　*Gupta Sumana*

Abstract

Phase retrieval from the measurements of the Fourier modulus is an important and difficult problem. Among all the approaches developed to solve the problem so far, the iterative transform algorithms are currently the most efficient. However these algorithms suffer from major drawbacks that limit their practical applications. In this thesis the direct method i.e., the iterative transform method as well as wavelet based method of phase retrieval is being presented with the aim to discuss the means to improve the performance of the algorithms leading to better phase retrieval quality. It is being established that wavelet based method of phase retrieval increases the computational efficiency by over 60% in many cases while at the same time obtaining reduction in residual reconstruction error (upto20%) as compared to the direct method. Further the quality criterion wavelets chosen for subspace signal decomposition has an influence over the phase retrieval error and quality to a varying degree is being established.

Title   *:*   *Computerzied Brain Tumor Boundary Detection: A Genetic Algorithm Based Approach*
Author(s)   *:*   *Banerjee Arindam*
Roll No   *:*   *9710412*
Supervisor(s)   *:*   *Ray G C*

Abstract

Detection of exact brain tumor boundaries from computerized brain images is a basic problem in medical imaging. The boundary detection problem has been formulated as an optimization process that seeks the boundary points in order to minimize an energy function based on an active contour model. A modified version of the standard genetic algorithm forms the basis for solving the optimization problem. Morphological preprocessing leads to the formation of a population of approximate boundaries of the tumor. The main algorithm deals with a population of boundary contours, performing genetic operations on them. Selection and formation of mating pool is done using stochastic remainder selection for less noisy results followed by a roulette wheel selection. Spatial crossover is implemented in a non-standard way to give rise to a single child contour from two parent contours, the process being repeated for all randomly selected pairs of virgin parents from the mating pool. Mutation is done in a deterministic manner on each contour thereby pushing them to the nearest local minima in the energy landscape. This process is repeated for some generations, and since the algorithm leads to the survival of the fittest under a given condition, the condition in this case being that of having minimum energy, the exact boundary of the tumor emerges after some generations. The method is quite insensitive to noise because of the morphological preprocessing. As an optimizer, the algorithm is extremely robust since it deals with a population ot possible solutions. The effectiveness of the approach has been shown by experiments on different slices of a magnetic resonance imaging data set

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Title   :   ***Estimation Of Formant Parameter Variations Using Linear Prediction***
Author(s)   :   ***Barman Abhirup Das***
Roll No   :   ***9710402***
Supervisor(s)   :   ***Rao Preeti & Sharma Govind***

Abstract

Estimation of vocal tract characteristics from the speech signal s an important problem. the properties of the vocal tract as represented by the speech signal formant parameters vary in time due to the movement of the articulators as well as due to the vocal fold oscillations in each pitch period. In this work the problem of the estimation of formant parameters as they vary in time due to the changing source tract coupling during the glottal cycle is addressed. A method using covariance based linear predictive analysis is studied. Continuously varying formant trajectories are obtained by peak-picking of linear prediction spectrum from a sliding short data window. In order to interpret the frequency estimates correctly, the instants of significant excitation corresponding to glottal closure and opening are determined using the prediction error and the log determinant methods. Experimental results using simulated s well as natural speech data re presented. In several cases of natural speech vowels, clear increases of formant frequency are observed in the open phase compared with the closed phase.

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Title : ***Teleradiology Kit With Automatic Brain Segmentation***
Author(s) : ***Das Sandhitsu Ranjan***
Roll No : ***9710444***
Supervisor(s) : ***Ray G C***

Abstract

The tremendous growth of information technology in the recent years has made it possible to design a variety of telemedicine systems. Several large scale multinational projects are currently being pursued which is revolutionizing remote health care. Teleradiology is one area where many projects are being undertaken. In India, there have been very few such efforts mainly because of lack of proper IT infrastructure and prohibitive costs of large scale telemedicine systems. In this work, we develop an inexpensive teleradiology kit which can run over any TCP network. It includes a client program providing a graphical user interface to the doctor who can retrieve data from a server site where MRI brain slices of patients are available. Other feature implemented include remote authentication, automatic brain segmentation by the server, knowledge-based image compression prior to data transmission, support for multiple patients and data caching. Brain segmentation is a prerequisite of many important MRI post-processing algorithms. It also allows for data compression. The automatic brain segmentation algorithm implemented on the server site is based on existing automatic thresholding and morphological methods. The algorithm has been modified to improve computational efficiency

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Title   :   Performance Analysis Of An Incoherent Optical CDMA
Network With Semiconductor Optical Amplifiers
Author(s)   :   Kasim Mohammad
Roll No   :   9710429
Supervisor(s) :   Singh Yatindra Nath

Abstract

Future optical LANs will be required to support a large number of users communicating at high data rates. Optical DCMA is one of the possible techniques which can be used in such networks. Incoherent optical CDMA systems employing OOC sequences are easy to implement all optically as compared to their coherent counterparts. These systems therefore appear to be an appropriate choice for future high speed LANs. The incoherent optical CDMA system architecture relies on encoding and decoding principles based on splitting and combining of optical pulses which results in high power loss. Therefore adequate power margins would be required if practical implementation of such systems is attempted. Optical amplifiers are widely used in optical communication systems to compensate transmission losses and improve power budget margins. In this work placement of SOAs in an incoherent optical CDMA network has been considered. System power budget analysis and performance evaluation with SOAs as post amplifier and preamplifier, is presented for active and passive encoding schemes. In preamplifier configuration the SOA can be placed either before photo detector (preamplifier-1) or before the decoder (preamplifier-2). It is found that when SOAs are used, the minimum transmitter power required to support the users at a specific BER is significantly lower than that required in the system without SOAs. Post amplifier and preamplifier-2 are found to give comparable performance improvement, with the former being slightly better. In general the performance of an optical system with optical amplifiers deteriorates under gain saturation. The performance of post amplifier is affected most due to saturation and preamplifier-1 shows marginal degradation. However it is found that saturation is not always disadvantage in an optical CDMA system as preamplifier-2 with a properly selected saturation power gives improved performance. In overall, an SOA before the decoder is found to be the optimum placement position in an incoherent optical CDMA star network.

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Title : ***Long Range Dependence, Self Similarity And Cross-Correlation Between Packet Sizes And Inter Arrival Times In Wan Traffic***

Author(s) : ***Sharma Sanjeev K***

Roll No : ***9710445***

Supervisor(s) : ***Srivathsan K R&Iyer Srikanth K***

Abstract

With the advent of applications like teleconferencing, video on demand etc., there is a growing need to address the problems of performance managements of networks. The explosive growth in the number of nodes in the internet and also the range of services that are being offered over it, makes monitoring more complex. It is important for a source, and possibly other nodes in the source destination path, to be able to perform predictive control by forecasting traffic on these paths. The forecasting of the traffic flow can be done by observing the data flows on the paths. This is achieved by constructing a dynamic model for data flow and then using it to predict flows. Any model that we use in this situation must be able to adapt to the fast changing conditions in the network traffic and should also be capable for providing accurate forecasts. A class of models that can be used for this purpose are the series models. A second issue of concern to network managers is to locate resources accessed over the network such that the network performance observed by the user is optimized. Once again, a systematic study of access patterns is necessary to predict future use and to allow relocation of resources over the network for optimal use of the networked system. Time series models can be used by the network managers for forecasting in this case too. It is interesting to both the above problems can be handled through the time series models. As the performance of a network is highly dependent on the load on the network, traffic modeling is of considerable importance in the management of performance. In this thesis we use time series method to address the problem of modeling and forecasting of WAN network traffic. The variables of our interest are the inter-arrival times and the packet-sizes. For that we down loaded the WAN traffic data from a site http://ita.ee.lbl.gov/html/contrib/LBL_PKT.html. The tracing was done on the Ethernet DMZ network over which flows all traffic into or out of the Lawrence Berkeley Laboratory, located in Berkeley, California. This data is then analyzed for the time series and for queueing analysis. We concluded from the results that both the inter-arrival times and packet-sizes exhibit long-range dependence and self-similarity with the hurst parameter H equal to 0.9. Then we put these data points in a queue with inter-arrival times and packet-sizes as the parameter. We study the queue empirically. One of our important results is that the number of packets in the queue is increasing slowly and steadily. But as a sudden these no, increases to a higher value. Reasons for this can be the statistical properties of the inter-arrival times and of the packet-sizes. These are that both inter-arrival and packet-size are correlated (but for classical queuing we assume them independent), both having the large dependence in their behaviour, strong negative correlation between the packet-sizes and the inter-arrival times, the distribution of the packet-sizes is bimodel (for queue this should be exponential). Hence a queue model should incorporate these conclusions and instead of univariate models we have to use bivariate models to model and forecast the WAN traffic

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*Title   :   **Performance Analysis Of All Optical Packet Switch
                    With Header Replacement Mechanism***
*Author(s)   :   **Dwivedi Pankaj***
*Roll No   :   **9710433***
*Supervisor(s) :   **Singh Yatindra Nath***

Abstract

Photonic technology has capability to fulfill increasing demand of the telecommunication services in the near future. The electronic header replacement in Optical Switches has been the main hitch in optimum use of this technology. Several efforts are being made to avoid the use of electronic header replacement and go for op tical header replacement resulting into development of all-optical switches. In all kind of switches the header replacement is done before the actual switching. In this thesis, we conducted a survey on methods of optical header replacement. Further, as an innovative approach, we pro pose the integration of header replacement and switching. For this purpose a method of header replacement based on two SOAs con nected in parallel, and a WDM switch based on Fiber Optical Loop Memory (FOLM) has been considered. The proposed scheme leads to saving of an SOA for each channel, but the minimum delay of the packet in the switch increases. Using the computational models of different components of loop, the noise analysis of the proposed scheme is done. It leads to the conclusion that the proposed scheme can not be used efficiently for 1 or more channels because in this case maximum o rotations are allowed in the loop. Also in case of different input powers to different channels at a time, the channel with least input power has lowest SNR and if this input power is too low then signal will have to be rejected due to low SNR. lii

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*Title   :   **Hopfield Neural Networks Applied To Economic Load Dispatch Problem***

*Author(s)   :   **Kumar P Phani***

*Roll No   :   **9710437***

*Supervisor(s) :   **Kalra Prem Kumar***

Abstract

The .Economic Load Dispatch problem is one of the essential optimization. problems in power systems. This problem has been solved by many conventional methods, most of which assume a quadratic cost characteristic for the generator. Also most of these methods suffer a lot to give optimal solution, with increase in number of constraints. To avoid these difficulties Hopfield method has been suggested for solving Economic Load Dispatch problem in the present work. In the present work, the abilities of the Hopfield Network ^n handling several constraints like power balance, SO2 and NOx dispatch constraints, prohibited zone constraints, heat limits etc., has been worked out. Also the ability of the Hopfield Network to handle piecewise quadratic and polynomial cost functions has been studied. In order to tackle third order cost function, a novel third order Hopfield method has been proposed. For tuning Hopfield coefficients to drive the Network towards global minimum, fast computational Hopfield method and Fuzzy logic,based coefficient tuning method is used

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Title : ***Comparison Of Neural Network Architectures For Prediction Problem***
Author(s) : ***Ram Gopal***
Roll No : ***9710418***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

The neuron has two processing functions, i.e. aggregation and activation function. The aggregation of input to the neuron is performed through weighted sum. The aggregation of input is passed through activation function to generate the output of the neuron. The performance of the neural network depends upon the characteristics of the neuron. The total number of connecting weights among neurons, the optimization algorithms and their parameters constraint the learning time for the neural networks. This thesis deals with study of conventional back propagation algorithm for learning of neural networks having neurons with different types of activation functions. The study reported here includes the prediction of short-term power demand, and interest rate forecasting. These two prediction problems have been solved using conventional neural network architecture and non-conventional architecture of the neural networks, The results obtained for prediction of either power demand or interest rate demonstrate directly the quality of prediction as function of activation function. The conventional architecture produces relative better results compared to non-conventional architectures for power demand forecast, whereas recurrent neural network performs better for interest rate prediction compared with other reported architectures

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Title   *:   Voltage Stability Based Contingency Ranking And Corrective Action Planing*

Author(s)   :   Ramana V Venkata

Roll No   :   9710452

Supervisor(s)   :   Srivastava S C

Abstract

Due to the stressed operation of the power system, the power utilities are facing the problem of voltage security and voltage instability. A power system becomes more imminent to voltage instability due to the outage (contingency) of any branch of its transmission network. Hence, it has become important to consider voltage stability criterion also in system security assessment. For secure operation of a power system, it is necessary to identify the contingencies causing voltage instability (critical contingencies) and plan for the on-line remedial actions in order to avert voltage collapse in the system. The present work has made an attempt in this direction. For ranking the contingencies considering voltage stability criterion, a new scalar index has been proposed. The post-outage analysis has been carried out with the help of distribution factors, which have been computed using sensitivity properties of the Newton-Raphson load flow Jacobian. Directly using the severity index values, a fast and simple method has been proposed for calculation of the additional reactive power support and its optimal location in the network for alleviating the voltage instability under contingency conditions. The proposed methods have been tested on two IEEE test systems.

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Title   :   ***Application Of Simulated Annealing To Economic Load Dispatch Problem***

Author(s)   :   ***K Vijay***

Roll No   :   ***9710421***

Supervisor(s)   :   ***Kalra Prem Kumar***

Abstract

Traditionally economic load dispatch problem has been solved using many conventional methods. But most of these methods assume the generator cost characteristics to be simple quadratic. And also most of them able to tackle the constraints in a limited way. But in practice, the economic load dispatch problem, demands solutions when there are generators with complicated cost characteristics and various type of constraints imposed on them. In this work, a general simulated annealing based economic load dispatch algorithm has been presented. Methods for incorporating the transmission losses, emission dispatch constraints and prohibited zone constraints of the economic load dispatch problem, into the simulated annealing algorithm have been worked out. Also methods for incorporating different types of cost functions like quadratic, piecewise quadratic and polynomial cost functions into the algorithm have been worked out. The effect of cooling schedule on performance of the simulated annealing algorithm has been worked out in detail. The ability of the algorithm to find the global or near global optimum solution has been demonstrated by several test examples. An attempt has been made to apply simulated annealing algorithm to update the weights of Hopfield Network, so as to drive the Hopfield Network to produce global optimum solution. The dispatch results obtained by applying simulated annealing algorithm to various problems discussed are proven to be either more economical or equally economical in all the cases compared to the conventional methods

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Title   :   *Design, Simulation And Pc-Based Implementation Of A Direct Torque And Flux Controlled Induction Motor Drive System*
Author(s)   :   *Tripathi Anshuman*
Roll No   :   *9710409*
Supervisor(s) :   *Das Shyama Prasad*

Abstract

SYNOPSIS Several strategies of speed and torque control of induction motors have been devised in an effort to imitate the technical excellence of a dc motor and thus to replace the same by more rugged induction motors. The present work is devoted to one of the upcoming methods of speed and torque control of an induction motor, called the direct torque and flux control method (DTFC).. The key to this method is the appropriate selection of voltage space vectors by setting up torque and flux status for the purpose of a pulse width modulated inverter switching. Several aspects of this control mechanism have been dealt with and a comparison of simulation and experimental results has been made. Key words: Vector control, direct torque and flux control (DTFC), flux and torque status, digital controller, pc-based control data acquisition card.

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Title   :   ***Simulation And Implementation Of A Fuzzy Vector Controlled Induction Motor Drive System***
Author(s)   :   ***Tewari Anant***
Roll No   :   ***9710405***
Supervisor(s)   :   ***Das Shyama Prasad***

Abstract

In this thesis, an induction motor drive incorporating a fuzzy logic controller to control its torque indirectly has been simulated and practically implemented .The present work exploits the advantages offered by a fuzzy logic controller (intuitiveness, simplicity, easy implementation, and minimal knowledge of system behavior) to obtain a robust, fast, and precise closed-loop control of speed of induction motor. Hie control algoritlim of the drive system has been implemented by a pentium PC, which uses PCL-208 data acquisition card for communicating with the inverter and the motor. The simulated and practical results show that fuzzy logic controller can give fast torque response and precise control of speed ot induction motor drive system-Keywords: Indirect field oriented control, Vector control, Fuzzy control, Data acquisition card

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*Title   :   **Reactive Power Compensation For Induction Generator***
*Author(s)   :   **Chakraborti Anirban***
*Roll No   :   **9710406***
*Supervisor(s)   :   **Dubey G K***

Abstract

Traditional method of Static Reactive Power compensation for Self-Excited Induction Generator based on Switched Capacitor or Fixed Capacitor and Thyristor controlled reactor are increasingly being replaced by new approaches utilizing the concept of Synchronous Link Converters. The two main advantages for which this class of reactive power compensation schemes have drawn tremendous interest from the researchers and power regulating authorities, are- 1) considerable reduction in ac passive elements thereby reducing size, losses and projected cost, and 2) near constant reactive power generation capability (both leading and lagging) even during low voltage condition. Moreover, as these type of compensators can be realized by self-commutated devices, better controllability over switching non-linearity is ascertained. Hence harmonics generated by this compensators remain low. A new control scheme for SEIG with controlled current SLCVC is taken up as the first investigating object of the dissertation. The present scheme is realized by a simple control structure thereby enhancing the system reliability. The scheme has a SLCVC in parallel with a fixed valued capacitor bank. The fixed valued capacitor bank is used for starting SEIG. It also supplies the reactive power, which is the average of the reactive powers needed at full load and at reduced load. The mathematical model for the scheme is developed. The validity of the scheme is verified through extensive simulation. Attempts are also made to analyze the steady-state performance of SEIG both in three-phase and single-phase case. Conventionally two analysis techniques are used. They are 1) Loop impedance method, and 2) Node admittance method. In this dissertation Loop impedance method is used. Capacitive reactive power required by an Induction generator is also determined to facilitate the design of the close-loop control scheme and to calculate the value of the capacitor bank needed for the closed loop scheme. A design technique has been provided for the Voltage-source Converter. Thus in this dissertation a consolidated effort is made to develop a reactive power compensation scheme with power-electronic interface. The viability of the proposed scheme can be confirmed through experimental studies

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Title   :   ***Reduced Network Model For Power Transfer Feasibility Assessment***
Author(s)   :   ***Singh Himanshu Kumar***
Roll No   :   ***9710419***
Supervisor(s)   :   ***Srivastava S C***

Abstract

In the upcoming deregulated electricity environment, transmission system operators face a lot of external network influence as a result of large number of inter-regional power transactions due to large number of market participants. Numerous external network equivalent models have been used in the past which reduce the external network completely and their biggest drawback lies in their inability to model any changes occurring in the external system. Consequently their effect on the internal system cannot be studied. This thesis presents an algorithm to form an external network equivalent to some details. The extent of details can be controlled by the user based on the requirements to model external changes in the equivalent for power transfer assessments, especially in a deregulated electricity system. The proposed method has been tested on two practical German electricity networks

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Title : ***Voltage Stability And Svc Placement In MTDC-AC***
System
Author(s) : ***Shrinivas C Chaudhari***
Roll No : ***9710415***
Supervisor(s) : ***Sachchidanand &Prabhu S S***

Abstract

methodology for deriving the voltage sensitivity factor [VSF] matrix of MTDC-AC system with synchronous/asynchronous links and with different kinds of HVDC controls is developed. Using the methodology, a detailed mathematical formulation of [VSF] matrix for reduced Northern Regional Electricity Board System (NREB), which has an embedded bipolar DC line, is presented. The Q - V modal analysis is used to identify critical modes of the system. By calculating bus participation factors, buses involved in the critical modes are found out. Three options are given for possible SVC positions. With proposed SVC's, voltage stability of the system is determined. Trunk line outages are considered to find out worst case line outage from voltage stability viewpoint. Voltage stability for worst case line outage, with and without proposed SVC's, is determined. For the base case, SVC outage condition is also considered to analyze the effect of each SVC on voltage stability of system. Two alternatives for strengthening of the AC system, with additional parallel lines and by series compensation of lines, are evaluated from voltage stability viewpoint. Incorporation of three SVC's has been found to be the best solution to enhance system voltage stability. Voltage collapse study of the system, with one DC pole outage, is carried out just with one additional SVC in the system. Two locations for placement of this SVC, namely at Lucknow 400 kV and Moradabad 400 kV buses, are examined. The effect of different voltage settings of SVC's on voltage stability is evaluated. It is indicated that voltage collapse of the kind encountered in the NREB system in the recent past can be avoided by just one additional SVC of appropriate rating placed preferably at Lucknow 400 kV bus.

Title   :   Simulation Of An Active Filter Using A 3-Level Inverter
Author(s)   :   Bisht Anil
Roll No   :   null
Supervisor(s) :   Joshi Avinash

Abstract

Power electronics equipments converts power from one form to the other, as required by the consumer, with ease of control and high efficiency. These equipments are used in various applications. These P.E. equipments have inherent non-linear characteristics, introduce harmonics into the source and consume reactive power. * In this thesis shunt active filter is analyzed in detail to eliminate these unwanted harmonics of the source and to compensate the reactive power of the load. A three level inverter is discussed, which with the control circuit acts as an active filter. The three level inverter has the advantage that switches with low power ratings can be used, hence one can use high frequency switches. The load currents are sensed and command currents for the active filter are generated, which would make the source currents sinusoidal. Using various controllers the active filter current is forced to follow these command currents. Thus the source only provides the real power, harmonics and reactive power are provided by the active filter. Active filter has been discussed both for balanced and unbalanced loads. In the end active filter is tested for various types of non-linear loads. The active filter is found to be effective in eliminating the harmonics of the source and improving the source power factor to unity

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Title   :   ***Investigation Of Complex Domain Back Propagation Algorithm***

Author(s)   :   ***Sidana J S***

Roll No   :   ***9810424***

Supervisor(s)   :   ***Kalra Prem Kumar***

Abstract

In recent years there has been a great deal of interest in Artificial Neural Networks and Their Applications. One of the most popular neural network models is the multi - layer network and its related back propagation algorithm. It has been applied to v arious fields such as data compression, image processing and speech recognition. In many application however, the inputs and output of a system are represented by complex valued signals. In such cases there is a need to use complex weights and activation f unction to approximate the behavior of such systems. Results have appeared in the literature, which generalize the well - known back propagation algorithm for training a feed forward neural with complex weights. Several complex activation functions have been considered by different authors. In this work an attempt has been made to investigate the back propagation in the complex domain with different activation functions. An attempt has also been made to compare the performance of each of the complex back propagation algorithm (CBPA) with different activation functions. First the CBPA is investigated with activation functions proposed by Haykin, Piazza and Georgiou and their performance is compared on the basis of three test problems, namely: Geometric transformation, XOR problem, classification and identity mapping. In addition the usage of complex learning factor and effect of using a momentum term is explored. In the end a modified activation function is proposed along with certain modifications in th e network architecture and the change of learning rate. The results indicate that the modified activation function gives very good results, however in as far as the problem of Geometric transformation is concerned, the best results are obtained with Piazza 's algorithm. There is scope for improvement by incorporating weight pruning also

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