

M.TECH. THESIS ABSTRACTS 2002

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Microelectronics, VLSI & Display Technology

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Title : *Modeling And Simulation Of Organic Light Emitting Diode (OLED)*
Author(s) : *Prasad C G Narasimha*
Roll No : *Y010408*
Supervisor : *Mazhari Baquer*

Abstract

This work describes the simulation and modeling of current voltage characteristics of polymer light emitting diode. To understand the device characteristics first a single layer organic device with single carrier injection is studied. The simulations are used to clarify the role of barrier height, device thickness and mobility. A new analytical model is developed based on a simple mobility model that matches well with the experimental characteristic. It is shown that in a single layer OLED with both electron and hole injection recombination takes place primarily near the cathode due to the much smaller electron mobility. It is also shown that with the proper adjustment of the anode barrier height recombination is spread uniformly over the bulk. In the two - layer device, presence of barrier at the organic - organic interface results in most of the recombination - taking place at the interface of two organic layers. It is shown that to get good device efficiency, hole barrier at the interface should be sufficiently large and greater than 0.3 eV. Electron barrier at the interface however plays no significant role. It is also shown that the electron transport layer largely determines turn on voltage of the device.

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Title : *An Improved Four TFT Circuit For Active-Matrix Organic Light Emitting Diode (AM-OLED) Display*
Author(s) : *Bhowmick Soumitra K*
Roll No : *Y010437*
Supervisor : *Mazhari Baquer*

Abstract

Active Matrix OLED (AM - OLED) displays are being actively developed as the flat panel display technology of the future due to their several advantages including wide viewing angle, fast response time, thin size and cost. For the success of AM - OLED display, it is important that the pixel characteristics be independent of variations in OLED and TFT characteristics. The pixel circuits proposed so far achieve this requirement but suffer from low output current range. In this work, we show that the output current range can be enhanced threefold by minimizing clock feed through effects through proper transistor sizing. We also propose a new pixel circuit with high output current range and less number of control signals using four polysilicon TFTs. Good performance was obtained for output currents as high as 25 μA thereby making the pixel circuit suitable for high - resolution OLED displays

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Title : *Study Of The Dynamic Response Of Organic Light Emitting Diodes And Crosstalk In Passive Matrix Displays*
Author(s) : *Mehrotra Sanjay*
Roll No : *Y010438*
Supervisor(s) : *Mazhari Baquer*

Abstract

Displays are found today in thousands of products from wristwatches and cellular telephones to notebook computers and TV's they are also a key component in the plethora of emerging communication and computing products. Thin, flat panel displays (FPDs) meet most of the present day requirements. As of now liquid crystal displays (LCDs) have the major market share of FPDs. But LCD's have limitation of viewing angle, operating temperature range, backlighting, higher power consumption and are heavy as well as fragile. Display based on organic light emitting diodes (OLEDs) have made significant progress in the last decade and are poised to capture major chunk of the FPD market in the next few years. This is because OLED displays do not suffer from any drawback of LCDs and are far more efficient. The organic display technology uses two types of matrix arrays. The "passive matrix" and the "active matrix". The passive matrix display technology is simpler from some problems such as crosstalk. Active matrix on the other hand is much more efficient but is more expensive as compared to passive matrix. The present work describes a detailed study of crosstalk in passive matrix OLED displays. For study, initially a SPICE model of the OLED has been developed, the I - V characteristics of which match the experimental data. To identify the reasons for crosstalk in passive matrix, dynamic response of an OLED alone, and in passive matrix of different sizes has been studied by means of simulations. Study of DC as well as dynamic mode of operation of passive matrix under different conditions of row scanning data input to columns has been studied. Comparison of errors in actual pixel output has been done for DC and dynamic cases. Flow of currents through different pixels and their elements under different conditions have been studied to identify reasons for crosstalk. A modified pixel model has been developed which eliminates crosstalk almost completely and offers far better response time. The armed forces use a wide range of electronic equipment, some of which do not require very large size displays. The basic requirements is of displays, which are portable, rugged, fast, consume less power and cost - effective. Passive matrix OLED displays meet these requirements to a large extent. Especially, roll - on (flexible) displays will be of great utility in the armed forces

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Title : *FPGA Implementation Of Auto TV Tracking Algorithms*
Author(s) : *Singh Manvendra*
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Supervisor(s) : *Mazhari Baquer*

Abstract

Real - time target tracking in video sequences is an essential component of any Electro -optical system. The auto TV tracker computers the target position in successive frames with respect to the center of the field - of - view (FOV) using image tracking techniques. In the present work centroid and correlation based tracking algorithms have been discussed, designed and implemented into FPGAs using hardware description languages (i.e. VHDL). The centroid algorithm has been designed using loop pipelining method for real -time application. This design approach has been successfully simulated and implemented into Xilinx's FPGA XC4008E. For the implementation of correlation based tracking algorithm, three - memory approach has been used to cater the real - time requirement. The correlation based tracking uses the Sequential Similarity Detection Algorithm (SSDA) for the calculation of match point as it requires less hardware than the classical algorithm. This technique has been designed, simulated and successfully implemented into Xilinx's FPGA XC4020E. The advantage of using FPGA implementation is that it can work as a stand - alone system and may be integrated with other system by using the standard communication protocol. This design approach has given the system, much - needed reconfigurability to suit the customer's requirement. It has also resulted in reduction of PCB fabrication time since the hardware remains essentially the same although the system design may change

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Title : *A New Approach To Reduce The Capacitance Value In A Binary Weighted Switched Capacitor Digital To Analog Converter*
Author(s) : *Bala Phalguni*
Roll No : *Y010412*
Supervisor(s) : *Mazhari Baquer*

Abstract

Switched capacitor digital to analog converter with binary weighted capacitor array suffers from the disadvantages that the area required to fabricate the capacitors doubles with each additional bit of resolution. In this work, a modified architecture is proposed which overcomes this disadvantage by using the same value of capacitor for each bit of the DAC. This is achieved by trading the frequency of operation for the area of the DAC. Simulated results for the proposed architecture for 0.5 μm CMOS technology show INL and DNL less than 0.3LSB at a conversion frequency greater than 1MHz

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Title : *A New Optimization Based Approach For Topology Seletion Of Analog Circuits*
Author(s) : *Nagar Sachin*
Roll No : *Y010443*
Supervisor(s) : *Mazhari Baquer*

Abstract

In the present work, a two step topology selection approach has been presented for cell level analog circuits. The first topology selection step is based on the fact that each topology is characterized by a unique set of constraints among the specifications. Depending on the satisfaction of these constraints, the successful topologies than undergo the second step of topology selection. In this case the simplest topology, which upon design and found to satisfy the specs, is selected as the final topology. The validity of this approach has been demonstrated with the help of basic analog modules like current mirrors and voltage driven amplifiers of various configuration. For the relatively complex differential amplifiers, a hierarchical approach is used

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Title : *Modeling Of TFT In The Kink Region Using Impact Ionization And Threshold Voltage Reduction Phenomenon*
Author(s) : *Ravi P*
Roll No : *Y010435*
Supervisor(s) : *Qureshi Shafi*

Abstract

A new analytical model for the current-voltage characteristics of polycrystalline silicon short channel thin-film transistors (poly-Si TFTs) in the kink region is presented. In this model increase in the current in the kink region is attributed to the phenomena of threshold voltage reduction together with impact ionization. The model has a_n , b_n and α as parameters which can be easily extracted and a method is proposed to find them. The model when tested on experimental data shows satisfactory agreement between the model and the data. The proposed analytical model is suitable for automatic parameter extraction and can be used for computer-aided design.

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Title : *Complementary A-Si: H/Organic TFT Circuits*
Author(s) : *Sonkar Dharmesh Kumar*
Roll No : *Y010411*
Supervisor(s) : *Mazhari Baquer*

Abstract

This thesis presents an estimate of performance that can be obtained from complementary CMOS circuits built using n-type amorphous Silicon and P-type organic TFT(pentacene). The results from this work show that although basic gates with good static characteristic can be designed the dynamic response is inferior by at least three order of magnitude due to the poor mobility of carriers in both amorphous Silicon and Organic TFTs Results from more complicated circuits such as a simple 8-bit microprocessor indicate that the clock speed is lower than a bulk silicon circuit of comparable geometry by again three orders of magnitude

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Title : ***Studies On Fast Infrared Indoor Optical Wireless Links***
Author(s) : ***Kuruvilla Nisha***
Roll No : ***Y010424***
Supervisor(s) : ***John Joseph***

Abstract

In recent years Wireless Infrared (IR) communication systems are being used widely to provide portable data communication at low cost. IrDA standards have emerged in order to meet the growing demand in this field. This thesis deals with the study of fast infrared indoor (FIR) indoor optical wireless and the design and implementation details of an experimental IrDA compatible FIR optical wireless link. The experimental IrDA compatible FIR link achieved a link length of 16cm. 4Mb/s data is encoded with the help of a 4PPM encoder and wrapped into a packet form along with preamble, beginning of frame and end of frame pattern with a FIR data wrapper. The FIR data wrapper for 256 chips is implemented with the help simple discrete components. These data were transmitted using a low cost IR LED as the source. The receiver is PIN diode based, with a JFET as the front - end amplifying device. The clock from the received signal was recovered back with the help of a digital PLL. The encoded data was decoded back with the help of a 4PPM decoder

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Title : *FDTD Analysis Of Suspended Stripline Overlap Discontinuity*
Author(s) : *Negi Rajendra*
Roll No : *Y010428*
Supervisor(s) : *SachidanandaM*

Abstract

The FDTD is the most popular analysis technique for analysis of microwave circuits due to its ability to simulate very complex structures with fairly good accuracy. It is also the only method that can give the frequency dependent parameters in a single simulation. In this thesis finite difference time domain (FDTD) techniques is used to analyse the SSL overlap discontinuity. This SSL discontinuity is used as a building block in various types of filter design. The three-dimensional FDTD formulation in Cartesian coordinate system is done for the symmetrical overlap discontinuity in SSL where both side of the substrate is used. A FDTD code is written based on the Yee algorithm for this specific problem. Maxwell's equations are discretized using the central differencing scheme for the differential equations. Code written for the simulations is then used for analysis of a structure similar to the one used in practical applications but much smaller in size to facilitate the computation. The results of wave propagation obtained are then compared with the expected results for such structure. The time domain plots are also analyzed. From the time-domain data acquired through simulation, frequency dependent scattering parameters of the discontinuity are obtained. The several modifications that could be done to the code are listed

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Title : *Integration Of Planar Circuit Analysis Into A Microwave Circuit Design Software*
Author(s) : *Shukla Sharad*
Roll No : *Y010441*
Supervisor(s) : *Sachidananda M*

Abstract

There are a number of commercially available software, which can be used for the design, and analysis of microwave circuits. But their high costs, copyright restrictions and training requirements restrict their utility in the academic environment, as the requirements for the students is to understand the approach and theory behind the development of such a software. Hence, the possibility of developing a simple Graphical User Interface software for microwave circuit design is explored. The basic framework of the software is such that it can integrate different computational techniques available for the analysis of microwave circuit design. As a test case for integration of computational technique, planar circuit analysis is integrated into the software. Planar circuit analysis provides a method for modeling of microwave circuit elements as a 2 - dimensional circuit, which is based on the assumption that E - field component is present only in one direction, and hence there is no wave propagation in that direction. By the formulation of planar circuit modeling 2 - dimensional wave equation can be solved for the E - field under given boundary conditions. The Green's function approach is used to find the Z - matrix elements for various ports on the periphery of the planar circuit element of simple geometry. Z - matrices are converted into S - matrix elements for characterization of the microwave circuit. Further Green's function approach has been extended with the use of segmentation and desegmentation to account for complicated geometry of microwave circuit element. Combination of the approaches is used for the analysis of three planar structure, rectangular resonator, single step and double step discontinuity for a frequency range from 0.01 to 15 GHz. The substrate Rexolite 1422 type III $\epsilon_r = 2.53$ is considered in the analysis of the examples. The wave guide model is used to calculate the frequency dependent effective width $w_{eff}(f)$ and $\epsilon_{eff}(f)$ for accurate characterization over the desired frequency range.

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Title : *Analysis Of Television Deflection Yoke*
Author(s) : *Maiti Subrata*
Roll No : *Y010451*
Supervisor(s) : *Sachidananda M*

Abstract

The thesis presents a method for analyzing the magnetic field inside TV deflection yoke (DY) and computing the electron beam trajectory. This method is based on an integral equation formulation in terms of the Fourier harmonics of the fields as well as the sources of the field. The magnetization due to the ferrite core and the consequent changes in the field is formulated in terms of the equivalent magnetic charge distribution which produces the same magnetic field outside the core and zero field inside the core volume. This procedure together with the Fourier harmonic expansion of the field and the source distribution lead to a one-dimensional boundary integral equations, which is solved numerically. The solution gives us an equivalent magnetic charge distribution on the surface of the core. The field in the interaction zone of the DY is obtained from the coil current distribution as well as the equivalent magnetic charge distribution using the Biot-Savart law. The electron beam trajectory is obtained from the equation of motion of an electron in the magnetic field. To reduce the computation time the magnetic field is computed only at points along the trajectory dynamically. After a brief review of some of the practical methods that have been successfully applied to analyze DY, the basic aspects of magnetic deflection are presented. The basic magnetostatic equations governing the generation of magnetic field are also briefly reviewed. The SMCM and the Fourier spatial harmonic expansion technique for three dimensional magnetic field calculations are studied. Spatial harmonic components of the magnetic fields generated by the magnetized ferromagnetic core of deflection yokes are derived by the SMCM. The orthogonality of harmonics, a one-to-one relation exists between each harmonic of the field distribution and that of the surface magnetic charge distribution. By this method, the two dimensional integral equations for magnetic charges are reduced to a set of one-dimensional equations, one for each order of charge harmonics. A toroidal coil with a radial winding and a saddle coil with a non-radial winding are analyzed. Programs are written for solving the integral equations for the equivalent surface magnetic charge distribution, and then calculating magnetic field in the interaction zone of the DY using the Biot-Savart law. The electron trajectory computation using the equation of motion of an electron in the presence of static magnetic field is programmed. The effect of the time step on the accuracy of the electron trajectory and the final point of impact on the TV screen is analyzed. The trajectory computation program outputs a dot pattern of the TV screen generated by stepping the coil currents in discrete uniform steps. The dot pattern shows the linearity and the aberrations in the picture due to the errors in the DY magnetic field

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Title : *Analysis Of Antipodal Slotline*
Author(s) : *Gangadharappa M*
Roll No : *Y010421*
Supervisor(s) : *Sachidananda M*

Abstract

In this thesis spectral domain immittance approach is used for the analysis of antipodal slotline. Although antipodal slotline fields very little use as a transmission line element in microwave integrated circuits, the present work is motivated by a need for the characteristics of this structure encountered in a novel antenna structure. In this antenna the radiating point is an antipodal slotline on a low dielectric constant substrate. No data is available in the open literature on the antipodal slotline on a low r substrate. Hence we set out to analyze the antipodal slotline. The technique chosen for the dispersion analysis consists in using the concept of the equivalent transmission line in the spectral domain of the Fourier transform to obtain matrix eigen values for the structure. To simplify the analysis procedure somewhat, we selected a closed geometry. The side walls when far removed from the slot, do not affect the propagation. However, because of the presence of conducting walls the substrate is closed structure and the Fourier integrals are reduced to Fourier series representations. This simplifies the computation, and using this analysis procedure the characteristics of antipodal slotline have been evaluated

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Title : *Analysis Of Step Discontinuity In The Ground Plane Of A Suspended Stripline*
Author(s) : *Ashesh C B*
Roll No : *Y010409*
Supervisor(s) : *Sachidananda M*

Abstract

In this thesis mode-matching technique is used for the analysis of step discontinuity in ground plane of suspended strip transmission line. The motivation for the present work came with the requirement to increase or decrease the characteristic impedance beyond the values limited by the strip widths. It was found that the characteristic impedance could be increased or decreased by changing the ground plane spacing. Modal analysis of step in the ground plane of suspended stripline requires the E- and H-field components on either side of the discontinuity. This needs the characterization of suspended stripline to obtain the propagation constant. Spectral domain immittance approach is used for this analysis. A program in MATLAB is written to obtain the propagation constants. Once the propagation constant is obtained the electric and magnetic field components can be derived. The variation of normalized wavelength with respect to the SSL dimension parameters have been plotted. The formulation of the mode matching has been done. The modal analysis of the step discontinuity needs as may as 15-20 higher order modes in addition to the dominant mode. The analysis could not be completed as results for the dominant mode only were obtained

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Title : *Environmental Impact Assessment Of In frastructre Projects With Special Reference To Road Sector In India*
Author(s) : *Lachhwani Prakash*
Roll No : *Y011711*
Supervisor(s) : *Rath Binayak*

Abstract

Throughout history in the developed world, transportation infrastructure has played an important role in supporting the economic development of communities. Safe and efficient transportation systems are vital to developing countries to provide boost to their economic development. Transportation plays a key role both in the regions capacity to participate in the global economy and in the well being of its communities and people transport infrastructure sector the highway sector promotes speedier flow of inputs and outputs, which are necessary for promoting industry and agriculture. Like many developing countries, India has fallen short of roads as compared to the demand, especially in the key trunk routes and more importantly, the quality as well as the carrying capacity of major arterial routes pose severe bottlenecks in the swift movement of goods as well as the people. The present study attempts to project the existing bottlenecks in the Indian road infrastructure and has identified that heavy resource crunch is one of the main bottleneck due to which the previous assets created at huge investment have been left to deteriorate severely which implies further loss to the nation. The various aspects and risks involved with privatization are also explored with the help of EIA studies. As reported in the literature, the EIA process has been conceived to consist of three steps namely, impact identification impact prediction and impact evaluation. While the impact identification step is simple and relatively well defined and practiced but the impact prediction and impact evaluation has been the subject of discussion with conflicting view points for several of the development projects. As observed from the analysis of the few EIA reports thatthe evaluation part of the environmental attributes is easily put into the question as no exact guidelines are reported in the standards published the available guidelines do not specify any scale and criteria for importance on which the impacts can be analysed. Hence it would be necessary to standardize the procedure by evolving the new methodology that can be followed to assess the probable impacts quantitatively and on a weighted scale. In view of the emerging R&R issues associated with development projects in India those issues increasing importance in infrastructure projects. In the road project as they are having long length of corridor in terms of impact generation the numbers of the people affected by them are significant unfortunately. The best site for road development (flat an stable) is also tends to be ideal for agriculture. Through the literature review and the questionnaire. It was apparent that there are many occasions where the R&R process fails. The need for the national R&R policy is also emphasized in the study. This study suggests that solution to remove the existing bottlenecks in Indian road infrastructure lies in the privatization in the form of BOT. In which the risk should be allotted optimally between government and private party in addition to that physical concessions, tax incentives, one-window timely environmental clearances and guarantee for the minimum expected returns from the traffic should be provided to the investors. The study, attempts to develop a representative methodology for conducting EIA studies of the road project that could

overcome the shortcomings and limitations of evaluation aspects of EIA's. The suggested representative methodology can work as a standard for the quantification of the impact so that the uniformity can be ensured between different EIA studies through standardization of the evaluation procedure the subjectivity in the EIA's can be reduced so that the produced results are easy to replicate in future. By undertaking the case studies of the two road projects, vadodara-Halol Toll road (VHTR) project in Gujarat and sikandra- Khaga road (SKR) project in Utter-Pradesh attempt has been made to highlight the present practice of R&R policies and the various issues concerning R&R. the social concerns and impact have been identified with a view to suggest remedial action plan (RAP). The methodology adopted includes extensive interaction with the local population in the area including PAP's, commuters and project authorities. The study found out that the VHTR project in Gujarat had done R&R as compared to the SKR project which is due to the privatization. The study suggests that assured timely payment of compensation considering the replacement cost not the market value should be given to the PAP's. The benefits to the local villagers should also be considered like enhancement in the basic amenities & safety R&R should ensure that the standards of living of the affected persons is at least restored to the pre-project level and preferably improved above the levels they enjoyed before the implementation of the project

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Title : *Simulation Studies Of Multi-Carrier Code Division Multiple Access On Frequency Selective Rayleigh Fading Channel*
Author(s) : *Rajat*
Roll No : *Y010430*
Supervisor(s) : *Chatterjee P K*

Abstract

The recent advances in the field of mobile communication Internet access, video transmission etc have resulted in the demand for high data rate transmission. Multi -Carrier Code Division Multiple Access (MC CDMA) which uses the properties of Orthogonal Frequency Division Multiplexing (OFDM) and Code Division Multiple Access (CDMA) holds one of the possible solutions to the ever increasing demand on the speed of transmission. In this thesis, MC CDMA using Quadrature Amplitude Modulation (QAM) for modulating of the incoming data on a frequency selective Rayleigh fading channel is studied. QAM has been considered in order to increase the rate of transmission, as QAM requires less bandwidth at the cost of increased transmission power. Also simulation have been carried out for Additive White Gaussian Noise Channel (AWGN) for the purpose of comparison. In this work, the downlink performance of the QAM based MC CDMA system is studied for both the Additive White Gaussian Noise channel and Rayleigh fading channel using different diversity combining techniques. In order to improve the performance of the QAM based MC CDMA system a Respread MC CDMA system is proposed in which the incoming data is spread twice using two sets of spreading codes before transmission. The same is compared with that of the MC CDMA system using codes of various types and lengths. The simulation results show that Respread MC CDMA system performs better than the conventional single spread MC CDMA system. The improved performance is achieved without increasing the complexity of the receiver, which would not have been in the case if error correction codes were used.

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Title : *Analysis Of Non-Stationary Signals By Time Frequency Distributions*
Author(s) : *Harshavardhan B*
Roll No : *Y010406*
Supervisor(s) : *SircarPradip*

Abstract

amplitude and frequency or sums of such amplitude and frequency - modulated components. However, the main problem is the numerical estimation of these time dependent characteristics. Time - frequency representations offer a convenient setup to estimate these parameters which tend to concentrate the energy density in disjoint regions of time - frequency plane. Scalogram, the modulus square of continuous wavelet transform, has been used as a time - frequency representation in the present work, the local maxima of Scalogram, also known as ridge of the wavelet transform, contain crucial information on the characteristics of the signal. Indeed, they mark the regions of the time -frequency plane where the signal concentrates most of its energy. Complex AM and FM signal models are introduced and their suitability to model speech phonemes has been studied, the parameters of which are estimated using Scalogram

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Title : *Tolerance relations for signal processing*
Author(s) : *Majumder Santanu Bijoy*
Roll No : *Y010449*
Supervisor(s) : *Venkatesh K S*

Abstract

The idea of a tolerance relation evolved many years ago. But it has not been applied for DSP problems before. We study this mathematical tool for DSP problems. The report covers the notion of tolerance relations; its application in signal representation and reconstruction for standard DSP problems like detection of video shot change, and the detection of the appearance of a new objects in a scene. The proposed method detects objects using a device we term a tolerance meter, then builds an object - to - objects correspondence between consecutive frames using tolerance criteria and finally also detects changes using a tolerance relation. We also study the application of tolerance to detect textural objects. The algorithm we propose shows promise

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Title : ***Speech Coding By Complex Am And Fm Signal Models***
Author(s) : ***Singh Deshraj***
Roll No : ***Y010410***
Supervisor(s) : ***Sircar Pradip***

Abstract

Complex AM and FM signal models can be used for representation of non-stationary signals such as speech [1,2,3]. Complex AM signal model has been found to be suitable for sustained voiced speech phonemes [1,3], while Complex FM signal model can be used for representation of sustained unvoiced speech phonemes [2,3]. But this type of classification is not appropriate, in this study it is shown that the phonemes having most of their energy in low frequency region can be fitted by complex AM model, while for those having most of their energy in high frequency region Complex FM model is suitable. Also in sustained vowel and consonant sounds the gain of the signal is constant so Complex AM and FM models can directly give the parameters. But in natural spoken speech signal the gain varies with time. This study considers the time-varying nature of speech signal gain and explains principle of parameter estimation by these two models by making gain of speech signal constant. Time varying gain of the speech is estimated and fitted by polynomial model. The parameters of constant gain speech signal and coefficients of polynomial are coded.

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Title : *Simulation Studies Of WCDMA Rake Receivers For A Rayleigh Fading Channel*
Author(s) : *Vijayaraghavan G Deepa*
Roll No : *7010413*
Supervisor(s) : *Sinha Vishwanath*

Abstract

Mobile Radio Networks provide mobile connectivity for users who may themselves be mobile or stationary (connected to fixed networks). Frequency Division Multiple Access (FDMA). Time Division Multiple Access (TDMA) code Code Division Multiple Access (CDMA) are the important multiple access techniques generally used. In CDMA, each user is allowed to use the entire bandwidth, like TDMA and for the entire duration of the call, like FDMA. This is enabled by assigning a unique spread sequence (code) to each user. CDMA has also been used in the second - generation cellular mobile system. However, the necessity of wideband services such as high speed internet access and video/high quality image transmission has led to the evolution of third generation mobile communication systems, generally termed Wideband CDMA (WCDMA). The International Telecommunication Union, s Radio communication Sector (ITU - R) is a 3 rd generation standard which can support bit rates upto as high as 2 Mbps and is aimed to operate in any propagation environment such as indoor or outdoor stationary or mobile. Two main factors adversely affect the performance of a CDMA system. They are intersymbol interference and fading. Rayleigh fading may be considered the most critical disturbance in a wireless communication system. It is generally modeled as a multiplicative process of the transmitted signal with a time continuous zero mean complex Gaussian distortion. To combat the effects of multi - path fading, the communication link must be carefully designed based on the properties of the time continuous channel. To reduce the influence of deep fades on the error probability of a communication channel, various techniques like coding diversity combining etc have been employed. Diversity reception techniques like frequency diversity, time diversity space diversity and path diversity mitigate the destructive effects of multiple independent branches over which the signals are transmitted. The multi path signals are appropriately separated first, and then recombined in the receiver. Rake receivers used to provide path diversity, are attractive for their performance. This thesis explores the performance of diversity combining techniques used to solve the problems imposed by fading on a mobile communication system. A rake receiver has been simulated for radio interface WCDMA for a rayleigh fading channel. The performance of three important diversity combining techniques viz. maximal ratio combining equal ratio combining and selection combining have been compared.

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Title : ***Model Based Approach To Non-Uniform Vowel Normalization***
Author(s) : ***Kumar S V Bharath***
Roll No : ***Y010442***
Supervisor(s) : ***Umesh Srinivasan***

Abstract

A model based vowel normalization procedure is proposed based on our study of the nature of relationships between formant frequencies of speakers. Conventionally, uniform scaling relationship between formant frequencies of speakers is assumed. In this thesis, we explore non-uniform scaling relationship between formant frequencies and then do appropriate speaker normalization for application in automatic speech recognition. The proposed model based vowel normalization procedure is independent of vowel class and is completely derived from Peterson & Barney and Hillenbrand et al. vowel formant databases. The frequency-warping necessary to do non-uniform vowel normalization using the model based procedure is similar to log-warp function. This method has been analysed using various cluster discriminability measures, scatter plots and HMM-based vowel recognizers. In this thesis, we also made a comprehensive study on the vowel normalization methods based on frequency dependent scaling of formant frequencies and scale-invariant transformation, each of which shows that the frequency-warping function required for normalization is a compromise between log-warp and mel-warp functions. Using separability measures like F-ratio and residual variance, the proposed method is found to be superior to Nordstrom & Lindholm's uniform scaling method and Fant's non-uniform normalization method. In addition, we have also compared the vowel-recognition performance of the proposed method with the other methods in a HMM-based recognizer. Using recognition accuracy as the performance measure, the proposed model based method is found to provide the best normalization for cross-gender cases.

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Title : *Performance Of MMSE Receiver In Ds CDMA Systems Over A Fading Channel*
Author(s) : *Kumar Pankaj*
Roll No : *Y010426*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

. Performance evaluation of MMSE receiver for DS - CDMA system in a frequency non selective Rayleigh fading channel has been considered. Two kinds of receives have been considered chip matched and block matched. If number of users are low then MMSE receiver with block matched filtering performs better as compared to MMSE receiver which chip matched filtering. Results show that as the fading rate increases the performance deteriorates for both. But the degradation in performance for MMSE with chip matched filtering is more as compared to MMSE with block matched filtering. We have shown that a better BER can be obtained by using more number of training bits. The complexity can also be reduced when we use block matched filtering.

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Title : *Simulatiuon Studies On The Performance Of Ds-CDMA Systems Using Bandwidth Efficient Modulation Schemes*
Author(s) : *Krishna V Hari*
Roll No : *Y010453*
Supervisor(s) : *ChaturvediAjit Kumar*

Abstract

In this thesis an attempt has been made to evaluate the performance of a DS-CDMA system using MSK and GMSK modulation techniques differential detection in a Rayleigh fading multipath channel. Compared to BPSK, MSK and GMSK are known to perform better with respect to spectral efficiency and adjacent channel interference. We evaluate the BER under various channel conditions and compare them with BPSK

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Title : *Spectral Warping And Noise Reduction In ASR Systems*
Author(s) : *Sharma Rajesh*
Roll No : *Y010432*
Supervisor(s) : *Umesh Srinivasan*

Abstract

In this thesis we have worked on two main problems faced by automatic speech recognition systems namely, speaker variability and background noise. The problem of speaker variability has been investigated using non-linear spectral warping functions for speaker normalization. We have proposed a model for the warping function and the parameters of this warping function have been estimated from speech data. This warping function has been compared with the more commonly used log warping and Mel warping functions. In the study of robustness to background noise, we have compared the recognition performance of WOSA (weighted overlapped segment averaging) and Mel filter bank methods of feature computation under various SNRs. We have also proposed a method for local estimation of the noise PSD that can be used in spectral subtraction. We present results comparing the recognition accuracies of the conventional method i.e. without any preprocessing of noisy speech with or proposed method of noise compe

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Title : ***An Efficient Color Image Retrieval System Using 2-D Representation Of Color***

Author(s) : ***Kant Shashi***

Roll No : ***Y010450***

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

Abstract

In this thesis we describes an efficient retrieval method based on indexing in 2 - D color space. This approach identifies the dominant colors in the image and uses them as a query for similarity retrieval. The dominant colors in the image are indexed in 2 - D space there by avoiding the problems associated with higher dimensional indexing space. The Y - C representation of color is obtained from a spiral approximation of UV color space. A simple similarity measure for the new (Y - C) space is discussed. The dominant colors in an image are obtained by segmentation of the image into similar color regions and by identification of a dominant color for each region. We propose a segmentation algorithm based on homogeneity and features of the color signal C. the performance of the segmentation algorithm is also analyzed. The retrieval performance is shown for a data based of 1000 images and retrieval accuracy is measured in terms precision and recall.

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Title : *Digital Video Watermarking Using Variable Temporal Length 3d-Discrete Cosing Transform*
Author(s) : *Kumar Anil*
Roll No : *Y010404*
Supervisor(s) : *Gupta Sumana*

Abstract

With an increase of digital data rate on Internet it has become very necessary to control the piracy. Several standards like MPEG-2, MPEG-4, MPEG-7 and MPEG-21 are presently available to represent data in compressed form. So piracy or copying of the data unofficial from Internet has become a common problem. In such cases watermarking of the data is one of the techniques by which we can control piracy and condemn illegal copying. In this thesis we develop an algorithm for digital watermarking of 3D-DCT coded video sequences. A variable length 3-D discrete cosine transform is chosen to give compression by exploiting the redundancy of the video sequences in temporal domain. Variable length 3D-DCT has been performed using a science change detector. We have proposed the embedding of watermark signal in the middle frequency range of transform coefficient as the sensitivity of human eye in this frequency range is minimum. This preserve perceptual quality of video sequences. The approach adopted for watermarking is to embed watermark in the transformed domain using variable temporal length 3D-discrete transform. As the 3D-discrete cosine transform block consists of both the spatial and temporal details we spread the embedded watermark signal in spatial and temporal domains. This makes the proposed method robust against some attacks like compression and frame skipping. The present approach can be used for HDTV, DVD and medical images.

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Title : *Texture Classification And Segmentation Using Angular Wavelet Frames*
Author(s) : *Mohan K Murali*
Roll No : *Y010416*
Supervisor(s) : *Gupta Sumana*

Abstract

In this thesis we describe a new approach to characterize texture images at multiple scales using angular wavelet frames (AWF). We have constructed 2D AWF by applying frequency transformations to the prototype filters of a 1D perfect reconstruction filter bank (PRFB) to obtain 2D filters. The objective of constructing AWF is to improve the performance of existing wavelet based methods for classification and segmentation of textures having dominant angular components. A texture is characterized by a set of channel variances estimated at the output of the corresponding 2D filter bank. Classification results for 26 Brodatz textures indicate that performance of the proposed AWF method is comparable to the existing wavelet based algorithms. The constructed AWF is also applied to perform supervised texture segmentation. We considered several images with different number of texture regions, and used the standard k - means clustering algorithm to integrate the feature images and produce segmentation of the original texture images. The performance of the supervised texture segmentation algorithm using AWF is found satisfactory

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Title : *Model Based Motion Estimation And Segmentation*
Author(s) : *Mishra Sampurnananda*
Roll No : *Y010446*
Supervisor(s) : *Venkatesh K S&Gupta Sumana*

Abstract

In this thesis we implemented a model based motion estimates and segmentation algorithm. Since a moving object in the 3 - D space can be modeled by a set of motion parameters, the corresponding 2 - D projection of the object can also be modeled using certain set of parameters. So on the basis of motion model we developed, we were able to decompose the motion parameters from the model. A particular object on the image plane can be modeled by a distinct set of motion parameters. In case of scenes containing multiple moving objects, on the basis of difference of the model parameters the segmentation of the motion was solved. Also, using the model parameters we could reconstruct the subsequent frame from the first. this makes an implication that the technique can be used for low bit rate video coding.

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Title : *Implementation Of An Operating System Kernel For The Cradle UMS Chip*
Author(s) : *Mukadam Ketan*
Roll No :
Supervisor(s) : *Bose Sanjay Kumar&Singh Yatindra Nath*

Abstract

UMSTM (Universal Micro-System), by Cradle Technologies, USA is the most amazing chip architecture consisting of an array of RISC processors that provide seamless, scalable system solution to the full spectrum of a wide variety of multi-media & networking applications. The chip is designed for as versatile an application as 2D & 3D graphics. MPEG encoding & decoding, image processing, set top boxes & Internet appliances. In this thesis, an operating system kernel is developed for this chip. This kernel developed with the possible extension of this project in development of set-top boxes or a multi-interface router. The kernel is derived from the open-source Linux. It will support the basic functionality needed to run browser (for set-top boxes) or router management software (for multi-interface router). The major components of the system are scheduler, process management, signaling, system cal mechanism, file-system and networking. All the modules are developed in this thesis except the networking part.*9

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Title : *Implementation Of A TCP/IP Networking Stack For The Cradle UMS Chip*
Author(s) : *Tiwari Sunil Kumar*
Roll No : *Y010452*
Supervisor(s) : *Bose Sanjay Kumar&Singh Yatindra Nath*

Abstract

UMSTM (Universal Micro-System), by cradle technologies, USA is a versatile chip architecture consisting of an array of RISC processors that provide a seamless, scalable system solution for a wide variety of multi-media and networking applications. The chip is designed for applications such as 2D and 3D graphics, MPEG encoding and decoding image processing set top boxes and Internet appliances. In this thesis the TCP/IP networking stack (TCP, IP, UDP, ICMP, PPP, and socket layer) is implemented on this chip. The approach followed is based on similar implementations in BSD and Linux. This networking stack is developed with the objective of subsequently using this to develop set-up boxes or a network routers. Since the evaluation board is not yet available, the code (written in C like assembly language CLASM) is tested on a simulator (Inspector). This implementation of TCP/IP networking stack on UMS will support the basic functionality needed to run browser (for set-top boxes) or router management software (for multi-interface router). This major components of the system are TCP, UDP, IP PPP, ICMP and socket layer.

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Title : *Irregular LDPC Codes Over GF (4) For CDMA Applications*
Author(s) : *Shrivastava Sachin*
Roll No : *Y010444*
Supervisor(s) : *Swami Sanjeev*

Abstract

In this thesis we have analyzed the decoding complexity of sum - product algorithm for non - binary low - density parity - check (LDPC) codes. The FER performance of GF (4) and GF (2) codes in a binary Gaussian and fading channel has also been investigated. We have shown that using GF (4) LDPC codes, we can get better results as compared to binary LDPC codes. Even with less decoding complexity GF (4) codes outperform binary codes. We have also investigated the performance of GF (4) LDPC codes in a CDMA cell environment

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Title : *Biodegradation Of Alkylphenol Ethoxylates In Miniaturised Biofilm Reactors*
Author(s) : *Tripathi Shweta*
Roll No : *Y011716*
Supervisor(s) : *GuhaSaumyen*

Abstract

Alkylphenol ethoxylates (APEs) are one of the most widely used group of surfactants. The biodegradation of APEs has been a subject of interest from past two decades owing to the threats these surfactants are imposing on the natural ecosystem and livestock. The metabolites and degradation products of these surfactants have been found to be more recalcitrant and bioaccumulative than the parent compounds. Moreover, they also have been found to exhibit estrogenic character owing to their structural similarities with the estrogenic compounds. The work involves study of biodegradation behavior of APEs of different ethoxylate chain lengths, present in a mixture of APEs. Analyses of degradation were performed with the help of High performance Thin Layer Chromatography (HPTLC) coupled with Automated Multiple Development (AMD) technique. A comparative study of the total dissolved organic carbon degradation and degradation of individual APEs were conducted. Some of the intermediate products of degradation were isolated and identified. Efforts were made to identify and characterize, the biofilm microbiota into broad categories of bacteria using fluorescent In situ Hybridization (FISH). The APEs could be degraded both aerobically as well as anaerobically. The degradation was in the range of 80-85% in both aerobic as well as anaerobic reactors except for the short chain nonylphenol ethoxylates (NPEs). The short chain NPEs were degraded 100% in the anaerobic reactors. The major degradation products were identified as alkylphenol with 1 and 2 ethoxylate units. The FISH results indicate the presence of large populations of gram-negative bacteria (of phylum proteobacteria) in the both aerobic and anaerobic reactors. Small amount of archaeobacteria were detected only in the anaerobic reactors. The study results present an overview of the degradation pattern of different APEs and a comparative analysis intending to establish the relation between biodegradability of APEs and their chemical structure. The results indicate the significance of ethoxylate chain length in determining the biodegradability of the compounds. The study supports the school of thoughts suggesting ethoxylate chain shortening as the major degradation pathway for the APEs existing in nature.

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Title : ***Congestion Management Issues In Power System Networks***
Author(s) : ***Adhvaryu Jayesh K***
Roll No : ***Y010415***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

The management of the transmission system and its pricing have been a subject of intense debate in view of the deregulation of this sector. There are several fundamental issues that have to be addressed in the operation of the transmission network in a new and modified framework. The real time control of the system is very complex and requires the determination of the optimal state of the system. This is done using various optimal power flow techniques. The basic transmission system has a limit on the amount of power that can be transferred over the system. The various contingency situations like outage of generators, line faults, line outages, overloads on the system etc may cause additional burden on parts of the system. These may also lead to congestion on critical links in the transmission network. This congestion affects the pricing scheme for the system. When the congestion takes place in the system then various strategies to manage congestion are utilized to alleviate the congestion in the network. The focus of the thesis is to study the various conditions in which the congestion would take place in a network. The various strategies that can be used to alleviate the congestion at the various locations in the system has been reported. The influence of congestion on the nodal price has also been discussed

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Title : ***Transmission Pricing In Deregulated Environment***
Author(s) : ***Vaid Rajesh***
Roll No : ***Y010429***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

Recent times have seen many countries both developed and developing open their traditional sectors to the market forces and competition. Electrical power industry was also one such traditional sector, which till a few years back was a fully regulated industry. It was a vertically integrated industry where a utility operated generation, transmission, distribution and provision of services to the consumers. The consumer had no choice and was used to buying a bundled commodity – electricity. Due to various reasons ranging from creating competition and more efficient operations in the developing countries; to problems of lack of resources and lack of return on the investment already in place for the developing countries, this sector has seen deregulation or re-regulation take place. It is because of this that pricing mechanisms too are undergoing change in accordance with the change in the industry from a single part tariff to two - part tariff. In this thesis, the variable component of the two - part tariff resulting from the use of energy on the part of the energy supply utility has been studied. The emphasis has been on the pricing of reactive power,

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Title : *Algorithms For Self-Growing And Higher-Order Neural Networks*
Author(s) : *Saleem S Mohammad*
Roll No : *Y010439*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

The area of dynamically altering neural network architecture is studied. Cascade correlation algorithm and its variants are considered. An attempt has been made to investigate the problems posed by self - growing architectures and to improve the performance of these algorithms. Various methods of cascading architectures “cascor”, “caserr”, “casall” are developed. The complexity of neuron in terms of enhanced inputs and their activations are studied. Both the static and dynamic methods of adding higher order complexities are investigated. Generalized neuron model and the different architectures that can be built with the generalized neuron as the basic node are developed. The improved variant of cascade architecture with the best combination of available inputs, “casany” is developed. Various problems that hinder the learning process are dealt with suitable solutions. The algorithms developed are validated on several benchmark problems

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Title : *Utility Friendly Regenerative Magnet Load Power Supply*
Author(s) : *Sri Balaji M*
Roll No : *Y010423*
Supervisor(s) : *Das Shyama Prasad & Dubey G K*

Abstract

In the present work, a utility friendly regenerative magnet load power supply has been proposed which can tolerate supply voltage dips and long duration sags or under voltages and maintains unity input power factor under all operating conditions. The harmonics injected into the utility are very less and the total harmonic distortion (thd) complies with iee standards. Unity power factor at the input is maintained by using a synchronous link converter (slc) as the front-end ac to dc converter with regenerative capability. The two-quadrant chopper in the second stage operates in a constant frequency current control mode and takes care of the load current ripple. The performance evaluation of the magnet load power supply has been made using saber simulator. A laboratory prototype has been fabricated and tested successfully. The real time control algorithm has been implemented using a pc (pentium-s) with pcl-207 data acquisition card

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Title : *Algorithms For Neuro-Fuzzy Systems*
Author(s) : *Bhavani Sankar G V*
Roll No : *Y010414*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

An attempt has been made to implement neural networks comprising of OR/AND neurons as the basic functional components. It has been observed that instead of using a single large network for solving a problem, the use of several smaller networks on properly divided data improves the learning performance, in general. Neuro - fuzzy systems (or rule - based systems) have been considered, as single architectures, to incorporate proper division of data and the smaller networks that approximate the function in each of the smaller divisions. The two different types of neuro - fuzzy systems considered are ANFIS and CNFS. The salient features of these neuro - fuzzy systems are heuristic initialization of parameters and parameter estimation using hybrid and compensatory learning algorithms. The problem of structure identification, which concerns partitioning the input space and determining the number of fuzzy rules for a specific performance, has been studied. An off - line rule - based clustering algorithm is proposed to cluster the input data and to determine the number of rules. Dynamic approach for generation of rules has also been considered, where an on - line self - constructing algorithm is used. The algorithms developed are validated on several benchmarking problems of function approximation and classification

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Title : *Resonant Single-Stage, PWM-Resonant Two-Stage Dc-Dc Converter For Satellite Power Supply*
Author(s) : *Ghosh Rajesh*
Roll No : *Y010431*
Supervisor(s) : *Das Shyama Prasad& Doradla S R*

Abstract

Two possible solutions for electronic power conditioner (epc) of the traveling wave tube amplifier (twta) used in satellite applications are given. Considering the transformer leakage inductance, inter turn capacitance and output diode bridge rectifiers junction capacitance the first scheme is a single-stage lcll four element dc-dc resonance power converter. Operation above the resonance reduces the switching loss and also reduces the volume and size of the overall converter. Detailed analysis, design and simulation of the four-element resonant converter are given. The second configuration explores the best features of a series resonance converter by operating it at the resonant frequency. The disadvantage of src in controlling the output voltage is overcome by a pre-regulator, connected in the front end of the src, which is essentially a buck converter. Controlling the duty ratio of the buck converter controls the output voltage across the load. The operation of the src at the resonant frequency ensures zero current turn-on and turn-off of the inverter switches which helps in achieving higher switching frequency. The duty ratio control is required to take the input voltage variation into account. Introducing the effect of inherent parasitics of transformer and diode bridge rectifier, a simple two-element src is indeed a multi-element topology. A practical prototype of two-stage dc-dc power converter is built and tested for verification of the theoretical results

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Title : *Available Transfer Capability Assessment In A Restructured Electricity Market Using Bifurcation Criteria*
Author(s) : *Chaudhary Sanjay Kumar*
Roll No : *Y010447*
Supervisor(s) : *Srivastava S C*

Abstract

In a restructured electricity environment, the market entities need to know the power transfer capabilities of the transmission network before committing any contract. Available transfer capability (ATC) is a measure of the unutilized transfer capability in the transmission network available for further commercial transaction over and above already committed uses. The present work proposes the application of bifurcation criteria for ATC determination. Hopf bifurcation limit has been considered for determination of the dynamic ATC and saddle node bifurcation limit for the static ATC. The proposed method is applied for various bilateral transactions on 9 - bus WSCC and 39 - bus New England system. The results of ATC computed using the bifurcation criteria and bus voltage limits are compared for different transactions under two different scenarios of load increase and for constant power as well as voltage dependent load models. Available transfer capability can be enhanced using FACTS controllers. In the present work, the use of SVC, which is one of the popular FACTS controller already installed by many utilities, has been studied for the enhancement of the system power transfer capabilities. A method based on the eigenvalue analysis and the bus voltage states corresponding to the critical mode has been utilized to decide the optimal placement of SVC. ATC values have been computed using the bifurcation criteria and the bus voltage limits for the different transactions in the two test systems with the optimal placement of SVC and compared with those obtained without SVC in the system

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Title : *Global Optimization Techniques For Neural Network Applications*
Author(s) : *KumarA V M Manoj*
Roll No : *Y010401*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

Back propagation has often been applied to adapt artificial neural networks for various pattern classification and function approximation problems. However, an important limitation of this method is that it sometimes fails to find a global minimum of the error function. To avoid local minimum solutions in back propagation learning. Feed forward neural network training is treated as a global optimization problem. Stochastic methods like simulated annealing and ALOPEX are investigated. Various cooling schedules for simulated annealing are developed. To improve the learning speed, hybrid algorithms are investigated. Hybrid-SA, SARPROP, NOVEL, R-GEM algorithms are developed. An improved variant of hybrid-SA called SA-BP_SA is proposed. Various problems that hinder the learning process are dealt with suitable solutions. The algorithms developed are validated on several benchmark problems of functional approximation and classification

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Title : *Control Co-Ordination Of Static VAR Compensator And Power System Stabilizer In A Power System Network*
Author(s) : *Sonkar Manoj Kumar*
Roll No : *Y010422*
Supervisor(s) : *Srivastava S C& Varma Rajiv K*

Abstract

This thesis examines the coordination of Static Var Compensator and power system stabilizer for enhancing the stability of the system. There are two system chosen for coordination (i) single machine infinite Bus system with SVC connected at the midpoint of the transmission line (ii) WSCC 3-machine, 9-bus system. In this thesis first of all we had to coordinate the PSS and SVC successfully in single machine infinite bus system. Then our task was to implement such coordination also in a multi-machine system (WSCC 3-machine, 9-bus, system). To coordinate single machine infinite bus system certain fault or disturbances was considered at the generator terminal and then our task was to coordinate PSS and SVC successfully so as to get overall positive improvement in power system damping. Similarly to coordinate PSS and SVC in multimachine system (WSCC 3-machine, 9-bus system) we had to again consider certain disturbance and then to coordinate PSS and SVC.

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Title : *Impact Of Independent Power Producers And Distributed Power Generation On Environmental Emission And Utility Planning In Northern Regional Electricity Board Network*
Author(s) : *Barnwal Bikash Kumar*
Roll No : *Y010407*
Supervisor(s) : *Srivastava S C*

Abstract

In most of the Asian countries including India, the electricity generation is largely based on fossil fuels. These power plants produce pollutants such as CO₂, SO₂, NO_x and particulate matters cause global and local environmental problems. The contribution of power plants in Green house gases emission has been found to be significant causing global warming effect. The power sector in most of the countries, including India, is in the process of restructuring which promotes the introduction of independent power producers (IPPs) and distributed power generations (DPGs). However, not much literature is available to quantify the impact of IPPs and DPGs on the power sector planning specifically their impact on environment emissions. In this work, the utility planning cost & planning and environment implications of IPPs and DPGs have been studied. The study has been carried out for the Northern Regional Electricity Board (NREB) network of India utilizing 16th Electric Power Survey data published by the Central Electricity Authority. Sensitivity analyses have also been carried out with respect to few important parameters associated with IPPs and DPGs to observe the trend in which the generation expansion planning shifts from its base case. In addition, the planning analyses have also been carried out for each of the DPG plants individually to identify their cost effectiveness and environmental implications. The study results reveal that the introduction of both IPP and DPG plants results in environmental emission mitigation and reduction in the total expansion cost. DPG based on wind power plants are found to be the most cost effective and those based on micro hydro have the highest environmental emission mitigation potential

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Title : *Friends devices and their coordination*
Author(s) : *Meena Ramjee Lal*
Roll No : *Y010433*
Supervisor(s) : *Ghosh Arindam& Joshi Avinash*

Abstract

Power Quality is the major concern in the present electric power scenario Dispersed generators are connected to power grid through power electronics based converters. Therefore, their protection attains great significance. The FRIENDS (Flexible, Reliable and Intelligent Electrical energy Delivery System) is a new concept about the future of the electric power delivery system. To operate the FRIENDS efficiently, power electronics technologies play important roles. Topologies of State Current Limiter, Static Circuit Breaker and Static Transfer Switch are presented and function of each component is discussed. The working of individual FRIENDS devices is performed with the help of PSCAD/EMTDC software package Static protective devices are simulated for a radial distribution system. The coordination issues of FRIENDS devices are discussed with their possible solution. For a generic test system the proposed coordination is simulated. The STS is simulated for the single phase and three phase R - L passive and regener ative sensitive loads. The results are compared for the SCR and GTO based topologies

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Title : *Study Of The Effect Of Degree Of Uniformity Of The Field On Breakdown Strength Of Air In Weakly Nonuniform Field Configuration With Lightning And Switching Impulse Voltages*

Author(s) : *Vaibhav Kishore*

Roll No : *Y010418*

Supervisor(s) : *Arora Ravindra*

Abstract

Dielectrics, the indispensable part of modern power systems are subjected to severe stress due to lightning and switching impulse over voltage. Therefore it is desired to investigate the strength of a dielectric subjected to stress produced by the lightning and switching impulses. Behaviour of dielectrics strongly depends upon the type of field they are subjected to. More is the electric field uniform, better the utilization of a dielectric is achieved. But in practice it is not possible to accomplish a totally uniform field in insulation systems. So for many practical installations, weakly nonuniform fields are realized. Best example of such a practical insulation is that of an enclosed gaseous dielectric system (Gas Insulated Systems) where the electric field configuration is tried to be designed weakly nonuniform. In this work the variation of breakdown strength of air in weakly nonuniform field conditions is investigated, when subjected to the lightning and switching impulses. For this purpose sphere electrode configurations of different dimensions are used. By using the different sets of spherical electrodes and by varying the gap distances, electric field in the air gap is made to vary from weakly nonuniform to extremely nonuniform field type. Four sets of spherical electrodes of diameters 15cm, 10cm, 5cm and 2.54cm are used in this work. The effect of polarity on the breakdown strength of air under the weakly nonuniform field condition is also investigated. Calculations are made to determine the maximum field intensity and average field intensity in the dielectric. The variation of average electric field intensity E_{mean} or E_{avg} with Schwaiger factor η is determined analytically from the measured results

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Title : *Effect Of Ultra-Violet Irradiation On XLPE Cable Insulation*
Author(s) : *Tripathi Vikas*
Roll No :
Supervisor(s) : *Arora Ravindra*

Abstract

There are many factors which affect the cable life in free air such as stress, heat from sun, rain, dust etc., but the phenomena which has greatest impact over cable life and its strength is exposure of cable to ultra-violet irradiation from the sun. In the present work, the effect of UV irradiation on XLPE and PVC cable insulations for different spans of time is investigated. A chamber was specially fabricated for the purpose. Effect of ultra-violet irradiation on XLPE insulation with and without mechanical stress is investigated. The solar UV intensity has been estimated in the subtropical areas like Kanpur. The UV chamber has been so designed that one month of solar UV irradiation has been made equivalent to two days of UV irradiation in the chamber. The cable samples were put in the chamber for periods equivalent to 3 months, 6 months, 9 months and one year. The insulation samples were cut into desired dumb-bell shape specimens for 'elongation at break' and 'tensile strength' testing. The XLPE was found vulnerable to UV irradiation. The initial effect of UV was significant on its ductility and toughness. Further effect was gradual upto a specific amount of UV irradiation. This specific amount was found to be equivalent to 9 - 12 months of solar UV irradiation. On further UV irradiation, both the ductility and toughness decreased drastically. The XLPE started showing signs of brittleness after UV irradiation equivalent to one year. The presence of mechanical stress on the insulation expedited the effect of UV irradiation. The time in which the XLPE started showing signs of brittleness decreased to 3 months in the case when the stress was present. There was no significant change in ductility and toughness of PVC with UV irradiation over a period equivalent to 12 months of solar UV irradiation under investigation in this work

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Title : *A Simulation Module For A Regulating Power Market*
Author(s) : *Kumar A Krishna*
Roll No : *Y010455*
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Abstract

In recent past, the power industries, all around the world, are undergoing major restructuring leading to deregulated market. This aims at introducing competition various market participants and bringing several competitive opportunities. In a competitive electricity market, an independent system operator (ISO) is responsible for system administration to meet the market contracts and in addition to supply the regulating power arising out of the imbalances between actual generation and demand. For supply of regulating power, special markets are set up which are similar to the spot markets but with different time limits and different set of power providers. In this work, a model is proposed that brings the relationship between the regulating market, the net operator, the regulating generator and other participants. The regulating market considered is an hour-to-hour exchange market, which maintains the balance between generation and demand. Different existing markets in Europe have been analysed and compared to create a basis for the design and implementation of a simulation module for the regulating market model. The proposed model is then tested for the power markets of Norway, Sweden and Finland. The simulation model presented in this work forms a basis for calculating the regulating price and allocating volume of regulating power to the generators participating in the regulating market

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