

M.TECH. THESIS ABSTRACTS 2003

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Microelectronics, VLSI & Display Technology

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Title : *Optical Flow Based Navigation In Static Environments*
Author(s) : *Adnan K Bohori*
Roll No : *Y110414*
Supervisor(s) : *Mukerjee Amitabha*
Abstract

The ability to detect and avoid obstacles is the foremost requirement for any robot navigation system. Optical flow based navigation systems are proposed for the robot navigating in an indoor unstructured environment which make use of the planar navigation constraint to calculate the depth map of the scene. In a real-life environment, the planar navigation constraint is seldom satisfied due the undulating motions or vibrations of the camera. In the presence of camera undulations, the planar navigation constraint gives an erroneous depth map which is almost useless for any navigation algorithm. In this thesis, it is proposed to compensate for camera undulations by assuming the undulating motion to be a rotation along the horizontal axis of the robot. Also, a fuzzy inference based approach is proposed to interpret the noisy depth map calculated from the optical flow. A fuzzy logic controller is presented for robot navigation. This fuzzy logic controller emulates the "corridor following" behavior.

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Title : *Fabrication And Characterization Of Single Layer Polymer Light Emitting Diodes*
Author(s) : *Gudavalleti Pavan Kumar*
Roll No : *Y110443*
Supervisor(s) : *Mazhari Baquer&Narain Jitendra*

Abstract

This thesis presents results obtained from fabrication and characterization of single layer polymer light emitting diodes. The initial results obtained from fabrication and measurements on indium-tin-oxide/poly (para) phenylene vinylene (PPV)/Al light emitting diode showed several problems including low forward current, sweep dependent current-voltage characteristics, absence of rectification and rapid degradation. The presence of solvent in PPV film was isolated as one of the reasons for low forward current. The elimination of this problem through use of vacuum annealing prior to the conversion of PPV was found to result in three orders of improvement in current. Through ozone treatment of ITO and incorporation of PEDOT on top of ITO, the turn on voltage was significantly reduced and bright electroluminescence was clearly observed. Studies conducted on the degradation of single layer devices clearly showed the important role of oxygen and moisture in the degradation process. Through use of encapsulation the device lifetime was significantly increased. Despite these improvements, several problems remain including large reverse currents and sweep dependent current-voltage characteristics.

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Title : *Design And FPGA Implementation Of An Ac Plasma Display Panel Controller*
Author(s) : *Paramahamsa Vaduguru Rama Krishna*
Roll No : *Y110474*
Supervisor(s) : *Mazhari Baquer&Vasudevan Kasturi*

Abstract

Among flat panel display technologies, plasma display panels hold the best promise in large area displays. The image in a PDP is displayed in a manner very different from that in a CRT. As a result, the conventional video signal has to be converted into a form compatible with the plasma display panel and the chosen driving scheme. The present work describes the design of a display controller that will serve as an interface between the conventional video signal and the PDP. The Display controller is designed for a 3~electrode AC PDP of resolution 640X480(VGA). It consists of two major blocks - a sequence controller that controls the timing of data and control signals sent to the panel and a signal processor that performs the required data conversion. Both these blocks were designed for implementation on a Xilinx FPGA using synopsys and xilinx EDA' tools. In view of the flexible nature of specs, the design of both the blocks was made generic in terms of the resolution and timing requirements of the driving scheme. The complexity of the sequence controller is about 3900 gates and can work up to a maximum frequency of 36.35MHz on a xilinx XC40-005 family FPGA. The signal processor is larger in terms of the complexity and can be implemented on a xilinx spartan FPGA.

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Title : ***Heterostructure Pin Diode For Power Application***
Author(s) : ***Dixit Jyoti***
Roll No : ***Y110424***
Supervisor(s) : ***Mazhari Baquer***

Abstract

Diodes for power application should have fast reverse recovery time, low reverse leakage current, low forward ON voltage and high breakdown voltage. In conventional PIN diodes, which are made from single semiconductor (e.g. Si), reverse recovery time is high especially at high breakdown voltage. In this thesis, it has been shown that heterostructure PIN diodes, made by using low bandgap material in highly doped P+ or N+ region, and high bandgap material in intrinsic region, have significantly lower reverse recovery time without compromising breakdown voltage or forward on voltage drop. The dependence of Effective carrier lifetime on various factors such as intrinsic region width, bandgap difference of highly doped region and intrinsic regions, surface recombination velocity are also discussed

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Title : *Passive Matrix Oled Display Using A Single Integrated Organic FET*
Author(s) : *Tiwari Madhulika*
Roll No :
Supervisor(s) : *Mazhari Baquer*

Abstract

Electronic displays in their many forms are a major contributor to communication, computation, entertainment, and safety. Presently, Liquid crystal displays (LCDs) have the major market share of flat panel displays (FPDs). Poised to emerge as the leading next-generation FPD technology, OLED technology employs OLEDs, which are bright, emissive, colorful devices that offer low-power consumption and wide viewing angle. OLED displays can be organized as either passive-matrix (PM) or active-matrix (AM) displays; the simple structured PM display is well suited for low cost, low information applications but suffers from limitation in the number of pixels and high crosstalk. AM displays, having integrated electronic backplane are used for high-information applications, but are complex and costly. A detailed study of crosstalk in passive matrix OLED displays is presented in this thesis. For this study, initially an OLED model has been developed, the I-V characteristics of which match the experimental data. A simple equivalent circuit, representing the passive matrix, has been developed and study of DC and dynamic mode of operation has been done by means of simulations, carried out in TINA-PRO software package. It has been found that crosstalk not only depends upon the reverse characteristics of the OLED but also on its forward characteristics. In order to overcome the problem of crosstalk, a modification in the design of PM displays has been proposed; an active element (organic thin film transistor OTFT) has been incorporated in the circuit of each pixel so that current flows through the OLED only when the TFT is xON'. The OTFT technology (was chosen for its ease in integration with OLEDs. The mobility of OTFTs does not exceed $1\text{cm}^2/\text{V}\cdot\text{sec}$, which V_I is low, but about equal to that of amorphous silicon already in use in display backplanes. This modification eliminates crosstalk quite appreciably and offers better response time

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Title : *Analysis modeling Of Organic Light Emitting Diodes (Oleds)*
Author(s) : *VYAS Apra*
Roll No :
Supervisor(s) : *Mazhari Baquer*

Abstract

Organic light - emitting device (OLEDs) represent a promising solution for the flat - panel displays of the new generation .In an effort to study the fundamental science underlying their functioning most of the studies so far have relied on numerical tools for analysis. However attempts made to study the device phenomenon with the help of numerical simulations obscure the underlying device operation. Study under analytical framework is to develop analytical models for the bilayer devices in particular, which reveals the dependence of current efficiency etc on various device parameters. Analytical models developed for single carrier device is then applied to study bilayer device under bipolar injection condition. Another important aspect of the present work is to explore the injection conditions analytically when the developed models are likely to hold good.

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Title : *Design Of Current Programmed Active Matrix Organic Light Emitting Diode Pixel Circuits*
Author(s) : *Chauhan Yogesh Singh*
Roll No : *Y110476*
Supervisor(s) : *Mazhari Baquer*

Abstract

Active Matrix Organic Light Emitting Diode (AMOLED) based flat panel displays are being actively pursued for high - resolution applications. In these AMOLED DISPLAYS both amorphous and Poly silicon TFT based current programmed pixels circuit are used .The present work describes in detail a methodology for sizing TFTs in both a - Si and poly - Si based top - anode and top - cathode AMOLED pixel circuits so as to obtain good match between programming and output current /. Results presented allow selection of TFT sizes for specified, maximum programming current and specified supply voltages. A novel five TFT poly -Si AMOLED pixel circuit is proposed which offers very good linearity up to currents as large as 20 m A

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Title : *Applicability Of Universal Contact On Both Sides Of Power Diode For Faster Reverse Recovery*
Author(s) : *Jain Ankush*
Roll No : *Y110403*
Supervisor(s) : *Mazhari Baquer*

Abstract

Effect of incorporation of P + N + Universal Contact (UC) in power diodes with high breakdown voltage (~2.6kV) was studied in term of important device parameter like breakdown voltage. On state voltage and reverse recovery time. Study of traditional PiN diode with the proposed modified structure was carried out. Various design tradeoff and their implications on device performance were also investigated. Some representative devices were fabricated and device parameters were experimentally measured values showed coherence with the findings of simulations.

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Title : *Area Efficient Implementation Of Survivor Management Unit In Viterbi Decoder*
Author(s) : *Garge Swapnil*
Roll No : *Y110468*
Supervisor(s) : *Mazhari Baquer&VasudevanKasturi*

Abstract

Convolution Coding is a coding technique, which employs Forward Error Correction (FEC) method to introduce latency in the source message. As result the transmitted message sequence is a longer coded message stream carrying redundant information to enable error correction at the receiver end. The key to the success of error correction scheme is the choice of the length of redundancy and generation polynomials. Viterbi Decoding technique is used to decoder convolutionally coded message streams. Viterbi algorithm was proposed by Andrew J. Viterbi in 1967 and has been used since in almost all convolution decoders due to its better performance. Implementation of Viterbi decoders in the hardware has been a challenge. This challenge is posed by a large number of addition and comparison operations involved on the process of computing the decisions, which govern the most likely output or the decoded data stream. Large number of states and paths through the trellis lead to a complex memory intensive architecture. The goal in present day architectures is to minimize the power consumption and chip area for mobile applications. Speed performance is another major issue. Area efficient implementation of Survivor management unit of Viterbi decoder is proposed in this work. Survivor management unit is used for storage and trace - back of most likely decision values thus giving the decoded data as output. ASIC memory is a precious resource. Memory blocks consume large areas on the die. Memory efficient architecture is proposed in the current work thus enabling both area latency optimizations. Synthesis results confirm the proposed saving on chip area and optimized speed performance can be readily deduced.

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Title : *Study Of Pentacene For Organic Thin Film Transistors*
Author(s) : *Gupta Girish Kumar*
Roll No : *Y110422*
Supervisor(s) : *Kumar Satyendra*

Abstract

Organic thin film transistors (OTFT) possess two principal advantages over TFTs based on inorganic semiconductors, as it is possible to fabricate them at lower temperatures and lower cost. OTFTs are of interest for a number of applications such as pixel-access devices in active matrix displays, liquid crystal light valves of organic light emitting diodes, switching devices for logic gate memory arrays in smart cards. Several organic semiconductors are being explored for devices in organic electronics. The aim of this work is to prepare Pentacene (C₂₂H₁₄) thin films and characterize them for application in TFT fabrication. TFT structures are produced on heavily doped (n+) Si with a SiC₂>2 gate dielectric. Oxide layer is grown over heavily doped Si substrate and spectroscopic ellipsometry is performed to determine its thickness and refractive index. In particular, Pentacene thin films are deposited on c-Si and quartz substrates using thermal evaporation and are characterized by IR spectroscopy, photoluminescence and transmission. AFM images are also taken to see the effect of deposition rate on surface roughness. Transistors are fabricated employing bottom gate-bottom contact (BG-BC) as well as bottom gate-top contact (BG-TC) structures. Electronic transport is measured in planar geometry. The quality of TFTs is checked using a semiconductor characterization

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Title : *Optical Modeling Of Organic Light Emitting Diodes*
Author(s) : *Pradeep Kumar*
Roll No :
Supervisor(s) : *Kumar Satyendra*

Abstract

Organic light emitting diode (OLED) consists of multiple layers, each having thickness of a few tens to hundreds of nanometers. External light output efficiency of these devices is determined by strong optical interferences effects that modify the exciton-photon coupling. The spectral profile as well as angular distribution of light output is also determine by the optical effects in the multilayer. The aim of this work is to develop a numerical model to calculate the effects of optical interference in OLEDs by including the multiple-reflections and absorptions in the constituent layers. In addition radiative and nonradiative decay processes that govern the quantum efficiency of light emission in the device are also included in the model. n

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Title : ***Design And Implementation Of High Speed Transmitter And Receiver For Optical Wireless Applications***
Author(s) : ***Bhattacharya Anshuman***
Roll No : ***Y110401***
Supervisor(s) : ***John Joseph***

Abstract

The present trends indicate that the networks of the future will consist of a fiber-optic backbone with short range wireless communication links providing network access to portable communication systems. In such systems, networks will use both indoor as well as outdoor optical links. Outdoor links are popularly known as "Free space links. Free space optical communication is a cost effective, high-bandwidth, wireless alternative for the connectivity of high-speed data to the user premises. This thesis gives the details of the design and implementation of high-speed transmitters and receivers intended for use in free space links. A brief review of the sources, detectors and devices used in optical communication systems is given. Review of free space systems are also presented with design considerations. Requirements and design challenges for transmitter and receiver for outdoor applications are discussed in details. An outdoor link was designed using low cost, medium power laser diode in the transmitter and a PIN photodiode in the receiver. The receiver front end was simulated using Micro cap simulation tool. The transmitter was implemented using 10K series ECL gates and a low cost laser diode. The receiver front end (preamplifier) was implemented using low cost surface mount BJTs(BFR91). Experimental setup with the implemented transmitter and receiver achieved data rates in excess of 40Mbps/sec, with a sensitivity of about -20dBm. The link had a dynamic range of about 6dB

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Title : *Semiconductor Waveguide Coupler*
Author(s) : *Sachan Rohit Kumar*
Roll No : *Y110456*
Supervisor(s) : *Das Utpal*

Abstract

simple and flexible approach for the design of semiconductor waveguide couplers is presented in this work. This device evolves out of the analysis of two dielectric rib waveguides put adjacent to each other. When the optical signal of a particular wavelength say of λ incident at input port of channel-1, it will get coupled to channel-2 and as a result the whole light incident on channel-1 will come at output port of channel-2 after a distance called the coupling length(l_c). The design is based on Effective Index Method followed by Multilayer waveguide theory to calculate the l_c . In this design the rib height h has been kept such that l_c remains less than 2.0mm, which would facilitate the fabrication of several filters on a single chip. The l_c were found to be of l_{c1} and l_{c2} for $\lambda=980\text{nm}$ and $\lambda=1550\text{nm}$ respectively. l_c is found to show a dip for $h \sim 0.2\mu\text{m}$ at $\lambda=1550\text{nm}$ whereas it is not observed at $\lambda=980\text{nm}$. It could possibly happen at $h \sim 0.2\mu\text{m}$ which has not been simulated here. It is therefore concluded that to keep the device short, one should choose a rib height of $\sim 0.25\mu\text{m}$ for $\lambda=980\text{nm}$ and $\lambda=1550\text{nm}$ respectively. Comparison of the results calculated by the effective index method and coupled mode theory show that the calculated l_c matches perfectly for higher values of h for both $\lambda=980\text{nm}$ and $\lambda=1550\text{nm}$ respectively. Also for large values of $d \sim 3-4\mu\text{m}$ the match is perfect for variation of the s from 1.5-3.0pm

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Title : *Crosstalk Analysis In Optical Interconnects*
Author(s) : *Neeraj Sharma*
Roll No : *Y110438*
Supervisor(s) : *Ghosh Anjan Kumar*

Abstract

Parallel optical interconnect which replace metallic transmission line with optical fibers or free space channels provide high throughput, easy system integration and low latency. Such interconnects are used in the design of multiprocessors and telecommunication central office switches and routers. In all such systems a set of light beams coming out of an array of sources interconnect with another array of optical devices. Owing to diffraction light beams spread spatially. So some optical devices in the path of light beams may receive power from adjacent channels. The power from adjacent channels gives rise to crosstalk noise. In our work we use different type of sources, which have rectangular and circular cross section and quantify the amount of crosstalk that can corrupt a channel in two-dimensional rectangular arrays of parallel optical interconnects. Crosstalk power in an array of interconnects is calculated as a function of the size of the array elements, inter-element spacing and distance between arrays, wavelength of light emitting by the source. The diffraction pattern of Gaussian beam by an off axis is lens is calculated

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Title : *Semiconductor Waveguide Gratings*
Author(s) : *Sonkar Ramesh Kumar*
Roll No : *Y110451*
Supervisor(s) : *Das Utpal*

Abstract

Distributed Bragg gratings have been analyzed for the purpose of its usage as reflectors for the discrimination of wavelengths pertaining to optical communications. Coupled mode theory and simple Bragg reflection methods have been used to calculate the reflection coefficient of periodically perturbed dielectric optical waveguides. The analysis has been done for both first order and second order gratings. First order grating shows larger discrimination however their physical dimensions are difficult to realize by simple photolithography. Second order grating show that they are realizable for 1270nm - 1610nm – wavelength range for periodic dimensions of 0.5 - 1.2 μ m. A practical; case of periodic change in the refractive index by Impurity Implementation Disorder of quantum wells have also been considered. The analytical expression for the coupling and reflection coefficients are given for the case of an asymmetric trapezoidal grating profile with a view to having different thicknesses of the multiquantum well layer. The lateral spread of the implanted impurity was modeled by a trapezoidal profile. The observation from the simulation plots of groove height with reflection coefficient shows as we increase frequency from 1270nm - 1610nm the groove height shifts towards right. The plots of distance with reflection coefficient also show increase in the frequency results right shift in the distance.

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Title : *Studies On Modulation Schemes For Indoor Optical Wireless Systems*
Author(s) : *Tripathi R*
Roll No : *Y110453*
Supervisor(s) : *John Joseph*

Abstract

Wireless Indoor 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 studies and performance comparison of different modulation schemes used in indoor optical wireless systems. Some PPM modulation formats are studied in detail. Simulation of OOK, 4 - PPM and 4 - DPPM schemes were done MATLAB for different SNR values. DPPM modulation scheme has some inherent advantages such as it is power and / or bandwidth efficient, as synchronization is not required, it is less complex and suitable for low cost systems as only threshold detection is needed. Hardware implementation of 4 - DPPM encoder and decoder were taken up using standard digital integrated circuits.

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Title : ***Time Delays And Angles Of Arrival Estimation Using Known Signals***
Author(s) : ***Singh Pushpendra***
Roll No : ***Y110447***
Supervisor(s) : ***Sircar Pradip***

Abstract

Source localization is an important problem in smart antenna technology. The parameters of primary interest are the time delay of the signal and there direction of arrivals at the array .We present a novel vector pace algorithm for estimating the time dela ys and the Angles - of0arrivals (AOA'S) of multiple reflection of known signals. Simulation results illustrating the performance of the algorithm. The algorithms performance relative to Cramer – Ro bounds has been illustrated by simulation examples

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Title : *Empirical Path Loss Model For 802.11b Wi-Fi Links*
Author(s) : *Gandhi Rajesh*
Roll No : *Y110449*
Supervisor(s) : *Sinha Vishwanath*

Abstract

For designing any wireless link a reliable estimate of path loss a transmitter to the receiver is most crucial. Knowledge of path loss enables us to know the signal strength and hence the computation of BER at the receiver. These help in ensuring good link quality with sufficient data rate and suitable link - margin to combat deep fades by suitable wireless link design. Therefore a good path loss model is a must for designing and optimizing a wireless network. This is an attempt to find an empirical path loss model for 802.11b Wi-Fi links in different situations particularly in a campus environment. The results are based on actual experiments conducted. We have obtained the path loss as a function of distance in three different scenarios Long distance point to point links Academic area environment and along the roads All the three situations are dealt with for line of sight situation Long distance Point to point links are designed and erected for the purpose of experimentation. The Requirements for such links are discussed briefly. Throughput of links in academic area is measured and compared with that obtained in laboratory environment. The details of the experiments as well as the foundation works done to achieve the goal e.g. calibration of WLAN cards attenuation of the components used etc are described We find that point links follow the free space path loss model (path loss varying as distance squared; i.e. exponent for distance $n=2$) very closely while the campus wide network following with a slightly higher value of component.

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Title : ***Time Prequency Analysis Of Multi Component Non Stationary Signals***
Author(s) : ***Pachori Ram Bilas***
Roll No : ***Y110450***
Supervisor(s) : ***Sircar Pradip***

Abstract

The Short Time Fourier transform (STFT) is linear by definition. However the non-linear energy distribution of this transform is often used to represent the non-stationary signal. It contains "CROSS TERMS" which would cause problems while analyzing multi-component non-stationary signals. In this thesis work we have made an attempt to reduce the cross terms. The multi-component signal has been expanded into Fourier-Bessel series. It has been shown that the coefficients of multi-component signal are non-overlapping. The resulting coefficient set has been used for reconstructing the components and then we apply STFT for each component to analyze its time-frequency distribution.

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Title : ***Time Varying Amplitude-Frequency Modulated Sinusoidal Model For Non Stationary Signals***
Author(s) : ***Venugopal P V***
Roll No : ***Y110444***
Supervisor(s) : ***Sircar Pradip***

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Title : ***Video Object Plane Extraction And Tracking***
Author(s) : ***Rao K Madhu Sudhana***
Roll No : ***Y110428***
Supervisor(s) : ***Gupta Sumana***

Abstract

This thesis work constitutes extraction of VOP's considering two frames and then track them for the subsequent frame using mean shift method .The problem of VOP extraction is divided into three different situations of a scene and three methods are developed for each case. Stationary background is considered as the first case moving background but stationary foreground objects as the second case and moving background and moving foreground as the third one. The VOP extraction is done on the first two frames .For the subsequent frames these segments are tracked using Means - Shift Method. Modeling each segment with color distribution and updating the target with the segment in the next frame during tracking .Means - shift Method for tracking converges for less number of iterations making it more suitable for real time applications.

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Title : ***Image Retrieval Based On Colour, Shape And Spatial Relations***
Author(s) : ***Holla M G Gopalakrishna***
Roll No : ***Y110423***
Supervisor(s) : ***Gupta Sumana***

Abstract

In this thesis, we propose a model of image retrieval system based on regions of an image. The system extracts regions using hierarchical region based segmentation method. In addition to using color and shape features for matching regions, the system also incorporates spatial relationship among the regions. A combination of tree-based representation of images, using inside-relation between the regions, and projection interval representation have been used for spatial relationships. Spatial relationship similarity is based on corresponding tree distance as well as projection interval relation distance. We describe the results of experiments on an image database of about 2,000 images.

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Title : *Random Access Channel In UMTS*
Author(s) : *Buch Yashesh Kamlesh*
Roll No : *Y110475*
Supervisor(s) : *SinhaVishwanath*

Abstract

The Universal Mobile Telecommunications System (UMTS), which uses Wide band Code Division Multiple Access (WCDMA) radio interface, promises exceptionally high data rates as well as Quality of Service (QoS) features. The most important issue in fulfilling these promises is to use the available radio resource as efficiently as possible. It is envisaged that most typical multimedia applications will require the User Equipment (UE) to transmit only small amounts of data to make requests for starting sessions. Once the session is established most traffic flow would be downlink. Using dedicated channels for such applications is wasteful of resources. The Random Access Channel (RACH) is a common uplink channel used in the Global System for Mobile Communication (GSM) only for the purpose of call establishment and maintenance; however, in UMTS the RACH is conceived to be used more effectively for transmission of small amounts of dedicated data in asymmetric traffic scenarios. Hence throughput and delay characteristics of the RACH become a matter of close investigation. The UMTS radio interface, in particular the Random Access Channel (RACH) is studied. The Physical Random Access Channel (PRACH) and the Acquisition Indicator Channel (AICH) have been modeled as specified in #GPP standards. One of the main objectives is to enhance UMTS Radio Interface Simulator (URIS) which is under development at the Communication Networks (CoMNETS), RWTH, Aachen. Simulations have been performed with the modeled PRACH by varying load and other critical parameters. Throughput and delay characteristics of the RACH have been studied from these simulations. Throughput of the RACH is found to be closely matching with that of multi-channel slotted ALOHA.

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Title : *Natural Speech Coding By Am And Fm Signal Models*
Author(s) : *Verma Arun Kumar*
Roll No : *Y110410*
Supervisor(s) : *Sircar Pradip*

Abstract

Complex AM and FM signal models can be used for representation of non-stationary slowly varying signals such as speech [1,2,3]. Complex AM signal model has been found to be suitable for sustained voice speech [1,3]. while Complex FM signal model can be used for representation of sustained unvoiced speech phonemes [2,3]. In all above phonemes were made sustained before processing. But in my study it is shown that in most of the cases Complex AM model can be used without making the phoneme sustained. This in turn produces better results along with saving in parameters required for regeneration. Also my study reveals that phonemes having frequencies spread over wide range in PSD plot and phonemes with very high zero crossings should be fitted with FM model while rest can be fitted with AM model.

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Title : ***Issues Of Performance Modeling For Multimedia Wireless Networks***
Author(s) : ***Kumar Anup***
Roll No : ***Y110405***
Supervisor(s) : ***Singh Yatindra Nath***

Abstract

In this work performance modeling of multimedia wireless network has been studied. The impact of teletraffic model on performance evaluation of these networks is investigated. Statistical behavior of publicly available MPEG - 4 encoded video traces is also examined. It is found that frame size has heavy tail distribution and positive autocorrelation exists between frame sizes at large lag. Finally an algorithm is proposed for synthesizing multimedia traffic. This algorithm can be used to simulate the traffic created by multimedia applications (e.g. Video Telephony). The traffic generated under this algorithm can be used to evaluate the performance of various scheduling and routing algorithms proposed for 3G mobile networks.

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Title : Periodic Complementary Sequences For Cdma Applicaitons
Author(s) : Varshney Anurag
Roll No : Y110407
Supervisor(s) : Chaturvedi Ajit Kumar
Abstract

Periodic Complementary Sequences (PCS) have good cross correlation properties in the sense that periodic cross correlation is zero for each shift. In this thesis, PCS have been applied to Multicarrier CDMA with same data bits on each carrier. We have compared the BER performance of Multicarrier CDMA using PCS with DS CDMA employing Gold and MLSR sequences in synchronous as well as asynchronous conditions in AWGN channel. We have shown that PCS is quite advantageous in asynchronous conditions and a significant gain is obtained in AWGN. The performance of PCS has also been investigated for Rayleigh fading channel.

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Title : *Automatic Object Tracking For Video Surveillance*
Author(s) : *Mastan Mahammad Rasul*
Roll No : *Y110430*
Supervisor(s) : *Gupta Sumana*

Abstract

In this thesis, we describe an automatic object tracking method for video surveillance using a robust change detection technique. The method proposed uses both the region based and the feature based techniques. In the first stage, a robust change detection algorithm based on integration of intensity and texture difference measures between two frames, identifies the objects from the background providing binary masks for the moving objects. The mathematical analysis shows that the change detection method is robust with respect to illumination changes and noise. In the second stage, a segmentation algorithm based on clustering techniques is used to segment the moving objects into homogeneous regions. For each region, the method provides a set of characteristic feature values, which are used to track the moving objects in the sequence. The method developed can be exploited by the content understanding module of an advanced video surveillance system for detecting the potentially dangerous situations that arise in traffic monitoring systems as well as for ensuring security of important establishments.

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Title : ***Combating The Effect Of Noise On Beam-Forming***
Author(s) : ***Shah Brijesh***
Roll No :
Supervisor(s) : ***Sircar Pradip***

Abstract

The effect of additive noise at the antenna array signal input on the beam forming is studied in this thesis .Two techniques viz., the optimization using reference signal and the optimal beam -forming are considered in this work. Methods based on singular value decomposition and orthogonal polynomial approximation is presented to combat the effect of noise on beam forming.

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Title : *Development And Evaluation Of Multihop Procedures For IEEE 802.11 Regarding QOS For Multimedia Applications*
Author(s) : *Bagual Rajesh S*
Roll No : *Y110412*
Supervisor(s) : *Sinha Vishwanath*

Abstract

Multihop transmission means that nodes cooperate to relay traffic on behalf of one another to reach distant Stations (STAs) that are otherwise out of range. Multihop transmission techniques increase the network capacity since the spatial domain could be reused for concurrent but physically separate sessions. A new multihop medium Access Control (MAC) protocol for Wireless Local Area Network (WLAN): RTSinstead ACK is proposed. The protocol. The intermediate relay STA sends Request To Send (RTS) to the next intermediate relay STA as the ACK. The protocol exploits the omnidirectional property of the antennas. In this scheme the STA reserves the medium for the next transmission. In this scheme the STA reserve the medium for the next transmission by the reservation information in the current transmission. Performance of RTSinstead ACK with reservation protocol for multihop transmission is evaluated against the IEEE 802.11e MAC protocol. The Wireless Access Radio Protocol 2 (WARP 2) Simulation Environment. Developed at the Chair of communication networks. Apache University of Technology is used for performance is evaluated in terms of delay - throughput characteristics. A random grid topology network is chosen for performance evaluation

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Title : *Detection Of Discrete-Time Signals In Coloured Noise*
Author(s) : *Pandey Rohit*
Roll No : *Y110457*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

ML decoding is optimal for the systems with ISI over an AWGN channel .The complexity grows exponent with channel length Equalizer is sub optimal technique but computationally efficient compared to ML decoder .DFE gives the best possible result when the cor rect decision are fed back /. Preceding is used to overcome the drawback of error propagation when estimated decision are fed .In case of time varying channels these approach is not a suitable for example in case of wireless application. An optimal scheme of signal detection in correlated interface using predictive viterbi algorithm for both coded and encoded system is proposed in [1] .As an application PVA is used in conjunction with fractionally spaced - linear equalizer .The computational complexity of PVA can be reduced by novel method of set - partitioning. Computer simulation were carried out for the PAV in conjunction with linear equalizer for the 4 -PSK and 8 - PSK Constellation

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Title : *AM-PM Representation Of Textures And Its Classification Using DWT And MWT*
Author(s) : *Nukarapu Dhanunjaya Rao*
Roll No : *Y110419*
Supervisor(s) : *Gupta Sumana*

Abstract

In this thesis, we describe a new representation for texture images. The representation is obtained by decomposing the images in the form a carrier image which is modulated in both amplitude and phase using a demodulation algorithm. Amplitude and Phase functions are specified over the spatial domain. The objective of decomposing the images using AM-PM model is to improve the performance of existing wavelet-based methods used for the classification of textures which have either dominant angular components or those with different orientations. The AM-PM texture images are characterized at multiple scales using 2D Discrete Wavelet Transform. Although wavelet (packet) transform has been widely used for texture analysis, in this case the extracted features of similar textures with symmetric orientations are indistinguishable. This is taken care of by using the AM-PM representation. A texture is characterized by a set of channel variances estimated at the output of the corresponding 2D filter banks. We also describe a new approach to characterize the AM-PM texture images at multiple scales using Modulated Wavelet Transform (MWT). We have constructed the Modulated Wavelet Transform. Classification results for 26 Brodatz textures indicate that performance of the proposed AM-PM representation of Textures and its Classification using DWT and MWT is comparable to the existing wavelet based algorithms

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Title : *Space-Time Turbo Coded Modulation*
Author(s) : *Kumar Ranjit*
Roll No : *Y110435*
Supervisor(s) : *Motwani Ravi Hiranand*

Abstract

Theoretic investigations have shown that Multiple Input Multiple Output (MIMO) channels can achieve very high capacities. The design method proposed by “Djordje Tujkovic, Markku Juntti, and Matti Latva-aho” for recursive space- time trellis codes and parallel concatenated space-time turbo coded modulation is used in this thesis. This can be applied to an arbitrary existing space-time trellis code. Tarokh’s space-time trellis code is modified to get a recursive space-time trellis code. The scheme is applied to two transmit antenna and one receive antenna. This code enable mobile receivers to exploit transmit diversity with very little increase in complexity. The methods enable a large, systematic increase in coding gain while preserving the maximum diversity gain and bandwidth efficiency property of the considered space- time trellis code.

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Title : ***Universal Source Coding For Non Stationary Processes***
Author(s) : ***Jacob Tony***
Roll No : ***Y110470***
Supervisor(s) : ***Bansal Rakesh K***

Abstract

non-stationary processes is considered here. Fixed rate and fixed distortion lossy source codes derived from the Lempel Ziv scheme are shown to be universal for non stationary processes with abstract alphabets. We characterize the rate distortion function for non-stationary sources. We also prove the continuity and convexity properties of the distortion rate function

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Title : *Concatenation Of Turbo Codes With Block Codes*
Author(s) : *Babu Vaddi Mahesh*
Roll No : *Y110473*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

In turbo decoding each decoding iteration results in additional computations and decoding delay. As the decoding approaches the performance limit of a given turbo code any further iterations result in very little improvement. Therefore it is important to devise an efficient criterion to stop the iteration process and prevent unnecessary iterations. One such stopping criterion is based on the cross entropy between the distributions of the estimates at the outputs of the decoders at each iteration. In this thesis we present a new stopping criterion based on error detection techniques. We have given the error profiles after turbo decoder. We also consider the problem of improving the performance of turbo codes by exploiting these error profiles. We have concatenated the turbo code with RS and BCH codes and simulated the performance of Turbo-RS and Turbo-BCH codes in AWGN channel. These simulations have been done for both error correction as well as erasures. The results are encouraging at the cost of some sacrifice in the code rate.

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Title : ***A CBIR Based On Partial Queries With Rotation And Crop Invariance***
Author(s) : ***Misra Shivani***
Roll No : ***Y110462***
Supervisor(s) : ***Venkatesh K S***

Abstract

Content -based image rotational is aimed at efficient retrieval of relevant images from large image databases based on automatically derived imagery features .In this the sis wed present a novel framework for matching and retrieval of color images based on segmentation into regions querying using the extracted color and shape features of these regions and their inter -spatial relationships. By finding image regions that roughly correspond to objects this algorithm allows querying at the level of sub objects rather than global image properties .The strongest point of the proposed algorithm is that it is invariant not only to translation and cropping at also to rotation for a clas s of suggested images with medium -detail. Apart from that this matching technique is insensitive to perceptually unsatisfactory segmentation as only a consistent segmentation of all images fulfils its basic requirement

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Title : *Frame Expansions Based On M-Channel Oversampled Filter Banks For Robustness To Erasures*
Author(s) : *Kumar Pankaj*
Roll No : *Y110441*
Supervisor(s) : *Motwani Ravi Hiranand*

Abstract

Over sampled filter banks are used as a tool to implement frame expansions. The redundancies present in over sampled filter banks are used to acquire resilience against erasures in packet based communication environment. In particular we study M - channel filter banks with down sampling factor $D = 2M$. We obtain conditions for recovery from bursty erasures and bounds on maximum size of reconstruct able erasure bursts. We prove that the maximum size of reconstruct able erasure burst depends upon length of analysis filters. We study the effect of erasures and quantization noise reconstructed signal.

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Title : *Design Of Mac Layer Protocol For Wireless Ad-Hoc Networks*
Author(s) : *Bharti*
Roll No : *Y110477*
Supervisor(s) : *Singh Yatindra Nath*

Abstract

Many medium - access control (MAC) protocol door wireless proposed or implemented to date are based on collision avoidance handshakes between and receiver .In the vast majority of these protocols including the IEEE 802.11 standard the handshake is sender ini tiated in that sender asks the receiver for permission to transmit using a short control packet and transmits only after the receiver sends a short clear - to - send notification. We analyses the effect of making the collision - avoidance handshake; receiv er initial and compares the performance avo9idancwe protocols. But in the RIMA [11] and MACA - BI [10] the compression of various protocols are not fairs as MACA - BI indicate the higher thought as compared to the there RIMA protocols are not fairer as M ACA -BI indicated the higher throughput as compared to the other RIMA protocols and its various versions which in all the visions of RIMA it has shown RIMA - DP as the best protocol among the receiver initiated policy .The heavy traffic approximation does not match the requirements of the multi - hop networks. So the comparison of MACA - bi with rime protocols do not fit well .As from the discussion among the RIMA protocols it is clear as we keep on increasing the number of nodes; the throughput variation in rime protocols it is clear as we keep on increasing the numbers of nodes; the throughput variation in RIMA protocols it is less as compared to other RIMA protocols. In this thesis we have tried to show more variants of RIMA - BP protocols and its compression with the original RIMA - BP protocol .By considering some realistic assumptions we have tried to show its effect on the throughput performance of various receiver initiated protocols

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Title : *Issues Of Qos Routing And Transmission Impairments In Opotical Networks*
Author(s) : *Venkatesh T*
Roll No :
Supervisor(s) : *Singh Yatindra Nath*

Abstract

In view of the growing importance of provisioning of high quality and multi - service networks Quality of service (QoS) Routing has assumed vast importance .Due to the ever increasing size of network in both core and access areas new distributed routing algorithms are being studied .In this work a new distributed routing algorithm based on intelligent and bounded flooding is proposed for better routing in large network with QoS provisioning. This algorithm named two -level flooding is yet another addition to t he numerous distributed routing algorithms in literature .In very specific cases this algorithm scales better than the conventional blind flooding approach. Further BER metric in optical networks. In this approach BRE degradation due to nonlinear and some linear impairments in WDM network is studied and existing algorithms are analyzed in view of this approach. Under these major impairments computations of paths taking the signal degradation into account becomes important for QoS based routing.

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Title : *A Modified Architecture Of All-Optical Wavelength Interchanging Cross Connect*
Author(s) : *PandaManoj Kumar*
Roll No : *Y110432*
Supervisor(s) : *SinghYatindra Nath*

Abstract

Wavelength interchanging Cross Connects (WIXC) have been proposed in the past for reducing blocking probability and increasing capacity utilization. The modular version of it that uses a block per wavelength, however, suffers from wavelength blocking, unless it uses tunable filters at its input side. These filters are costly and less reliable because of the tunability features associated with them. Also, complicated algorithms have to be used for deciding the wavelength which a specific tunable filter has to be tuned to, for eliminating wavelength blocking. Because, this decision has to be taken based on the current demand for input output connectivity. In this work, I have suggested a modification to this modular architecture of WIXC so that wavelength blocking can be reduced without having to use the costly and unreliable tunable filters at the input side. I have also examined the impact of the suggested modification on other important parameters of the cross connect

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Title : ***Texture Synthesis Using Angular Wavelet Frames***

Author(s) : ***Rao R Venkateswara***

Roll No : ***Y110452***

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

Abstract

In this thesis we proposed a method for texture synthesis using the angular wavelet frames (AWF). The 2D AWF is constructed by applying frequency transformations to the prototype filters of a 1D perfect reconstruction filters bank (PRFB) to obtain 2D filters . The objective of using AWF is to improve the performance of existing wavelet based methods for synthesis of textures having long - range and non - linear spatial correlation .A statistical model (AR model) consisting of random fields in wavelet sub bands is used for Texture .The basic idea here is that a complex random field e.g. one that contains long - range and nonlinear spatial correlations can be achieved .The proposed model can be used for texture matching and noise removal. We got some promising results for texture synthesis and texture matching

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Title : *3d Videocoding: A Novel Approach*
Author(s) : *Maiti Kausik*
Roll No : *Y110426*
Supervisor(s) : *Gupta Sumana*

Abstract

The main objective of this thesis - work is to apply transform - coding techniques to code video in a manner that helps to achieve improved rate - distortion performance and efficient bit - rate - control. At first we have made combined use of DCT and sub - band coding (DWT) techniques to reach this goal. No motion compensation is used at all. For videos with small object motion (as is the case in video - phone /video - conferencing type applications) the proposed method preserves the objective quality even at every low bit -rate (at around 0.04bpp). However when the object - motion increases significant artifacts have been observed in the regions containing large motion. The same has been noticed while coding video at an extremes low rate (around 0.02 bpp). To reduce this effect we have proposed a modification to the algorithm. Next we have tried to generalize the coding scheme so as to code wide variety of videos (e.g. videos with complex motions of objects synthetic video etc.) with acceptable performance at different bit - rates. With this in view we have replaced DTC with a set of KL transformation matrices. THROUGH comparative study we have shown that the second method yields better results for general class of video. The price paid in return is additional complexity at the encoder and hence greater encoding delay. Finally we have discussed how the proposed method can include interesting features like SNR – scalability spatial - scalability temporal - scalability and produce an embedded bit - stream that is suitable for progressive transmission over error - prone channel.

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Title : *Analysis Of Multiple Description Trellis Coded Quantization*
Author(s) : *Parida Umashankar*
Roll No : *Y110472*
Supervisor(s) : *Motwani Ravi Hiranand*

Abstract

Multiple descriptive coding is posed as a source - coding problem that uses diversity to overcome channel implements. Trellis coded quantization (TCQ) is used to obtain granular gain over the multiple description scalar quantizer. Several algorithms are proposed for different level of channel reliability. But by investigating the relationship of voronoi regions of the side and central quantizer, TCQ performance at central; receiver with a little sacrifice at the side receivers is being achieved. On the other hand with side receiver both having the TCQ performance and approaching the rate distortion bound the performance at the central receiver can get close to the multiple description rate distortion limit. The tensor product of trellis is being used to build trellis, which is applicable to multiple descriptive coding. The problem of index assignment and set partitioning for resulting trellis are considered. Here it is found that the complexity of the scheme is almost independent of the rate. The quantizer provides remarkable performance with little encoding complexity.

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Title : ***A Computational Geometry Approach To Multiuser Detection In CDMA***
Author(s) : ***Manglani Girish***
Roll No : ***Y110431***
Supervisor(s) : ***Chaturvedi Ajit Kumar***

Abstract

The computational complexity of the optimal detector in a multiuser CDMA system is prohibitive and therefore, in general, sub-optimum detectors are used. Most of these detectors approximate the combinatorial decision region by a convex region and carry out the minimisation of noise power over this region. In this work, a different approach to the problem has been taken. We consider a matrix that contains the matched filter outputs as well as the correlation information of the signature sequences. This matrix is approximated by a matrix of lower rank, which forms the basis of a new detector whose decision region is still combinatorial, but the function to be minimized is changed. The resulting detector is again sub-optimal with the interesting property that the computational complexity increases exponentially with the rank of the matrix. Hence a desirable trade-off between performance and computational complexity can be achieved. Simulations have been carried out under various settings to demonstrate the performance of the detector

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Title : *Threshold Free Image Segmentation Using Level Set Method*
Author(s) : *Bhatt Rajesh*
Roll No : *Y110448*
Supervisor(s) : *Sharma Govind*

Abstract

Level set method is a numerical technique to compute advancing fronts, while fast marching algorithm provides computationally efficient method for the tracking of monotonically evolving contours. Numerical analysis of conservation laws plays an important role in the implementation of curve evolution equations. Here we discussed the relevant concepts of level set methods and the relation between curve evolution, Hamilton-Jacobi partial differential equations, and conservation laws. Curve evolution serves as a powerful technique for image segmentation. We proposed an efficient algorithm for detecting image boundary such that there is no need of threshold

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Title : *Turbo Decoding In Correlated Noise*
Author(s) : *Rai Brijesh Kumar*
Roll No : *Y110415*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

Turbo codes are family of forward error correction codes, which achieve performance near Shannon limit. The decoding in turbo codes is done through an iterative exchange of information between elementary decoders, which are MAP decoders. Although most of the current literature deals with iterative decoding in additive white Gaussian noise (AWGN) in most partical situation the noise is correlated. This correlation is usually due to the non - ideal nature of the receive filte rs. In this thesis the problem of turbo decoding in correlated noise is discussed. Noise prediction filtering is applied to turbo decoding and modified turbo is suggested .The improvement in performance by using the modified turbo decoding is demonstrated through simulations

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Title : *Analytical And Practical Study Of Resonant Dc-Dc Converters With Minimum Switching Losses*
Author(s) : *Dwivedi Om Prakash*
Roll No : *Y110439*
Supervisor(s) : *Doradla S R*

Abstract

To predict the true performance of resonant converter under various operating conditions proper modeling and analysis is needed. In this thesis domain and complex circuit analysis of two three and four element converters. The time domain expressions for three element converters require decoding fourth order system into two - second order systems using similarity transformation does numerical iterative solutions. The time domain analysis of four -element converter. This method is an efficient tool for the analysis of resonant converters with more than three resonant elements. The high voltage dc power supplies using load resonant converters have the disadvantage of either turn on or turn off losses. A solution to this problem is use of two stage resonant converter discussed in this thesis explores the best features of series resonant converter discussed in this thesis explores the best features of series resonant converted (SRC) by operating it at the resonant frequency. The disadvantages of SRC in controlling the output voltage is overcome by a regulator connected in the front end of the SRC which is a buck converter. The buck converter is also operated with zero current switching (ZCS). The soft switching of all the switches ensures minimum switching loss in converter and allows the converter to operate at high switching frequency. The output voltage is maintained constant by closed loop frequency control of the converter. A practical prototype of two stage dc - dc converter is built and tested results are compared with simulated results

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Title : *Some Studies On Buck Boost And Resonant Dc-Dc Converters*
Author(s) : *Khan Shahab A*
Roll No : *Y110460*
Supervisor(s) : *Doradla S R*

Abstract

Practical behavior of power electronic converters is different from ideal behavior because of the non-linear and time variant nature of various elements. State space averaging technique provides a method to model the practical steady state behavior of power electronic converters. This method eliminates the time variant terms from the state equations of converters. Using this approach in conjunction with switching function technique, non-ideal nature of switches (finite turn-on, turn off times and conduction drops) can be modeled. In this dissertation Buck and Boost converters are modeled using this approach. Steady state dc gains obtained from modeling are compared with experimental results. PSPICE simulations of both converters are performed taking into account various parasitic components. High frequency operation in hard-switched converters is not possible because of high switching losses. An LCL resonant converter which can operate at high frequency is analyzed, simulated and implemented. This converter topology has advantages of both SRC and PRC. Effect of magnetizing inductance on performance of converter is studied. This converter is operated with zero voltage switching at turn on. A 100 W proto type is designed and tested. Closed loop voltage control is obtained by frequency control method. Switching frequency of LCL converter is varied to vary the gain of converter. This frequency range required for the control of converter is small so that the quasi-sinusoidal nature of voltages and currents is maintained.

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Title : *Experimental Investigation Of Performance Of 400 KV Insulators Under Pollution*
Author(s) : *Rai Manoj*
Roll No : *Y110434*
Supervisor(s) : *Arora Ravindra*

Abstract

In many parts of the world Insulator contamination has become major impediment to the uninterrupted supply of electrical power. Outdoor insulator are subjected to nature Polluted environmental contaminants which may include sea salt comment dust fly ash brides droppings industrial emissions etc. Deposited on their surface with the increasing industrialization not only the degree of pollution but also the type of pollution has an effect on the present performance of the insulators. In the present work, Experimental Investigation of the Performance of 400kV line ceramic insulator under Pollution is studied. Flashover under dense fog conditions on400kV Kanpur -Obra line has been investigated .For these investigations four single ceramic insulator disc of th e actual line were made available .Two out of which was used one and other two were unused (new). One each old and new was of 160kN and other two were of 120kN mechanical strength ratings. Different failure modes of the Insulators were investigated. Poll utant Layer on the insulator was analysed using X - ray Diffraction meter .It showed that the Pollutant dust layer on insulators contained a large percentage of NaCl, KOH and CaSo4.2H2O. Flashover tests under different simulated atmospheric conditions were performed .Experimental results revealed that under Polluted and wet conditions the flashover voltage falls below 10 kV whereas it was measured to be more than 60kV under Polluted and try conditions .Experimental results did not have signific ant difference for old and new insulators .Capacitance's surface gradient estimation on the three phases of the line has been made. The voltage distribution across the insulator string has also been estimated. Remedies are voltage distribution across the insulator string has been estimated. Remedies are suggested for reducing flashover on polluted conditions. Particularly RTV Silicon coated ceramic insulators have been found very effective under polluted conditions

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Title : *Coordination Of Power System Stabilizer And Facts Supplementary Controller Parameters In A Multimachine System*
Author(s) : *Kumar Boddeti Kalyan*
Roll No : *Y110425*
Supervisor(s) : *Srivastava S C*

Abstract

Fast exciters having automatic voltage regulator feature have been popularly used to enhance power system transient stability. At high gain settings, it some times introduces a negative damping torque component in the system resulting in small signal instability. The best solution for this is to provide power system stabilizer (PSS) in the exciter control loop. In a multimachine system, the PSS parameters must be coordinated in order to avoid negative interactions. In this thesis, a method based on optimal control strategy with pseudo-decentralization has been proposed for the coordination of the parameters of different PSS in a multimachine system. Flexible AC Transmission systems (FACTS) are popularly being used in the network to improve the system power transfer capability, provide effective voltage control, offer damping to the power system oscillations and thus, improving the system transient and small signal stability. Among various FACTS controllers, static VAR compensator (SVC) has been extensively used by the power utilities in their network, which employ a supplementary control loop for damping the oscillations. As different PSS in a multimachine system needs coordination to avoid interactions, SVC supplementary controller and PSS needs coordination. The proposed optimal control strategy with pseudo-decentralization method has also been applied for the coordination of SVC supplementary controller and PSS parameters. The proposed method for coordination of PSS as well as PSS and SVC controller has been implemented on WSCC 9-bus and New England 39-bus system. It has been observed that system stability improves considerable with the use of coordinated values of stabilizing controllers

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Title : *Generation Expansion Planning Of Nreb System Considering Carbon Emission Reduction Strategies*
Author(s) : *Kumar Priay Ranjan*
Roll No : *Y110446*
Supervisor(s) : *Srivastava S C&Singh Sri Niwas*

Abstract

The electric energy is the key to the economic growth and improving the living standard of a country .In most of the Asian countries particularly in India there is shortage of enough enervating plants to meet required peak demand. Continuous addition of power plants require the generation expansion to be carried out at regular intervals following a least approach Increased awareness to both local and global environmental has forced the planners to include various magnitude criteria in the generation planning also .In the present thesis an attempt has been made to include mitigation of green house gases (GHG) especially carbon dioxide in the planning methodology. In this work the utility planning cost & planning and environmental implications of supply - and demand - side options imposition of carbon tax on fossil fuels proportionate to their carbon contents and ranking of barrier in adoption of clean and energy efficient (CEE) technology have studied .The studied has been carried out for the Northern Regional Electricity Board (NREB) network of India Utilizing 16 th Electric Power Survey data published by the central Electricity Authority. Sensitivity analysis have also been carried out with respect to few important parameters associated with imposition of carbon tax and supply - and demand -side options to observe the trend in which the generation expansion planning shifts from its base case .In addition the ranking of barriers in adoptions of CEE technologies has been carried out with the help of an Analytical Hierarchical process (AHP). The study results reveal that the introduction of both supply - and demand - side options and imposition of carbon tax results in reduction of not only global pollutants SUCH AS carbon dioxide but also local pollutants such as NOx and SOx gases. The key barrier to the adoption of clean generation technology like IGCC and PFBC are the non availability of indigenous knowledge their proven ness in Indian condition and lack of financial instruments and those for solar based power plants are the high capital cost and lower efficiency

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Title : *Performance preserving controller order reduction for
Uncertain systems*
Author(s) : *Chakraborty Debraj*
Roll No : *Y110418*
Supervisor(s) : *Hole K E*

Abstract

m-synthesis is a widely used controller design paradigm that utilizes the structure in the uncertainty associated with the plant. However the controller thus produced is typically of very order. This dissertation is concerned with the approximation of the controller such that there is no degradation in the closed loop performance. A new proof has been proposed for the additive perturbation reduction techniques with sufficient conditions to guarantee the closed loop structured singular value of remain less than unity. This proof provides a rigorous basis for controller reduction in the m framework. A new coprime reduction technique has been proposed that makes unstable controller reduction possible with sufficient conditions to guarantee preservation of closed loop performance. The coprime factor perturbations to the controller have been shown to have a block diagonal structure. The proposed algorithms have been tested on a widely studied benchmark HIMAT aircraft and have been found to work satisfactorily producing more than 50% reduction in the controller order without optimization. Lastly, a full m synthesis design has been performed on the experimental data available from a flexible launch vehicle. The details of the design with the selected performance weights and the simulation results are presented. The reduction algorithms are also tested on this practical example and found to produce considerable reduction in the controller order while preserving performance.

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Title : *Discrete Time Sliding Mode Based Converter Control For Custom Power Applications*
Author(s) : *Ratadiya Sarit*
Roll No : *Y110458*
Supervisor(s) : *Ghosh Arindam&Joshi Avinash*

Abstract

Power converter are piecewise linear systems in which the control action rapidly changes converter technology from one to another .The control is effected by varying d (the duty cycle) power switches in the converter. Hence the state trajectories move back and forth around an average surface in the space. This leads to ripple in state variables and system exhibits nonlinear behaviour. Sliding mode controller can take advantage of this behavior do the same and can give a performance better than the conventional controller. Judiciously selected sliding surface combines useful properties of circuit modes and can even new properties not present in any modes. Power converter today is used to compensate for load supply side distur bance to maintain power quality in the distribution systems. Complete solution to power quality problem can be obtained with a Unified Power Quality Conditioner (UPQC) .It is a capacitor driven device which works in zero power inject/absorb mode .It co nsists of a series compensator to inject a voltage in series with the source terminal .It keeps load voltage sinusoidal in the presence of supply side distortions and unbalance .A dead beat controller has been used to track a reference for the series voltage to be injected .The resulting value of controlled signal obtained had a high peak to average to be injected .The resulting value of control signal obtained had a high peak to average value and thus require a high switching frequency of power converter to realize the same .At partial frequencies the dc capacitor current exhibits a bias and zero power mode is not realized . The whole system thus obtained becomes unstable. UPQC also use a shunt compensator whic h compensator control. Besides this separate application of the sliding mode control techniques to dynamic Voltage this separate application of the sliding mode control techniques to Dynamic Voltage Restores and Distribution STATic COMPensator is also di scussed. A discrete time sliding mode - based controller that gives a switching strategy for power converter is shown in figure .It keeps the compensator states along a judiciously selected hyper -surface .The resulting control can be easily realized using PWM switching of power compensator at partial frequencies Further whole controller can be implemented in a microprocessor the output of which can be used to control switching inside the power converter. Application of sliding Mode control in power quali ty systems leads to following advantages. ♦ Zero power Inject/absorb mode is easily realized. ♦ Stability for large load and supply variations as state trajectory is maintained on average sliding surface. ♦ Robustness to external disturbance and system model ing errors. ♦ Simple implementation and better performance compared to classical control techniques.

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Title : *Single And Dual Converter Topologies Of Synchronous Converter For Electric Traction Application*
Author(s) : *Srinivasulu S*
Roll No : *Y110463*
Supervisor(s) : *Das Shyama Prasad&Dubey G K*

Abstract

The modern 25 kV ac Traction System favours use of PWM-VSI fed Squirrel Cage induction motor drive due to numerous advantages. Such system requires an efficient bi-directional front-end converter for converting ac to dc. So far uncontrolled rectifier or phase –controlled rectifier, has dominated power conversion from and to dc. Such front-end converter systems suffer from low input power factor at low output voltages and harmonics input current. These harmonics injected into source can cause faulty operation of single and interface in telephone line and thus results in a number of indivisible effect. Hence the conventional front –end converters require a reactive power compensator and a passive harmonic filter at the input. The Synchronous Link Converter can be used as the front-end converter in electric traction due to its unique advantage of high power factor operation and low harmonics in sources current .The present work investigates the performance of the Synchronous Link Converter when used as a front-end converter in modern regeneration ac traction motor drive. The utility power factor operation of the Synchronous link converter has been simulated and experimentally verified

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Title : *A Comparative Study Of Some Rotor Flux Estimation Methods For An Induction Machine*
Author(s) : *Auddy Soubhik*
Roll No : *Y110464*
Supervisor(s) : *Das Shyama Prasad*

Abstract

Accurate estimation of rotor flux magnitude and its position is given much attention ever since the method of field orientation has been proposed. However, the state estimator designed by the existing techniques depends heavily on the accuracy with which the rotor time constant as well as the stator resistance are identified. Moreover, the transient performance of the existing flux observers is still not satisfactory even in some recent designs aimed to achieve accurate estimation of the rotor flux. In this dissertation a reduced order rotor flux observer is designed considering the state space model of the induction machine to be nonlinear. Observer gain is chosen in such a way that it is updated every time the donor speed is changed. Estimated rotor flux is used for state feedback to generate the control input to the plant (an induction machine employed in a direct vector control application. The simulation results demonstrate satisfactory performance of the designed observer inserted in the feedback path of the closed loop system (direct vector controlled induction machine drives). Like the previous works this observer also fails to perform satisfactorily in the transient. To overcome this problem an Artificial Neural Network (ANN) based nonlinear dynamic observer is designed. The gain of this observer is updated on line using Widrow's stochastic gradient descent algorithm for Mean Square Error. The performance of this observer is tested for the same system used for the design of the reduced order observer. The simulation results show acceptable improvement in the transient performance of the observer even at a low speed and low dc link voltage of the inverter while maintaining the stability and performance of the closed loop system. Lastly, random noise is introduced at the output measurements of the plant to test the robustness of the estimator to disturbance inputs. The performance with the very high random noise at the output measurements is quite satisfactory in the transient as well as in the steady state operating conditions of the machine

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Title : ***Tracking And Estimation Of Parameters Of Linear Time-Variant Systems***
Author(s) : ***Prakash Eathakota Vijay***
Roll No : ***Y110421***
Supervisor(s) : ***Behera Laxmidhar***

Abstract

Adaptive algorithms have a wide range of applications in the fields of signal processing, control and communications. Identification or tracking of time varying parameters of a system is one such application which is used in Eye Tracking used in Human Computer Interaction (HCI), noise cancellation, adaptive control and adaptive filtering. It becomes absolutely crucial in selecting the appropriate adaptation algorithm for the particular application on hand and hence the study of the characteristics of the various adaptation algorithms is very important. In this thesis a comparative study of the Recursive Least Squares (RLS), Weighted Least Squares (WLS), and the Kalman Filter algorithms is done based on their tracking abilities. A similarity between these algorithms is also established. A Kalman Filter algorithm based on the random walk parameter model is developed. A predictor corrector algorithm based on the Discrete Kalman Filter is also developed for adaptive noise cancellation. All the simulations are done by applying the aforementioned algorithms to track the time-varying parameters of an Autoregressive (AR) process and a Finite Impulse response (FIR) process

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Title : *Simulation And Experimental Realization Of A Regenerativ
Sustain Driver For Three-Electrode Plasma Display Panel*
Author(s) : *Behera Ranjan Kumar*
Roll No : *Y110454*
Supervisor(s) : *Das Shyama Prasad*

Abstract

In recent years AC - Plasma Display PANEL (AC - PDP) has been developed as attractive solution for High Definition Television (HDT V) and large flat TV Displays. But high power loss and the high cost are still major issues concerning Plasma Display Panels (PSPs) . In a three electrodes AC - PDP the high voltage drivers are required for scan data and sustain terminals . Suitable voltages are applied at the terminals for lighting the AC -PDP. Majority of power loss occurs during the sustain operation at the sustain driver this thesis aims at the simulation and experimental implementation of a regenerative sustain drivers for AC - Plasma Display Panel (AC - PDP) . The proposed sustain drivers for AC - Plasma Display Panel (AC - PDP) provides alternating high voltage pulses to ignite plasma and recover the energy discharged from the intrinsic capacitance between the sustain electrode (X) and sustain electrode (Y) inside the panel .The proposed sustain driver for AC - PDP has been simulated .This driver utilizes the inductors to resonate with the equivalent intrinsic capacitance of the AC - PDP to avoid abrupt charging and discharging operation .The energy loss due to hard switching and the displacement current of the AC - p is mainly recovered .This regenerative sustain driver circuit has a quite simple structure and is suitable for asymmetrical operation

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Title : *Direct Torque And Flux Control Of Induction Motor Fed From Two-Level And Three-Level Inverters*
Author(s) : *Dwivedi Umakant Dhar*
Roll No : *Y110471*
Supervisor(s) : *Das Shyama Prasad*

Abstract

Direct Torque and Flux Control (DTFC) is an advanced control strategy in the field of adjustable speed drive. It has been developed on the space vector approach, where the torque and flux of an induction motor can be controlled directly and independently, without any co-ordinate transformation. In the DTFC, the motor torque and flux are calculated from the primary variables and they are controlled directly and independently by selecting optimum inverter switch modes. This selection is made so as to restrict the errors of flux and torque within the desired hysteresis bands. This control results in quick torque response in the transient operation and improvement in the steady state efficiency. Initially, this thesis deals with the design, simulation and PC-based hardware implementation of DTFC scheme for a two-level inverter-fed induction motor. For high power adjustable speed drives, direct torque and flux control algorithm for a three-level inverter-fed induction motor is also presented. Basic voltage selection method similar to a two-level inverter gives rise to some problems such as stator-flux drooping phenomenon and undesirable torque control deterioration especially at low-speed operation. To overcome these problems, an algorithm is proposed in this thesis where the basic switching sectors are subdivided and intermediate voltage vectors are applied as necessary. Keywords: Direct torque and flux control (DTFC), Induction motor, Low-speed operation, Two-level inverter, Three-level inverter, Switching table, PC-based implementation

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Title : *Control Co-Ordination Of Static Synchronous Compensator
And Power System Stabilizer In A Power System Network*
Author(s) : *Dawnee S*
Roll No :
Supervisor(s) : *Das Shyama Prasad*

Abstract

Static Synchronous Compensator (STATCOM) and Power System Stabilizer (PSS) when connected together in a power system network enhance the stability of the system by damping out the system oscillations. However there may be deleterious interactions between the two controllers. In this thesis a possible control coordination of STATCOM and PSS is examined so that the overall system stability is improved. The control coordination is tested on two systems (1) the Single Machine Infinite Bus System and (2) W SCC 3 MACHINE 9 BUS SYSTEM. The performance of the PSS and STATCOM is independently tested first in the SMIB SYSTEM AND THEN the two controllers are simultaneously coordinated for successful improvement in stability. The individually tuned controllers are then connected together to the WSCC 3 machine 9 bus test system and again coordinated for positive improvement in the multi - machine system. Simulation and analysis have been carried out using the PSCAD/EMTDC software package. The simulation results show excellent coordination and effective damping improvement when coordinated PSS - STATCOM is used in the power system network.

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Title : *Complex Value Based Neural Networks And Alogorithms For Their Implementation*
Author(s) : *Wat Kshitij*
Roll No : *Y110427*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

Complex value based neural network is a multi - layered neural network whose weights biases, inputs and outputs are all complex numbers. It can be applied in the areas where inputs and outputs of the system need to be represented by complex values such as in signal processing, speech processing, channel equalization etc. it has been also shown that the complex valued neural network can transform geometric figures, e.g. rotation, similarity transformation and parallel displacement of straight lines, circles et c. these transformation capabilities appears only by extending neural networks to complex domain. In this thesis, Resilient Back - propagation Algorithm and its modified form in real valued neural network have been extended to complex valued neural networks . It is shown that this extended algorithm substantially improves the convergence speed of the network compared to the complex back propagation algorithm. The complex New Neuron model is also developed. The inversion of complex neural network and Complex New Neuron Model is also achieved by extending the gradient descent inversion algorithm to complex domain. The performance of complex neural network in learning the function mapping in complex domain is also studied.

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Title : *Methodologies For Implementation Of PID Controller For Linear And Nonlinear Systems*
Author(s) : *Sinha Arpita*
Roll No : *Y110409*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

Inn general PID controllers are applied to the error between the outputs the reference input to the system. Proportional and derivative actions can also be applied to the output of the system rather than the error. This gives an improved response for linea r systems that are fast and oscillatory .It is also effective to nonlinear systems with block nonlinearity like saturation or relay. This thesis present a PID controller in which the proportional - integer - derivative action are applied both to the error a nd the output of the system that is in the forward and feedback path .All the combinations that are possible when the P, I, and D action are placed at the forward and feedback path while keeping the characteristic equation same are studied for both linear and nonlinear SYSTES. To all these different combinations of PID controller a sector - bound nonlinear gain is placed in cascade with the linear fixed – gain either in the forward path or in the feedback path. This is an extension of the forward path sim ple nonlinear PID Controller .Two simple nonlinear gains are proposed that is applied in the feedback path; a modified exponential function and the piecewise - linear function. These new controller are applied to both linear and nonlinear systems .An attempt is made to find the best configuration that gives an improved performance both for set point changes and disturbance inputs.

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Title : *Development Of An Ozonator Adopting Surface Discharge Technique*
Author(s) : *Meena Pankaj Kumar*
Roll No : *Y110442*
Supervisor(s) : *Arora Ravindra*

Abstract

Ozone (O₃) that is allotropic form of oxygen occurs in atmosphere naturally and can be produced artificially also. As natural ozone layer at the stratosphere protects the earth being form ultra violet radiations, coming from the sun and human made ozone is used for the water purification, chemical and pharmaceutical industry, in desulfurization (DeSO_x) and denitritization (DeNO_x) of combustion gases etc. So far techniques have been developed for ozone generation are employing electric discharge method since chemical and ultra violet methods doesn't produce enough ozone quantity and a lot of wastage of chemicals also take place in chemical method. Conventional ozonator generally employing electric discharge uses the corona discharge principle, in which sharp pointed electrodes are used. In this work, the property of tracking i.e. electric surface discharge at power frequency of solid dielectrics like ceramics is being used for the ozone generation. In this experimental work, the dependence of ozone production like the effect of electrode length, length of creep age path, applied high voltage, flow rate of inlet gas, type of inlet gas whether it is oxygen or air are being investigated. Here discharge currents and power consumptions by a particular electrode configuration are also being studied. A compare study of performances achieved by non conventional ozonator is also being done in this work with conventional one, which uses the corona discharge principle for ozone generation

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Title : ***Improved Utility Interface For Ac Drive System With Voltage Sag Ride-Through Capability***
Author(s) : ***Jaiswal Pankaj***
Roll No : ***Y110440***
Supervisor(s) : ***Das Shyama Prasad&Dubey G K***
Abstract

Voltage sags are common occurrence even in most advanced power system networks. In voltage sensitive applications like textile and paper mills even brief voltage sag may potentially causes an Adjustable Speed Drive (ASD) to introduce speed fluctuation which damage the end product or many also cause tripping resulting in heavy losses. Further as the harmonic restrictions are becoming stricter the front - end converter used in ASD to get a dc power from ac supply needs to be controlled to draw nearly sinusoidal current. Hence an improved utility interface is required that can draw almost sinusoidal current at unity power factor from supply keep the dc link voltage constant under varying supply voltage conditions and allows bi - directional power flow making regenerative operation possible. In this dissertation an advanced converter called Synchronous Link Converter (SLC) has been used as the front - end converter for ac drive system. Indirect current control scheme has been used with constant switching frequency pulse width modulation drawing nearly sinusoidal (low in harmonics) current at unity power factor from the supply. With this closed loop control scheme the dc link voltage is maintained close to the reference value in voltage sag as well as swell conditions thus providing the ac drive with voltage sag ride - through capability. By de - rating the front - end converter the maximum sag ride - through can be increased. Further at lower loads higher sag is compensated. The performance evaluation of this advanced utility interface for ac drive systems has been done by simulation studies in saber simulator. A laboratory prototype has been fabricated and tested successfully. The real time control algorithms have been implemented using a PC (Pentium) with PCL - 208 data acquisition card

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Title : *Simulation Of Active Hybrid Filter*
Author(s) : *Shinde Satish Mahadev*
Roll No : *Y110461*
Supervisor(s) : *Ghosh Arindam&Joshi Avinash*

Abstract

Proliferation of non-linear devices like ASDs has resulted in serious utility interface issues. These devices degrade power quality by distorting voltage and current waveforms, drawing reactive power and causing voltage flicker. The distortion of current or voltage waveform is expressed in terms of harmonics. Utilities are facing problems due to harmonics such as higher losses, resonance and due to this equipment derating is required. Apart from increase in losses, harmonics also cause malfunctioning of equipment. Passive filters consisting of capacitors and inductors have long been used to reduce harmonics. Passive filters offer less expensive and simple solution to the harmonics. But passive filters suffer from the danger of resonance at one or more harmonics frequency, which further increases harmonics. Active filters overcome majority of the drawbacks of the passive filters. Pure active filters provide effective solution for a small rating nonlinear load, but are not feasible and cost effective for a large rated non-linear load due to their high rating requirement. Hybrid filters offer a cost effective and practical solution for harmonic filtering and harmonic isolation for large rated nonlinear loads. In this scheme small rated square wave inverter switching at dominant harmonic frequency is transformer coupled to each L - C branch of the passive filter to form the hybrid parallel active filter system. This system employs low rating low switching frequency square wave inverters to achieve harmonic isolation at dominant harmonic frequencies. Active tuning command for the passive filter is calculated in d - q reference frame. Modified PWM scheme is used to generate desired voltage from inverter of the active filter. This scheme will overcome limitations of pure passive filters such as component tolerances, component variation resulting from aging, temperature rise, and out of specification inductors, change in capacitance value due to capacitor bank unit failures. The scheme is validated by simulating it using EMTDC/PSCAD software, IEEE 519 - 1992 limits are checked at PCC with active hybrid filter.

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Title : *A Static Synchronous Series Compensator Based On Flying Capacitor Multilevel Inverter*
Author(s) : *Shukla Anshuman*
Roll No : *Y110404*
Supervisor(s) : *Ghosh Arindam&Joshi Avinash*

Abstract

In this thesis, a static synchronous series compensator (SSSC) has been designed using flying capacitor multilevel inverter (FCMLI). Basic concepts of the series compensation and various approaches of its realization are explained. It is verified from simulation study that the SSSC can be used to improve various power system performance measures. Basic concepts of the FCMLI have been discussed and the three-level and the five-level flying capacitor inverters have been simulated. A method for controlling the FCMLI is used which ensures that the flying capacitor voltages to remain constant using the preferential charging and discharging of the capacitors. This is possible because the structure offers redundant switching combinations possible for d generation of different voltage levels. For minimum harmonic content in the output voltage, a modulation scheme has been used taking in consideration the frequency and phases of the carrier waves with respect to the modulating signal. A start-up procedure has been presented, which is used to charge the capacitors before making the inverter functional. The two simulated inverters are being used separately to implement the SSSC. Two control approaches namely, indirect control and direct control, have been used for regulating the inverter parameters in accordance with the varying system requirements. The indirect control regulates the dc link voltage with respect to a reference value. The reference value varies with the change in functional requirements of the SSSC. It has been verified from simulation results that it is a less efficient and slow control, as the dc capacitor takes significant time to charge or discharge to its new reference value for the new functional requirement. The direct control varies the modulation index of the inverter according to the functional requirement, and the dc link voltage is kept constant. By simulation results it has been verified that direct control approach is fast and more efficient in operation than the indirect control. The simulation study has been done using PSCAD/EMTDC package Version 3.

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Title : *Multilevel Inverters For Statcom Application*
Author(s) : *Gupta Ashish*
Roll No :
Supervisor(s) : *Ghosh Arindam&Joshi Avinash*

Abstract

The structure and control schemes of a STATic synchronous COMPensator (STATCOM) using Flying Capacitor Multi-Level Inverter (FCMLI) have been discussed in this thesis. The STATCOM is an electronic version of the synchronous condenser connected in shunt with the transmission line through a coupling transformer. The main objective of the STATCOM is to maintain the line bus voltage at its reference value, which increases the power transfer limit, transient limit and voltage stability of the transmission system. The STATCOM is realized by a synchronous Voltage Source Inverter (VSI), which generates three-phase ac voltages in phase with the transmission system voltage. For the compensation purpose, the dc voltage source of the VSI is replaced by a dc capacitor. Two control schemes namely, indirect control and direct control, have been discussed for regulating the inverter parameters in accordance with the varying system requirement. In the indirect control, the dc link voltage is regulated with respect to a reference value. The reference value varies with the variation in the functional requirements of the STATCOM. In the direct control, the modulation index of the VSI is varied according to the functional requirement, keeping the dc link voltage constant. Due to charging/discharging time of the dc capacitor, the direct control is faster than the indirect control. Hence it gives better performance. Multilevel inverter structure of the VSI is used for the realization of the STATCOM. Three multilevel inverter structures (Diode clamped, cascade and flying voltage source) have been described in this work. The operation of these structures for the general inverter operation and compensation purposes has been studied. FCMLI is a special structure of the flying voltage source topology. A method for controlling the FCMLI is used which ensures that the flying capacitor voltages remain constant. The above inverter structures and control schemes of the STATCOM have been verified through digital computer simulation studies using PSCAD/EMTDC (Version 3) software package

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Title : *Simulation And Performance Evolution Of Flow And High Power Active Power Filters*
Author(s) : *Thakur Manoj Kumar*
Roll No : *Y110433*
Supervisor(s) : *Das Shyama Prasad&DubeyG K*

Abstract

thesis models of Active Power Filter have been developed for single - phase three - phase three - wire and three - phase four - wire systems for compensation of single phase three - phase balanced and unbalances loads. Both non -linear and inductive linear loads have been considered for each topology of APE. Proportional In tegral controller has been used in each control of the active filter and maintains it at the reference voltage. It also generates the reference supply currents to draw the necessary power from the ac source to feed the real power required by the load in ad dition to the real power required to meet the Active Power Filter losses. A hysteretic -based bang bang current control is employed for fast and efficient control. Simulation of each type APF has been done for different loads with the help of SABER simulato r for steady state and dynamic performance evaluation. A parallel converter based APF suitable for high power load compensation has been proposed. SABER simulation has been done for the parallel converter topology with linear and non - linear loads. The parallel converter is a combination of two converters having high power low frequency devices (main converter) and low power high frequency devices (auxiliary converter). A neutral point clamped (NPC) converter acts as the main converter for VAR compensat ion of the load. The parallel - connected auxiliary converter operating at low power and high frequency compensates the main converter harmonics and load harmonic current

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Title : *To Investigate The Breakdown Characteristics Of Atmospheric Air With Varying Degree Of Uniformity In Extremely Nonuniform Fields With Dc And Ac Voltages*

Author(s) : *Daya Shankar Chaubey*

Roll No : *Y110417*

Supervisor(s) : *Arora Ravindra*

Abstract

Dielectrics, the indispensable part of power systems are subjected to severe electric stress due to ac and dc voltage. Therefore it is desired to investigate the strength of a dielectric subjected to stress produced by the ac and dc voltages. Behavior 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 achieved. But in practice it is not possible to accomplish a totally uniform field in insulation systems. Best example of such a practical insulation installation is that of an enclosed gaseous dielectric system (Gas Insulated Systems) where it is tried to achieve a weakly non uniform field. In this work the variation of breakdown strength of air in extremely non uniform field conditions is investigated, when subjected to the ac and dc voltages. For this purpose rod-rod and rod-plane electrode configurations are used. The effect of polarity of dc voltage on the breakdown strength of atmospheric air under the extremely non uniform 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_{vg} with Schwaiger factor (n) is determined analytically from the measured results. Thus the effect of polarity on breakdown strength of atmospheric air becomes more prominent.

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Title : *Role Of Facts Controllers In Enhancing System Loadability And Available Transfer Capability In Restructured Electricity Environment*
Author(s) : *Satish Natti*
Roll No : *Y110437*
Supervisor(s) : *Srivastava S C*

Abstract

FACTS (Flexible AC Transmission Systems) controllers are increasingly being used in power system networks for improving the system security and power transfer capability without expanding the transmission network. Electrical networks, throughout the world, are undergone major restructuring and introducing competition at different levels. In this new environment, all parties can have open access to participate in the market activities. Since it offers a competitive market, all trading parties will have tendency to purchase power at the lower cost. If these transactions are not controlled properly, transmission congestion takes place due to the unplanned power exchanges between two areas. FACTS controllers can play a major role in deregulated market in congestion management and enhancing the level of power transactions. In this thesis, an attempt has been made to maximize the system loadability by introducing FACTS controllers. Two FACTS controllers viz. Thyristor Controlled Phase Angle Regulator (TCPAR) and Unified Power Flow Controller (UPFC) have been considered in this study. A new approach based on linear sensitivities of loading parameter with respect to parameters of FACTS controllers has been proposed for their optimal placement in the network. Optimal control settings of these controllers have been obtained by maximizing the system loadability using an Optimal Power Flow (OPF) formulation. The impact of TCPAR has also been studied in Available Transfer Capability (ATC) enhancement with respect to bilateral as well as multilateral transactions. The proposed methods have been tested on IEEE 30-bus system and New England 39-bus system. Results show that the system loadability significantly improves with TCPAR and UPFC placed in the system. A considerable impact of TCPAR is observed in enhancing the Available Transfer Capability (ATC).

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