

## M.TECH. THESIS ABSTRACTS 2006

Sr No	Area	Page No
1	Microelectronics, VLSI & Display Technology	10-26
2	RF Microwaves& Photonics	27-33
3	Signal Processing, Communications & Networks	34-73
4	Power and Control	74-98

## Miroelectronics , VLSI & Display Technology

Sr No	Title	Supervisor	Page No
1	Comparative Study Of Organic Solar Cells Based On MEHPPV/CNPPV And MEHPPV/PCBM	Iyer S Sundar Kumar	10
2	Improved Amplifier Design For 6-BIT 500MSPS Pipeline Analog-To-Digital Converter	QureshiShafi	11
3	Analysis Of Contact Resistance Of Top Contact OFET Through Two-Dimensional Numerical Simulations	Mazhari Baquer	12
4	A Novel NMOS Based Dynamic Logic Family Using Gated Diode For Voltage Boosting	Mazhari Baquer	13
5	Techniques For Improving Copying Accuracy & Threshold Voltage Sensitivity In Current Driven Active Matrix Organic Light Emitting Display	Mazhari Baquer	14
6	Simulation And Analysis Of Bi-Layer Organic Solar Cells	Iyer S Sundar Kumar	15
7	A Novel VLSI Architecture Of Three Step Hierarchical Search (3SHS) For Motion Estimation	Qureshi Shafi	16
8	Fabrication And Characterization Of Pentacene Based Organic Thin Film Transistor On PMMA Dielectric	Mazhari Baquer	17
9	A Novel Approach Of Defining The Threshold Voltage For MOSFETs And An Accurate And Technology-Mapped Definition Of The Surface Potential At The Threshold Point	Dutta Alope	18
10	A Study Of P3HT/PCBM Bulk Hetero Junction Organic Solar Cells	Iyer S Sundar Kumar	19

11	Effect Of Built In Potential On Bi-Layer Organic Solar Cell	Mazhari Baquer	20
12	The Effect Of Logic Block Granularity On Deep-Submicron FPGA Power And Energy	Qureshi Shafi	21
13	Modeling Of Threshold Voltage Behavior Of Symmetric And Asymmetric Double-Gate (DG) MOSFETs	Qureshi Shafi	22
14	Fabrication & Characterization Of Nearly-All-Organic TFT With PMMA As Gate Dielectric	Iyer S Sundar Kumar	23
15	Techniques For Reducing Leakage Currents In SRAM Cells	Mazhari Baquer	24
16	Design Of Bulk-Driven Down-Conversion MOS Mixers Having Low Power Consumption And High Conversion Gain	Dutta Alope	25
17	Study Of Cathodes And Other Properties Of Polyfluorene Based Polymer Light Emitting Diodes	Mazhari Baquer & Narain Jitendra	26

## RF Engineering And Photonics

Sr No	Title	Supervisor	Page No
1	Study Of A Printed Omnidirectional Antenna For WLAN	Sachidananda M	27
2	Study Of Surface Wave Structures For Antenna Array Applications	Sachidananda M	28
3	Design Of A Laser Based System For Real Time Monitoring Of Misaligned Wheelsets For The Indian Railways	John Joseph	29
4	Dispersion And Attenuation Characteristics Of Multiconductor Microstrip Lines And Finlines On Anisotropic Substrates And Realization Of Broadband Bandpass Filter Structure	Biswas Animesh	30
5	Theory and Applications of Optically Actuated MEMS Structures	Ghosh Anjan Kumar	31
6	On UHF RFID Tag Antenna - Design And Measurements	Harish A R	32
7	Generation Of High Frequency Wideband Chaos Using Solid State Amplifier	Harish A R	33

## Signal Processing, Communication & Networks

Sr No	Title	Supervisor	Page No
1	Design Of A Protocol For Wireless Sensor Network And Its Simulation In TOSSIM	SinghYatindra Nath	34
2	Optimization Of Spot Pattern In Indoor Diffused Optical Wireless Systems	SinghYatindra Nath	35
3	A Modified Photonic Switch Architecture Based On Fiber Loop Memory	SinghYatindra Nath	36
4	A Low Complexity Decoding Algorithm For Permutation Modulation	Chaturvedi Ajit Kumar	37
5	On Error Rate In Hypothesis Testing Based On Universal Compression Algorithms	Bansal Rakesh K	38
6	Font Insensitive Recognition Of Multiple Indian Scripts	Venkatesh K S	39
7	Inter-Pulse Interference In Ultra Wide-Band Communication Systems	Chaturvedi Ajit Kumar	40
8	Prefiltering In Autocorrelation Domain And Its Application In Noisy Speech Analysis	Sircar Pradip & Banerjee Adrish	41
9	Study On Energy Efficient Modulation Techniques For Wireless Sensor Network	Sircar Pradip & Banerjee Adrish	42
10	Video Coding Based On Analysis Of 3D DCT Coefficients	Sharma Govind	43
11	Interpolation Of Lost Frames Of Video	Sircar Pradip & Banerjee Adrish	44
12	Implementation Of Layered Video Codec	Singh Yatindra Nath	45
13	Analysis Of Turbo Codes Using EXIT Chart	Vasudevan Kasturi	46

14	Block Differential Scheme For Maximum Diversity Over Doubly Selective MIMO Channels	Chaturvedi Ajit Kumar	47
15	Turbo Code Design For Half-Duplex Relay Channel	Banerjee Adrish	48
16	Two Dimensional Directions Of Arrival Estimation	Sircar Pradip	49
17	On Peak-To-Average Power Ratio Reduction Of Orthogonal Frequency Division Multiplexing Modems	Sircar Pradip & Banerjee Adrish	50
18	Modification Of Congestion Control Algorithm For TCP And Its Extension To Explicit Rate Adjustment Algorithm	Singh Yatindra Nath	51
19	Human Activity Representation, Analysis, And Recognition	Venkatesh K S	52
20	Signaling With Truncated Root Nyquist Pulses	Vasudevan Kasturi	53
21	Comparison Of Various Photonic Packet Switch Architectures Under Random And Bursty Traffic	Singh Yatindra Nath	54
22	Detection And Tracking Of Moving Objects In Compressed Video	Sharma Govind	55
23	Complexity Scalable 3D Video Coder For Low Bit Rate Applications	Gupta Sumana	56
24	Just Noticeable Distortion Model And Its Application To Video Coding	Sharma Govind	57
25	Constant Quality Video Coding Using Video Content Analysis	Sharma Govind	58
26	Rate-Adaptive Resource Allocation In Downlink OFDMA Wireless Communication System	Sharma Govind	59
27	Writer Dependent Handwriting Synthesis	Venkatesh K S	60
28	Channel Estimation For Ultra Wide-Band Communication Systems	Chaturvedi Ajit Kumar	61

29	Time Hopping Codes For Multiuser Ultra Wide-Band Communication Systems	Chaturvedi Ajit Kumar	62
30	Traffic Engineering In Multi-Hop Optical Networks	Singh Yatindra Nath	63
31	A Comparative Study Of Protocols For Cooperative Diversity	Chaturvedi Ajit Kumar	64
32	Successive Interference Cancellation For FHSS Multiple Access Systems	Vasudevan Kasturi	65
33	Content Based Video Segmentaion And Retrieval In Compressed Domain	Gupta Sumana	66
34	Turbo Trellis Coded Modulation For BandWidth Efficient Signaling At Low Signal-To-Noise Ratios	Vasudevan Kasturi	67
35	The Representation Theory For Relations	Venkatesh K S	68
36	Restoration Of Old Color Film Sequences	Gupta Sumana	69
37	Color Correction And Intensity Flicker Removal From Old Film Sequences	Gupta Sumana	70
38	Study Of Speaker-Invariant Features For Speech Recognition	Umesh Srinivasan	71
39	Speaker Normalization Using Frequency Warping	Umesh Srinivasan	72
40	Secure Data Communication Using Synchronized Chaotic Oscillators	John Joseph& Sivaprakasam Sivaraman(LTP)	73

## Power & Control

Sr No	Title	Supervisor	Page No
1	Analysis And Simulation Of A Matrix Converter-Fed Stator Flux Oriented Vector Controlled Synchronous Motor Drive System	Das Shyama Prasad	74
2	Design, Simulation And Implementation Of A Single-Phase Optimized Unified Power Quality Conditioner	Das Shyama Prasad	75
3	Analysis Of PWM Techniques By Double Fourier Series Method	Joshi Avinash	76
4	Digital Power Quality, Energy Audit And Communication Device	Kalra Prem Kumar	77
5	Application Of Power Frequency Estimation Algorithms For Operation Of Custom Power Devices	Ghosh Arindam & Joshi Avinash	78
6	Power Flow Control Using A 5-Level Converter Based Unified Power Flow Controller	Ghosh Arindam & Joshi Avinash	79
7	Development Of Adaptive Supplementray Feedback Controller For GUPFC	Singh Sri Niwas	80
8	Application Of Self Organizing MAP And Extended Relation Function Method For Power Transformer Fault Diagnosis	Singh Sri Niwas & Biswas Bikash	81
9	Design, Simulation And Realization Of A Wideband Shunt Hybrid Active Filter	Sensarma Partha Sarathi	82
10	Optimal Bidding Strategies In A Competitive Electricity Market Using A Particle Swarm Optimization	Singh Sri Niwas	83
11	Analysis, Design and Implementation Of A Three-Level Neutral Point Clamped (NPC) Regenerative Front-End Converter For Induction Motor Drive	Das Shyama Prasad	84



12	Simulation And Implementation Of A Speed Sensorless Indirect Vector Controlled Induction Motor Drive System	Das Shyama Prasad & Behera Laxmidhar	85
13	Improvement Of Current Dynamics During Controller Saturation In A D-STATCOM	Sensarma Partha Sarathi	86
14	Design And Implementation Of A Low Cost Microcontroller Based Single Phase Power Analyzer	Das Shyama Prasad	87
15	Voltage Stability Assessment And Enhancement Of Nepal Power System	Srivastava S C & Singh Sri Niwas	88
16	Transmission Cost And Loss Allocation Methods In Competitive Electricity Markets	Srivastava S C	89
17	Angular Stability Enhancement Of NEPAL Power System Using Stabilizing Controllers	Srivastava S C & Singh Sri Niwas	90
18	Performance Analysis And Control Of DG Supported Distribution Systems	Joshi Avinash & Ghosh Arindam	91
19	Double Vector Control Of Dynamic Voltage Restorer Using Improved Phase Locked Loop	Sensarma Partha Sarathi	92
20	Optimal Placement And Operation Of Distributed Generators In Power Systems	Srivastava S C & Singh Sri Niwas	93
21	Design Development And Implementation Of Minimum VA Rated UPQC	Sensarma Partha Sarathi	94
22	A Stochastic Model For Electric TREE Progression Due To Partial Discharges Within Tree Tubules	Gupta Nandini	95
23	Variable Gain Controllers For Nonlinear Systems Using T-S Fuzzy Model	Behera Laxmidhar	96
24	Electric Field Distortion And Stress Control At The Crossing Of Transmission Lines	Arora Ravindra	97
25	Performance Evaluation Of Ceramic Insulators Under Pollution With And Without RTV coating	Arora Ravindra	98

**Title** : *Comparative Study Of Organic Solar Cell Based On MEHPPV/CNPPV And MEHPPV/PCBM*  
**Author(s)** : *Bhat Amruta*  
**Roll No** : *Y4104008*  
**Supervisor** : *Iyer S Sundar Kumar*

***Abstract***

Organic materials have gained interest as alternative semiconductor materials in the last decade. Several applications were demonstrated for these materials. In this work a blend of MEHPPV:CNPPV was fabricated as these organic materials have suitable HOMO-LUMO gaps to enable exciton dissociation. In order to improve the efficiency, in the later part of the work, PCBM, a more soluble form of C60 molecule was used as an acceptor. Thus, in this work, the blends of MEHPPV:CNPPV and MEHPPV:PCBM were fabricated and characterized. The current densities obtained for MEHPPV:PCBM devices were about 3 orders of magnitude larger than MEHPPV:CNPPV devices. These characteristics were then used to calculate the effective values of mobility, series and shunt resistances. Also the variation of various parameters like short circuit current, open circuit voltage, fill factor, series and shunt resistance were studied with the variation of intensity of incident light.

**For more details click here**

**back**

*Title* : *Improved Amplifier Design For 6\_BIT 500MSPS Pipeline Analog -To-Digital Converter*  
*Author(s)* : *Pradhan Kishan*  
*Roll No* : *Y4104042*  
*Supervisor* : *Qureshi Shafi*

### *Abstract*

The pipeline analog-to-digital converters (ADC) have shown promise for high speed and low power in modern VLSI technology. The design of a 6-bit 500 MHz digital self-calibrated pipeline ADC is presented in this work. Employing open-loop amplifier in one-bit conversion per stage architecture, the circuit operates in high speed and low power consumption. A behavioral model for the pipeline ADC is presented, where most of its non-idealities are considered and time domain behavioral simulations were performed. A low power low voltage open-loop amplifier is proposed. The open-loop amplifier is implemented using 0.18  $\mu\text{m}$  CMOS technology with a single 1.8 V power supply. The integral non-linearity (INL) and differential non-linearity (DNL) is found to be less than 0.3 LSB and 0.4 LSB respectively.

**For more details click here**

**back**

*Title* : *Analysis Of Contact Resistance Of Top Contact OFET Through Two-Dimensional Numerical Simulations*  
*Author(s)* : *Sharma Abhinav*  
*Roll No* : *Y1147011*  
*Supervisor* : *Mazhari Baquer*

### *Abstract*

Parasitic contact resistance effects are becoming a major issue in organic transistors in that they can severely limit or even dominate their overall transistor performance especially for short channel transistors (< 1 micron). In the majority of experimental studies (for bottom contact OFETs), the total contact resistance was estimated by analyzing the (macroscopic) electrical device characteristics based on stringent assumptions like channel length and electric-field independence of contact resistance. Purely resistive models have been suggested for bottom contact OFETs. Similar analysis has been extended to top contact OFETs. In this work, contact resistance of top contact OFET is analyzed using two-dimensional numerical simulations. Contact resistance is studied both when transistor is operating in linear and saturation regime. Source contact resistance is explored in detail and the difficulty in defining drain contact resistance for a top contact OFET is also explained. Nonlinear I-V characteristics of top contact OFET simulated at low drain source bias, for high injection barrier heights, can not be explained by a purely resistive model of organic transistor. The inadequacies present in this model are pointed out and an attempt has been made to propose a model which is not purely resistive. Numerical simulations also show that source resistance saturates for large source contact lengths and increases for small contact source lengths. Simulations also show that the basic assumptions for extracting contact resistance, that the contact resistance is independent of channel length and electric-field, are inadequate. Effect of film thickness reduction on source resistance is studied and the ensuing effect on Unity Gain frequency (UGF) is analyzed. Device parameters are identified which determine the optimal film thickness for maximizing UGF of top contact OFET.

**For more details click here**

**back**

***Title*** : ***A Novel NMOS Based Dynamic Logic Family Using Gated Diode For Voltage Boosting***  
***Author(s)*** : ***Bawa Anil***  
***Roll No*** : ***Y4104011***  
***Supervisor*** : ***Mazhari Baquer***

### ***Abstract***

The performance and area of processing logic circuitry is of vital importance in design of high performance processors. Dynamic CMOS Logic Family, due to its high speed and area efficiency, has become very popular for use in critical paths of such processors. In this thesis, a new Dynamic Logic Family based on only NMOS transistors is proposed with the objective of reducing area. The degradation of high logic level due to use of NMOS transistors is compensated through voltage boosting using Gated Diodes. Two logic families, inverting with basic gates such as NAND, NOR etc and noninverting with basic gates such as AND, OR etc are proposed. Delayed clocks are used to ensure proper cascading of logic gates. It is shown that a 2-input NOR gate implemented using the proposed inverting logic family saves 62% area compared to conventional domino dynamic logic family 2 input OR gate with comparable speed. The proposed logic NAND / NOR gates show 2 times improvement in delay over standard dynamic NOR with almost same precharging time. The logic style proposed in this work is the only logic style that is able to eliminate static power dissipation through the use of only one transistor type.

**For more details click here**

**back**

***Title*** : ***Techniques For Improving Copying Accuracy & Threshold Voltage Sensitivity In Current Driven Active Matrix Organic Light Emitting Display***  
***Author(s)*** : ***Gupta D K***  
***Roll No*** : ***Y4104025***  
***Supervisor(s)*** : ***Mazhari Baquer***

### ***Abstract***

Current Copying accuracy and stability of current through the organic light emitting diode (OLED) is of immense importance for better performance of current driven active matrix display. This thesis first describes a detailed analysis of parameters that impact copying accuracy through a systematic comparison of an idealized circuit implemented with switches and a TFT based circuit. It is shown that the order in which TFTs are turned on and voltage level of control signals has a significant impact on current mismatch. Based on insight gathered through this analysis, it is proposed that an additional control line be added to the conventional circuit. This modification along with appropriate shaping of control signal waveform allowed current mismatch between data and load current to be reduced below  $\pm 5\%$  with minimum sized transistors. A new pixel circuit utilizing negative feedback is proposed which reduces the problems associated with Kink effect in poly-silicon transistors. This technique is shown to reduce not only current mismatch but threshold voltage sensitivity as well.

**For more details click here**

**back**

***Title*** : ***Simulation And Analysis Of Bi-Layer Organic Solar Cells***  
***Author(s)*** : ***Kumar Sachin***  
***Roll No*** : ***Y1147307***  
***Supervisor(s)*** : ***Iyer S Sundar Kumar***

### ***Abstract***

To understand the operation of a solar cell, understanding of exciton creation, exciton diffusion, carrier transfer from one layer to another and carrier transfer to electrodes is very important. These processes are very critical to the operation of a photovoltaic device and their understanding requires knowledge of carrier and electric field profile within the device and their variation with the applied voltage. Therefore, a simulator for organic solar cells, which can reproduce the behavior of a realistic device as closely as possible, is very important. In this thesis work, a simulator written in “C” programming language is developed to simulate the characteristics of organic solar cells. This simulator is used to clarify issues related to open circuit voltage and fill factor in organic solar cells. It has been shown earlier through simulations that open circuit voltage of an organic solar cell remains unchanged as the injection barrier height at cathode changes while keeping the anode injection barrier height constant. However, experimental results show that open circuit voltage in fact changes as built-in voltage of solar cell changes. It is shown in this thesis that inclusion of leakage currents, which are often there in a real device, can give rise to the variation of open circuit voltage with the built-in voltage. It is well known that the shape of dark current-voltage characteristics affects fill factor and its magnitude affects open circuit voltage. It is shown through simulation that while open circuit voltage is practically independent of dark current, the fill factor increases with increase in dark current. The ratio of dark current at open circuit voltage and short circuit current is identified as a key factor that affects fill factor. It is shown that with increase in this ratio, fill factor increases almost linearly.

**For more details click here**

**back**

**Title** : *A Novel VLSI Architecture Of Three Step Hierarchical Search (3SHS) For Motion Estimation*  
**Author(s)** : *Rawat Surendra*  
**Roll No** : *Y1147363*  
**Supervisor** : *Qureshi Shafi*

### ***Abstract***

Motion estimation is a technique to remove the temporal redundancy within video frame sequence and provides means for video compression with significant bitrate reduction. Motion vector can be estimated both in space-time domain and transform domain. In space-time domain various block matching algorithms have been developed to reduce the computational complexity. These algorithms can be implemented in two ways (1) on general-purpose processors, (2) on dedicated hardware. The processing time and complexity reduction are two important parameters which give the motivation for implementing these algorithms on dedicated hardware. Among these existing algorithms 3-step hierarchical search is considered as one of the best algorithms. In contrast to VLSI architectures of full search which takes the advantages of the regular data flow, low control and address generation overhead, 3-SHS architectures become complex because of irregular data flow due to the hierarchical nature of the algorithm. The unpredictable data access from the on-chip memory (cache) complicates the addressing of the cache and control overhead. This work addresses these challenges using some data management techniques (1) residual memory interleaving (2) task redistribution in data path (3) specific new design technique to compress the unpredictability of the data requirement by re-allocation of candidates in each step. Several units have been optimized for resource-usage in the design which increase the number of clock cycles to find the motion vector but the architecture provides enough throughput to fit this design in low bit-rate visual telephony. Architecture has been synthesized using Altera-FPGA which gives the throughput of 5.K (block/sec). This proposed design accesses the external system memory 248 times per block matching.

**For more details click here**

**back**



**Title** : *Fabrication And Characterization Of Pentacene Based Organic Thin Film Transistor On PMMA Dielectric*  
**Author(s)** : *Saini Ashish*  
**Roll No** : *Y4104015*  
**Supervisor** : *Mazhari Baquer*

### ***Abstract***

Plastic electronics promises to make the electronic products more affordable, user friendly and less damaging to environment. The possibility of usage of flexible substrates has the potential to target a whole new area, which is untouched by any conventional technology till today. As a result, Organic Thin Film Transistor (OTFT) are being actively pursued worldwide for applications as diverse as electronic price tags, postage stamps, radio frequency identification (RFID) tags, smart cards, electronic paper and back plane circuitry for active matrix displays. This work describes fabrication and characterization of top contact Organic Thin Film Transistor with vacuum deposited Pentacene as semiconductor and spin coated Poly Methyl Methacrylate (PMMA) dielectric on Indium Tin Oxide (ITO) coated glass. The fabricated OTFT exhibited exponential drain current vs. gate-voltage characteristics indicating presence of large interface state density. An analytical model based on assumption of exponential variation of free charge density at the insulator/semiconductor interface is developed and found to adequately describe the experimental characteristics. The fabricated device has maximum ION/IOFF ratio close to 10<sup>3</sup>. Field effect mobility show strong dependence on applied gate bias reaching maximum value of 1.6 X 10<sup>-2</sup> cm<sup>2</sup>/V-sec at VGS = -30V. The drain current is about two orders of magnitude higher than gate leakage current and the maximum gain obtained is 90. The I-V characteristic of Pentacene diode fabricated along OTFT shows that the current in OTFT is space charge limited.

**For more details click here**

**back**

*Title* : *A Novel Approach Of Defining The Threshold Voltage For MOSFETs And An Accurate And Technology-Mapped Definition Of The Surface Potential At The Threshold Point*  
*Author(s)* : *Sarkar Vaskar*  
*Roll No* : *Y4104095*  
*Supervisor* : *Dutta Alope*

### *Abstract*

A novel approach of defining the threshold voltage for long channel MOSFETs has been presented in this work here, where it has been proposed that it corresponds to the gate-to-source voltage for which the drift and diffusion components of the total drain current become equal to each other. In order to avoid the greater computation time associated with the numerical solution of these two components, an analytical expression of the surface potential, corresponding to the threshold condition, is given here, which has the same form as the one proposed by Tsividis. The fuzzy parameter  $\phi_s$ , appearing in this expression of the surface potential, is expressed as a function of the substrate doping density and the oxide thickness. The threshold voltage values, obtained analytically from the relation between the surface potential at the threshold condition and the closed form technology mapped expression of the fuzzy parameter, show an excellent match with those obtained from SILVACO simulations for a wide range of the substrate doping density and the oxide thickness, with the maximum error being only about 4%. The comparison of the percent error values of the threshold voltage obtained from this proposed model with those obtained from the other two recently proposed methods, all with respect to SILVACO simulation results, further verifies the validity of our completely analytical, mathematically simple, and straightforward approach, proposed in this work here.

**For more details click here**

**back**

**Title** : *A Study Of P3HT/PCBM Bulk Hetero Junction Organic Solar Cells*  
**Author(s)** : *Bajaj Dipesh*  
**Roll No** : *Y4104028*  
**Supervisor(s)** : *Iyer S Sundar Kumar*

### ***Abstract***

Harvesting solar power by using photovoltaic technology is a way of addressing the growing energy demand when currently available fossil resources are diminishing quickly. Organic photovoltaic cells have the potential to be a low cost alternative to other renewable energy technologies. Most promising results have been shown by the bulk hetero-junction device structure. The goal of this project work is to develop, test and optimize a process to build polymer photovoltaic cells and to find concepts for improvements. It concentrates on the bulk hetero-junction device architecture based on the conjugated polymer/fullerene compound consisting of a blend of poly (3-hexylthiophene) (P3HT) and the methanofullerene [6, 6]-phenyl C61-butyric acid methyl ester (PCBM), with an anode of indium-doped tin oxide (ITO) and a cathode of aluminum (Al). Short circuit current density as high as 3.24 mA/cm<sup>2</sup>, open circuit voltage, of 0.44 V and Fill factor (FF) as high as 0.28 is obtained. Post production annealing effect has also been investigated. It is found that with annealing the device performance degrades.

**For more details click here**

**back**

*Title* : *Effect Of Built In Potential On Bi-Layer Organic Solar Cell*  
*Author(s)* : *Sheik Khaja Mohiddin*  
*Roll No* : *Y4104081*  
*Supervisor(s)* : *Mazhari Baquer*

### *Abstract*

For improving the performance of organic solar cell, knowledge about its dependence on various parameters like built in potential, mobility and life time of excitons is indispensable. Carrier generation in an organic bi-layer solar cell takes place at the heterojunction between electron transport layer and hole transport layer; by dissociation of excitons that diffuse from either side of the interface. In order to replicate this photogeneration at the interface of simulation, a very thin layer is incorporated between electron transport layer and hole transport layer and photo generation is limited to this layer. The performance device at zero built in potential is investigated in terms of open circuit voltage, short circuit current density, fill factor and conversion factor as a function of mobility of carrier and recombination time of excitons. As there is no built in electric field, a simple analytical model based on diffusion was able to track the variation of open circuit voltage and short circuit density. With a built in potential of 1.3eV, there is improvement in performance as the built in electric field complements the effect of diffusion. Performance of device and improvement in performance over zero built in potential is analyzed in terms of mobility of carrier's and recombination time of excitons at this higher built in potential..

**For more details click here**

**back**

**Title** : *The Effect Of Logic Block Granularity On Deep-Submicron FPGA Power And Energy*  
**Author(s)** : *Gupta Swati*  
**Roll No** : *Y4104087*  
**Supervisor(s)** : *Qureshi Shafi*

### ***Abstract***

The architecture of an FPGA (Field Programmable Gate Array) has significant effect on power and performance. In deep-submicron designs, the interconnect resistance and capacitance accounts for most of the circuit delay and power consumption. This study focused on FPGA logic block architecture to determine the impact of logic block functionality on power, energy and EDP (Energy Delay product). In this study cluster-based island style FPGAs were considered. The effect of LUT (Look-Up table) cluster size and number of inputs to the cluster on power, energy and speed of FPGA was studied. The study revealed that an improvement in power consumption of nearly 35% can be obtained for LUT size of 7, with average saving of 17.5% over all LUT sizes considered. This improvement was due to reduction in number of inputs per cluster,  $I$ . Further, optimized values of cluster size,  $N$  for different LUT sizes,  $K$  were obtained. An expression for number of inputs to the cluster in terms of  $K$  and  $N$  is proposed.

**For more details click here**

**back**

***Title*** : ***Modeling Of Threshold Voltage Behavior Of Symmetric And Asymmetric Double-Gate (DG) MOSFETs***  
***Author(s)*** : ***Shukla Pankaj***  
***Roll No*** : ***Y4104060***  
***Supervisor(s)*** : ***Qureshi Shafi***

### ***Abstract***

Continuous scaling of MOSFETs down to nanometer range has made Double-Gate(DG) MOSFETs, the most promising device structure for nanometer device technology. The turn on and turn off characteristics of the device is still an area of research as the classical threshold voltage definition is no longer valid for undoped body DG MOSFET. In this work threshold voltage behavior with changing technology parameters like body thickness ( $t_{si}$ ), gate oxide thickness ( $t_{ox}$ ) and channel length (L) has been studied both for symmetric and asymmetric DG MOSFETs. Observing the threshold voltage behavior with changing device parameters, a semiempirical threshold voltage model has been proposed. The proposed model results are then compared with the simulation results of 2D ATLAS device simulator. A good agreement is found between the proposed model and the 2D simulation results. The strength of the model is that it is simple, non-iterative and depends only on the physical device and fitting parameters.

**For more details click here**

**back**

**Title** : *Fabrication & Characterization Of Nearly-All-Organic TFT With PMMA As Gate Dielectric*  
**Author(s)** : *Chouksey Amit Kumar*  
**Roll No** : *Y4104005*  
**Supervisor(s)** : *Iyer S Sundar Kumar*

### ***Abstract***

Polymethylmethacrylate (PMMA) is an organic polymer which is easy to process compared to typical inorganic insulators such as silicon dioxide which are used in transistor fabrication. In this work, PMMA is used in a 'nearly-all-organic' thin film transistor (TFT) as a gate dielectric. The dielectric properties, such as permittivity and leakage current, of this organic polymer are studied using capacitor structures with the polymer as the dielectric. The fabrication processes involving PMMA are optimised for its use as gate dielectric in TFTs. Pentacene TFTs with PMMA gate dielectric, fabricated with the optimised process showed satisfactory p-type accumulation mode TFT operation with a threshold voltage of -11V and a subthreshold swing of 5.4V/decade. The minimum interface trap density at the PMMA-Pentacene interface is estimated to be  $6.2 \times 10^{12} \text{ cm}^{-2} \text{ eV}^{-1}$ . The  $I_{ON}/I_{OFF}$  ratio of the device is found to be typically exceeding 100. The maximum mobility of holes, the majority carriers in these devices, is found to be  $0.11 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$  which is better than previously reported values for similar devices. The mobility variation with gate bias is also studied and as expected is found to be better for lower gate bias voltages..

**For more details click here**

**back**

*Title* : *Techniques For Reducing Leakage Currents In SRAM Cells*  
*Author(s)* : *P Lava Kumar*  
*Roll No* : *Y4104044*  
*Supervisor(s)* : *Mazhari Baquer*

### *Abstract*

This thesis describes three different techniques for reducing leakage currents in SRAM cell. In the first technique, it is shown that for a constant supply voltage ( $V_{DD} - V_{SS}$ ) across the cell in inactive mode, there is an optimum combination of  $V_{DD}$  and  $V_{SS}$  that minimizes leakage currents while maintaining a constant noise margin. Results obtained through simulations carried out using BPTM device models show that for an effective supply voltage across the cell of 0.5 volts the optimum values of positive and negative supply rails are (0.35V-0.85V), (0.25V-0.75V), (0.1V-0.6V) for 90, 65 and 45nm technology nodes respectively. The second technique describes an SRAM structure in which each of the NMOS transistors in the cross coupled inverter pair are realized as a parallel combination of two smaller transistors of half the original aspect ratio. By making one transistor in each pair inactive in standby mode, the technique allows reduction of leakage currents without compromising static noise margin. The cell reduces leakage currents by 22% on average with 17.5% penalty in area. The third technique describes the potential savings in leakage power that could be obtained through substitution of NMOS access transistors by their P-type counterparts in view of relatively low gate leakage in PMOS transistors. Two different methods for implementing the concept are discussed. The first cell gave 16% savings in leakage currents with only 5% penalty in area. The other cell saves 2.1% leakage currents and nearly doubles the performance of the cell.

**For more details click here**

**back**



**Title** : *Design Of Bulk-Driven Down-Conversion MOS Mixers Having Low Power Consumption And High Conversion Gain*

**Author(s)** : *Mehta Niraj Arvind*

**Roll No** : *Y4104051*

**Supervisor(s)** : *Dutta Alope*

### ***Abstract***

Mixers are a crucial building block in wireless transceiver design, and are used for frequency conversion, in order to make the signal processing easier. Some of the important performance parameters are the power dissipation, area, power and voltage conversion gains, harmonic distortion, input-output coupling, etc. In this work, a traditional down-conversion mixer (i.e., Gilbert cell), as well as a novel design reported recently in the literature, which uses the gate and body terminals of a MOSFET to apply the RF (radio frequency) and LO (local oscillator) signals (referred to as the body-input mixer), thus eliminating the need to use two different devices to apply these inputs to, were studied in detail in order to obtain a better understanding of their operation. Based on this knowledge, in this work, we proposed three different MOS mixer architectures, in order to down-convert a 1.9 GHz RF signal to a 250 MHz IF (intermediate frequency) signal, all of which used the technique of body input and active loading (in order to improve the gain of the circuit). More specifically, the designs tried out were body-input mixers with i) depletion load, ii) cascode driver, and iii) an input buffer and depletion load. The primary aim was, of course, to achieve high power and voltage conversion gains with low power dissipation, while maintaining an acceptable performance with regard to other performance parameters. All these circuits were simulated using TANNER SPICE, along with the Fourier analysis of their outputs. It was observed that no single design (proposed in this work) provided the best values of all the parameters. Overall, however the body-input mixer with cascode driver produced the best performance. With 0.8 V power supply, its power consumption was 601.45  $\mu$ W, and showed an extremely low harmonic distortion of only 0.1552%. Its power and voltage conversion gains were found to be 9 dB and 5.75 dB, respectively. Its 1-dB compression point, the input-referred third order intercept point, and the RF-IF isolation were -27.74 dBm, -12.75 dBm, and 12.47 dBm, respectively. It is to be noted though, that depending on the specific requirements and constraints, any of the designs proposed in this work could be used in a practical application.

**For more details click here**

**back**

**Title** : *Study Of Cathodes And Other Properties Of Polyfluorene Based Polymer Light Emitting Diodes*  
**Author(s)** : *Sud Ashish*  
**Roll No** : *Y4104016*  
**Supervisor(s)** : *Mazhari Baquer & Narain Jitendra*

### ***Abstract***

The interface between layered conjugated polymer and electrode is an important factor in improving the performance and lifetime of polymeric light-emitting diodes (PLEDs). In the present work, we optimize the performance of blue emitting, polyfluorene based PLEDs for different cathode structures viz. Al only, Ca/Al, Ca/Ag, LiF/Al and NaOH/Al while keeping the standard anode (ITO coated with PEDOT:PSS). Devices with different cathodes have been made by optimizing the fabrication process (including thermal treatment) and cathode structures. Devices with Ca/Al, Ca/Ag, LiF/Al and NaOH/Al cathode, all show significantly improved performance as compared to those with bare Al cathodes. The improvement is correlated with enhanced electron injection due to a decrease in electron injection barrier and improved injection charge balance. The different performances of the devices can be ascribed to the variation of the electron injection barrier heights at the polymer/cathode interface. Experimental results show that highest achieved efficiencies of PFO PLEDs, as compared to bare Al cathodes devices (0.012 Cd/A), improved by a factor of 458 (5.5 Cd/A), 220 (2.65 Cd/A), 145 (1.74 Cd/A) and 230 (2.76 Cd/A) in Ca/Al, Ca/Ag, LiF/Al and NaOH/Al devices respectively. A heat treatment of the PFO film is required to remove the solvent from the spincoated film. The effect of this heat treatment on the film morphology has been studied using AFM technique during the course of this work. The effect of Benzothiadiazole (BT) doping on PFO PLED device efficiencies has been investigated in the last part of this work. Blending BT (5%) in PFO reduces hole current but does not change electron current. This helps in achieving better charge balance in BT blended PFO devices and very high efficiencies (7.38 Cd/A).

**For more details click here**

**back**

***Title*** : ***Study Of A Printed Omnidirectional Antenna For WLAN***  
***Author(s)*** : ***Alapati Bhargavi***  
***Roll No*** : ***Y4104020***  
***Supervisor(s)*** : ***Sachidananda M***

### ***Abstract***

A wireless LAN (WLAN) access point facilitates wireless connection between PCs, laptops, wireless routers and other wireless modules with a freedom of movement inside a prescribed region. It has led to the development of compact RF modules and antennas for such applications. An antenna for such applications was proposed and designed. The antenna is an omnidirectional microstrip antenna formed by switching the microstrip line and groundplane from top to bottom of the substrate at every half wavelengths. The analysis of the antenna is carried out using FDTD software. The antenna is designed for different number of elements. Some design graphs are provided. A transmission line equivalent circuit was developed for the antenna and validated over a band of frequencies. With the help of this transmission line model, self impedance and mutual impedance were calculated. Finally a design procedure was given.

**For more details click here**

**back**

**Title** : *Study Of Surface Wave Structures For Antenna Array Applications*  
**Author(s)** : *Sure Pallaviram*  
**Roll No** : *Y4104059*  
**Supervisor(s)** : *Sachidananda M*

### ***Abstract***

In this thesis, we propose the possibility of a planar array antenna with the array elements excited by surface waves. A reactive impedance surface (RIS) realized with a periodic texture of conducting square patches on a metal backed dielectric substrate which can support the surface wave propagations, is used as a surface wave structure. A square patch mounted inside the dielectric substrate of the RIS is used as a feeding structure for exciting surface waves on the RIS. This feed patch is excited using a probe. The surface waves are launched in different directions, depending on the position of the probe on the patch. At a particular position of the feed point, it is possible for the surface waves to be launched in a single direction. We propose a slot discontinuity on the RIS, which is capable of radiating the surface waves excited on the RIS. We obtain the radiation patterns of RIS with two discontinuities, which show the possibility of antenna array, with the elements of the array being slot discontinuities. A transmission line model which can aid in the design of an actual array is developed and studied in this thesis.

**For more details click here**

**back**

**Title** : *Design Of A Laser Based System For Real Time Monitoring Of Misaligned Wheelsets For The Indian Railways*  
**Author(s)** : *Jain Manuj Kumar*  
**Roll No** : *Y1147207*  
**Supervisor(s)** : *John Joseph*

### ***Abstract***

Indian railways have one of the largest and busiest rail networks in the whole world. Such a strategic and mass system requires proper maintenance of their rolling stock. A major issue is the safety aspect of the entire rolling stock. As of now Indian railways have preventive maintenance schedule as well as overhauling worked out for various coaches and wagons. Any fault of the wheel sets and other parts of the coach/wagon are mainly attended to during these sessions. In addition to this coaches are put through visual inspection at major stations. However, at present Indian railways has no system for realtime monitoring of misaligned wheel sets. Our endeavor through this thesis is to propose a system which is rugged, easily deployable and operates in real time in a trackside environment. The system is designed to reliably identify bogies with misaligned wheel sets allowing operators to make timely repairs which would substantially reduce rail wear and derailment risk. The system we have proposed works on the principle of direct measurement of angle of attack between the radial line of the track and the axle axis. A laser rangefinder installed on the trackside continuously measures the distance to the flat annular rim of each axle of the passing bogie. This forms the Y coordinate of the rim portion of the wheel. A set of proximity sensors are used to measure the speed of each axle which is used to generate the X coordinates corresponding to the Y coordinates obtained with the laser range finder. Thus a linear profile of the rim portion of the wheel is generated from which angle-of attack and tracking error are calculated.

**For more details click here**

**back**

**Title** : *Dispersion And Attenuation Characteristics Of Multiconductor Microstrip Lines And Finline On Anisotropic Substrates And Realization Of Broadband BandPass Filter Structure*

**Author(s)** : *Awasthi Seema*

**Roll No** : *Y4104080*

**Supervisor(s)** : *Biswas Animesh*

### ***Abstract***

The work presented in this thesis is devoted mainly to characterization of multiconductor microstrip lines in conventional as well as in suspended substrates. The numerical procedure, based on the full wave modal analysis, is formulated to compute all the frequency-dependent normal mode parameters for multiconductor lines. Numerical results include the propagation constants, modal characteristic impedances and attenuation constant. Perturbation theory has been used for the calculation of conductor and dielectric losses. Conductor loss is computed for the finite thickness using the perturbation theory and comparison plot is also provided to validate the results. Dispersion characteristics of asymmetric three, four and five coupled microstriplines in shielded suspended substrate are presented first time in this thesis. In addition, attempts have also been made to compute the dispersion characteristics of multi unilateral finlines on isotropic substrates using full wave modal analysis. The effects of electromagnetic coupling on the frequency-dependent properties of multi-coupled asymmetric unilateral finlines due to uniaxial and biaxial substrates are also investigated in this thesis. The method used to analyze the asymmetric multi-port unilateral fin-lines characteristics is full wave modal analysis in conjunction with the Galerkin's method. Numerical results include effect of dielectric anisotropy in propagation constants and modal characteristic impedances of two and three fin-lines on uniaxial and biaxial substrates at various frequencies. The effect of anisotropy on effective dielectric constant and characteristic impedance has been provided on multi unilateral fin-lines by introducing the dielectric anisotropy in either of three directions. We also gave efforts to compute the conductor and dielectric losses of multiple unilateral fin-lines on biaxial anisotropic substrate for the finite thickness using perturbation theory. We also present a systematic procedure for designing a bandpass filter with wide bandwidth based on parallel coupled three microstrip lines structures in conventional as well as in suspended substrate. Utilizing the data generated by full wave analysis, wideband bandpass filters have been designed. Compared to the conventional microstrip structure, the filter bandwidth is quite improved in suspended substrate case. It is also found that the tight gap sizes between the resonators of end stages and feedlines, required for wideband filters based on traditional coupled line design, can be greatly released. A filter with a pass band centered at 10 GHz of order 5 with fractional bandwidth 70% has been designed, and fabricated using microstrip lines. A broadband bandpass filter based on parallel coupled three unilateral finlines structure has also been designed for high frequency applications. A design graph for a symmetric three unilateral fin-line structure for substrate  $\epsilon_r=2.2$  is provided using full wave analysis. On this basis, a band pass fin-line filter centered at 10 GHz of order 5 with fractional bandwidth of 30% is designed and simulated.

**For more details click here**

**back**

*Title* : *Theory and Applications of Optically Actuated MEMS Structures*  
*Author(s)* : *Pal Sagnik*  
*Roll No* : *Y4104076*  
*Supervisor(s)* : *Ghosh Anjan Kumar*

### *Abstract*

Photons possess momentum, and hence, a beam of light can exert a force when reflected by a surface. Higher the reflection, higher is the radiation pressure. Radiation pressure is nearly insignificant for most macro scale applications, but it can be quite significant for microelectromechanical devices. In this thesis we investigate the possibility of using optical pressure for actuating microelectromechanical devices. We study the mechanics of laser actuated singly and doubly clamped polysilicon micro-beams under steady state and transient conditions. We show, through analysis and simulations, that there exists an optimum point of incidence of the laser beam that produces the maximum steady-state deflection of a singly clamped cantilever. An expression for the point of incidence corresponding to maximum deflection is derived. When a microstructure is actuated by radiation pressure, a fraction of the incident power gets absorbed and heats up the device. Overheating may be detrimental to device performance and may even cause melting. In order to estimate the maximum laser power that will not cause melting, we solved the heat equation numerically. We also present an analytical solution of the steady state heat equation. We find that the temperature dependence of material properties has negligible effect on the steady state deflection. However, when the surrounding medium is air, the damping coefficient increases by about 16% from 300 K to 400 K. Based on our calculations, we propose three possible applications of optical actuation—a photodetector cum beam profiler, an optical switch and a diffraction grating based switch. The photodetector cum beam profiler consists of a micro-beam structure. An incident laser beam causes the micro-beam to get strained. The laser beam can be characterized by measuring this strain. The optical switch consists of a singly clamped micro-cantilever structure. On actuation, the cantilever bends and obstructs the path of light between two optical fibers. The diffraction grating based switch is made of a doubly clamped micro-beam with diffraction gratings at the center. An incident laser beam causes the microbeam to get strained. Consequently, the grating period changes with incident power. Different diffraction angles may be achieved by varying the laser power.

**For more details click here**

**back**

*Title : On UHF RFID Tag Antenna - Design And Measurements*  
*Author(s) : Pandit Rachana*  
*Roll No : Y4104069*  
*Supervisor(s) : Harish A R*

### *Abstract*

While RFID systems are finding wider and newer applications, several important issues that limit the system performance still remain to be resolved. Focusing on the tag end of the system we find that, except for special applications involving material with prespecified electrical properties, UHF RFID tag antennas are designed for free space conditions. When deployed on material backing of unknown electrical properties their electrical characteristics change, resulting into a change in the performance of the overall system. A means of estimating this change when the tag is placed on a material of unknown dielectric constant is, therefore, one such requirement. In this work we first study the constraints posed by RFID applications on tag antennas and show the way they determine the antenna design objectives. We then proceed to design three different tag antennas for a specific transponder integrated circuit. We show that measuring the electrical properties of tag antennas, though theoretically possible, becomes practically infeasible. A test fixture is designed to perform indirect measurements on the antennas. We next focus our attention on the performance degradation due to change in input impedance of the tag antennas when they are placed on different dielectric surfaces. We show that for a wide range of practical scenarios, where the material backings are thin and have low dielectric constants, it is the input impedance mismatch caused due to a change in input impedance that plays the dominant role in performance degradation. We measure and quantify this effect using power transmission coefficient and show that a single valued relationship exists between the dip frequency measured through the designed test fixture and the transmission coefficient for tag antennas used on material backings of extremely low loss, thin (<10mm), low dielectric constant (<4) material. Finally, we propose to exploit this relationship and provide a practical means of estimating the reduction in read range of tag antennas used within the above mentioned set of conditions. **Keywords:** UHF, passive RFID, tag antenna, read range, impedance matching, transmission coefficient, dielectric thickness.

**For more details click here**

**back**



***Title*** : ***Generation Of High Frequency Wideband Chaos Using Solid State Amplifier***  
***Author(s)*** : ***Mehta Kalpesh Badreshkumar***  
***Roll No*** : ***Y4104049***  
***Supervisor(s)*** : ***Harish A R***

### ***Abstract***

Chaotic signals are defining new ways of communications. The chaotic signal has a wide spectral response and provides many advantages such as higher security and multipath resistance. Ultra wideband (UWB) and several other communication systems utilizing chaotic signals have also been proposed. These systems require wideband high frequency chaos generators. In this thesis we look at the possibility of generation of chaos using a forced nonlinear ring oscillator system where the solid state amplifier acts as a nonlinear device. An approach to model this wideband system is presented. A new nonlinear model based on instantaneous input output voltage relationship has been proposed for the amplifier. These models are implemented in Simulink to simulate the system and study its performance. Using this model we demonstrate the generation of chaos by this system. We have also designed a setup to demonstrate the generation of chaos experimentally. A technique to extract the parameters of the functional blocks of the system is presented. A comparison of results obtained by the experiments and the simulations has been done and are found to be in good agreement. Finally, a mathematical model based on the delay differential equation has been presented, and its performance has been compared with the Simulink results.

**For more details click here**

**back**

***Title*** : ***Design Of Aprotocol For Wireless Sensor Network And Its Simulation In TOSSIM***  
***Author(s)*** : ***Srinivas Vietla***  
***Roll No*** : ***Y4104094***  
***Supervisor(s)*** : ***Singh Yatindra Nath***

### ***Abstract***

In this thesis, we have studied Wireless Sensor Network. The already implemented routing algorithms in TinyOS has been studied. Thereafter we have tried to develop a new algorithm for a two level hierarchical network. The algorithm has been implemented in nesC. It has been simulated in Tinyviz. The simulation verifies that the algorithm is correct in the sense that it does not lead to dead locks. Further, the number of modules in TinyOS routing layer is reduced along with the reduction of the code size..

**For more details click here**

**back**

***Title*** : ***Optimization Of Spot Pattern In Indoor Diffused Optical Wireless Systems***  
***Author(s)*** : ***Lebaka Madhusudhana Reddy***  
***Roll No*** : ***Y4104047***  
***Supervisor(s)*** : ***Singh Yatindra Nath***

### ***Abstract***

Simulated Annealing(SA) algorithm is proposed to be used in the optimization of the spot pattern for the indoor diffuse optical wireless systems. The channel Response is analyzed using conventional grid-based patterns and a field of view (FOV) of 30 is found to give a good performance balance in the uniformity of the received power distribution and multipath dispersion. Using the algorithm, the optimized spot pattern is found for minimizing the ratio of standard deviation of the received power to the average received power level. It resulted in more than 50% improvement.

**For more details click here**

**back**

*Title* : *A Modified Photonic Switch Architecture Based On Fiber Loop Memory*  
*Author(s)* : *Mangal Vipin*  
*Roll No* : *Y4104097*  
*Supervisor(s)* : *Singh Yatindra Nath*

### *Abstract*

All optical networks can be used as a promising solution for the increasing demand for higher bandwidth. In this thesis an all optical loop buffer switch architecture is presented, which is used for contention resolution in optical packet switch based networks. This thesis discusses the drawbacks of the existing architecture, and proposes a new architecture to remove the constraints of the existing architecture. A mathematical model is presented to analyze the performance of the switch in terms of storage time

**For more details click here**

**back**

***Title*** : ***A Low Complexity Decoding Algorithm For Permutation Modulation***  
***Author(s)*** : ***Raghavendra S A***  
***Roll No*** : ***Y4104070***  
***Supervisor(s)*** : ***Chaturvedi Ajit Kumar***

### ***Abstract***

Permutation modulation codes were introduced by Slepian. Later these were used as constant weight vector quantizers. Recently a joint source and channel modulation technique using permutation modulation has been proposed. One of the reasons for their not being popular is complexity in decoding (when used as a modulation technique) and encoding (when used as source codes). In this work we present a new generalised decoding/encoding algorithm for permutation codes. We also show that our new algorithm is computationally faster than ML decoding algorithm.

**For more details click here**

**back**

***Title*** : ***On Error Rate In Hypothesis Testing Based On Universal Compression Algorithms***

***Author(s)*** : ***Gopalan A K***

***Roll No*** : ***Y4104041***

***Supervisor(s)*** : ***Bansal Rakesh K***

### ***Abstract***

Identity test is a hypothesis test defined over the class of stationary and ergodic sources, to decide whether a sequence of random variables has originated from a known source or from an unknown source. For an identity test proposed by Ryabko and Astola in 2005, that makes use of an arbitrary pointwise universal compression algorithm and , the null distribution to define the critical region, we have studied the rate at which type-2 error goes to zero as sample size goes to infinity. A formal link is established between this rate and the redundancy rate of the compression algorithm in use for the class of Markov processes by an application of the method of types.

**For more details click here**

**back**

***Title*** : ***Font Insensitive Recognition Of Multiple Indian Scripts***  
***Author(s)*** : ***Agrawal Saksham***  
***Roll No*** : ***Y1147310***  
***Supervisor(s)*** : ***VenkateshK S***

***Abstract***

Recognition of scripts in document images is a necessary first step in enabling Optical Character Recognition of multi-lingual documents. In the present work, a new approach is proposed for automatic recognition of Indian scripts in document images. Recognizing words as the basic building blocks common to all Indian scripts, we view a feature as a frequency distribution over all the words present in the document image. This frequency distribution is expected to be characteristic of a script, enabling classification. We develop a variant of the Naive Bayes classifier for this frequency distribution approach, wherein the distribution is approximated as a probability distribution function, and Maximum A-Posteriori probabilities are directly used for classification. We use this classifier to identify the script in document images and study the dependence of Rate of Identification on number of words in the document image.

**For more details click here**

**back**

*Title* : *Inter-Pulse Interference In Ultra Wide-Band  
Communication Systems*  
*Author(s)* : *Bajaj Rahul*  
*Roll No* : *Y1147273*  
*Supervisor(s)* : *Chaturvedi Ajit Kumar*

### *Abstract*

Inter-Pulse Interference or IPI is often ignored in Ultra Wide-band systems assuming that the UWB pulses do not overlap. However, in a realistic UWB channel, this assumption does not, generally, hold true. The multipath delays may cause the received pulses to overlap and interfere with the successive pulses. The effect of IPI can be severe for a dense multipath channel. In this thesis, we propose an alternative representation for the UWB channel model which incorporates all the information from the modified S-V model (the channel model recommended by IEEE 802.15.3a) and in addition, implements the delay resolution of the channel in it. We show that such a representation enables us to compare the performance of different UWB pulses in the presence of IPI. Also, with the help of this representation, we propose UWB pulses that can provide IPI-free communication.

**For more details click here**

**back**



**Title** : *Prefiltering In Autocorrelation Domain And Its Application In Noisy Speech Analysis*  
**Author(s)** : *Srinivas A*  
**Roll No** : *Y4104001*  
**Supervisor(s)** : *SircarPradip& Banerjee Adrish*

### ***Abstract***

Speech processing is the study of speech signals and the processing methods of these signals, these include analysis, coding and synthesis of speech, speech and speaker recognition. In practical applications these speech processing systems have to operate under conditions that are very different from the ideal laboratory environments. The speech can be contaminated by additive noise and by the transfer function of the transmission channels. The presence of these effects will become a major obstacle to commercial use of speech processing systems. Recently Ferdousi et.al.[1] has demonstrated that a simple prefiltering technique in the autocorrelation domain can improve the accuracy of the AR parameters of a noisy signal. In the present work, we have applied the above technique in designing noise robust feature vectors (MFCC) and speech denoising. The Itakura Saito spectral distance measures are computed for reconstructed signals with and without the above mentioned filtering. The comparison of the distance measures shows the effectiveness of the presented technique..

**For more details click here**

**back**

**Title** : *Study On Energy Efficient Modulation Techniques For Wireless Sensor Networks*  
**Author(s)** : *Sharma Atul*  
**Roll No** : *Y4104018*  
**Supervisor(s)** : *SircarPradip& Banerjee Adrish*

### ***Abstract***

The battery driven nature of wireless sensor networks, combined with the need for operationallifetimes of months to years, necessitates that energy efficiency be treated as ametric of utmost priority while designing these distributed sensing systems. In this thesis westudy about physical layer parameters of communication in wireless sensor network with aview to conserve energy. The narrow band and the ultrawide band modulation schemes arecompared with respect to the wireless sensor network environment under various conditionsof channel, both in AWGN as well as fading conditions. The effect of diversity improvementhas been simulated in such an environment. Simulation to evaluate bit error performanceanalysis has also been done.

**For more details click here**

**back**

*Title* : *Video Coding Based On Analysis Of 3D DCT Coefficients*  
*Author(s)* : *Konda Raju*  
*Roll No* : *Y4104043*  
*Supervisor(s)* : *Sharma Govind*

### *Abstract*

In this thesis, we have used 3D transform coding technique to achieve significant ratedistortionperformance. Most of the energy in 3D DCT domain of a global, constant-velocity,translational motion lies on a plane. Based on this analysis, we propose a new techniqueto estimate this dominant plane. Moreover, by realizing that significant energy in the DCTdomain concentrates around a plane, we propose new approaches to video compression. Wepropose a new way to quantize and scan the DCT coefficients adaptively. The new compressionschemes performs better than standard MPEG-2 and 3D DCT. We discuss the design ofthe complete 3D DCT coders and we carry out a performance comparison of the new coderswith hybrid coders.

**For more details click here**

**back**

***Title*** : ***Interpolation Of Lost Frames Of Video***  
***Author(s)*** : ***Kaur Amrit***  
***Roll No*** : ***Y4104007***  
***Supervisor(s)*** : ***Sircar Pradip& Banerjee Adrish***

### ***Abstract***

While transmitting a video number of frames are lost due to noise or congestion in the network. For interpolating the lost frames using the received frames number of techniques were proposed but these techniques are good only for slow motion. For fast motion video, these interpolating techniques created artifacts in the interpolated frames. We propose a technique for interpolating lost frames using object based motion estimation and compensation. This method is based on the estimation of displacements of minimum bounding box (MBB) sides of an object. From the received frames we first detect the type of motion (translation, rotation, part rotation) the object has undergone and after detecting the motion and displacement of the object in the two received frames the object in the missing frame is linearly interpolated from the object motion. The position of the object in the missing frame is linearly interpolated from the corresponding position originating from one received frame to the other received frame.

**For more details click here**

**back**

*Title* : *Implementation Of Layered Video Codec*  
*Author(s)* : *Gangele Sunil*  
*Roll No* : *Y4104085*  
*Supervisor(s)* : *Singh Yatindra Nath*

### *Abstract*

Applications for real-time video transmission in heterogeneous network and computing environments, like the Internet, need to be highly scalable and adaptive in terms of bandwidth and processing requirements. Layered video encodings in combination with layered transmission schemes can be thought as a solution to network and terminal equipment heterogeneity. The main aim of this thesis is to design Layered video encoder with advanced features of scalability such as SNR, Spatial and Temporal scalability. We presented two layered video encoding techniques to achieve these scalabilities. Both these techniques use 1-D discrete wavelet transform to exploit temporal redundancy and then 2-D discrete wavelet transform to exploit spatial redundancy. Then 3D-SPIHT algorithm is applied in two different ways to encode the transformed coefficients in a group of frames. First technique supports only SNR scalability while the second technique supports all the three i.e., SNR, Spatial and Temporal scalabilities.

**For more details click here**

**back**

*Title* : *Analysis Of Turbo Codes Using EXIT Chart*  
*Author(s)* : *Sreekanth N*  
*Roll No* : *Y4104056*  
*Supervisor(s)* : *Vasudevan Kasturi*

### *Abstract*

The bit-error-rate (BER) performance of Turbo Codes is predicted using mutual information (MI) (also called extrinsic information transfer (EXIT)) chart. This technique is based on the observation that the extrinsic information from the constituent maximum a posteriori (MAP) decoders is well approximated by Gaussian random variables when the inputs to the decoders are Gaussian. The mutual information is computed from the pdf of the log-likelihood values of the extrinsic information that is available at the output of each constituent decoder. The iterative decoder converges to zero probability of error as the number of iterations increases if and only if the channel  $E_b/N_0$  exceeds the threshold. This threshold value of  $E_b/N_0$  is estimated. The exchange of extrinsic information is visualized as a decoding trajectory in EXIT chart. This allows the prediction of bit-error-rate after an arbitrary number of iterations

**For more details click here**

**back**

*Title* : *Block Differential Scheme For Maximum Diversity Over Doubly Selective Mimo Channels*  
*Author(s)* : *Kumar Gopal*  
*Roll No* : *Y4104033*  
*Supervisor(s)* : *Chaturvedi Ajit Kumar*

### *Abstract*

The usual space diversity schemes for MIMO channels assume the channel to be quasi static and frequency non-selective. Some space diversity schemes have been designed for quasi static MIMO channels with frequency selectivity (delay spread), based on OFDM. Any scheme coming from either of the above categories produces ISI on a time selective channel (a channel with Doppler spread). A time and frequency selective MIMO channel may be viewed as a channel offering delay and Doppler diversities along with space diversity. In this work, a block differential diversity scheme has been proposed which can simultaneously exploit space, delay and Doppler diversities on a time and frequency selective MIMO channel. The maximum order of the achieved diversity is as high as the product of delay, Doppler and space diversities.

**For more details click here**

**back**

*Title* : *Turbo Code Design For Half-Duplex Relay Channel*  
*Author(s)* : *Rout Satyabrata*  
*Roll No* : *Y4104078*  
*Supervisor(s)* : *Banerjee Adrish*

### *Abstract*

In this work, we propose turbo code design criteria for the half-duplex relay channel. Our approach is based on the density evolution algorithm for turbo decoding. Since the turbodecoder for the half-duplex relay channel using decode-and-forward approach is different from normal turbo decoders in the sense that an estimate of parity bits has to be made before they can be used in the actual decoding procedure, the a priori density of the parity bits becomes an important factor in the overall decoding algorithm. We have used a Gaussian approximation for the a priori probabilities of the parity bits before they are estimated and used in actual decoding. We present an approach to calculate the decoding thresholds of turbo codes used in relay channel. We have searched for good turbo codes in AWGN and Rayleigh fading environment and determined their convergence thresholds. The results found are in conformance with the actual decoding results.

**For more details click here**

**back**



***Title*** : ***Two Dimensional Directions Of Arrival Estimation***  
***Author(s)*** : ***Kumar Thota Santhosh***  
***Roll No*** : ***Y4104092***  
***Supervisor(s)*** : ***SircarPradip***

### ***Abstract***

In this thesis we present a new algorithm to estimate the 2D directions of arrival(DOA) namely azimuth and elevation of multiple narrowband sources lying in the far field of the antenna array. The array contains two uniform linear arrays connected orthogonally in an L-Shape. The approach lies in forming a polynomial from the received data matrices. From the roots of the polynomial, the DOAs can be calculated. It uses singular value decomposition(SVD) to reduce the effect of noise. We also give a generalized expression for the Cramer-Rao Bound(CRB) of the 2D-DOA estimation problem. The performance of the algorithm is observed through simulations. Performance comparison with an existing method and the CRB is also made.

**For more details click here**

**back**

***Title*** : ***On Peak To-Average Power Ratio Reduction Of  
Orthogonal Frequency Division Multiplexing Modems***  
***Author(s)*** : ***Kumar N S L Phani***  
***Roll No*** : ***Y4104054***  
***Supervisor(s)*** : ***SircarPradip & Banerjee Adrish***

### ***Abstract***

Orthogonal Frequency Division Multiplexing (OFDM), a multi carrier communicationscheme, transmits symbols over multiple orthogonal carriers simultaneously achievinghigh rate data transmission. It suffers from the problem of high Peak-to-AveragePower Ratio (PAPR). In this thesis, we have proposed a new companding methodwhich achieves good PAPR reduction compared to the already existing exponentialcompanding method.We have presented a new approach of design of receiver by treating the nonlineartransformation of OFDM signal as constellation modification in the frequency domain.It has also been shown that the proposed method performs better than exponentialcompanding technique in terms BER performance through the simulations. Finally, wehave compared PAPR and BER performance of different PAPR reduction techniques.

**For more details click here**

**back**

***Title*** : ***Modification Of Congestion Control Algorithm For TCP  
And ITS Extension To Explicit Rate Adjustment Algorithm***  
***Author(s)*** : ***Roy Angshuman***  
***Roll No*** : ***Y4104010***  
***Supervisor(s)*** : ***SinghYatindra Nath***

### ***Abstract***

Congestion control is an important part of data networking. If transmission rate is more than the network capacity then congestion occurs. So, congestion control algorithm need to be implemented in each kind of data communication, i.e. one to one (unicast) communication and one to multiple (multicast) communication. In unicast communication, several algorithm have been proposed, but among them TCP Reno is used almost all over the Internet. The design of Multicast is quiet difficult due to the heterogeneity of the Internet. Like unicast, different designs have been proposed for Multicast communication, but all of those have some drawbacks. Recently, an efficient protocol named Explicit Rate Adjustment (ERA) has been proposed which fulfills all goals of Multi Rate Multicast congestion control (MRMCC) algorithm. In this thesis, a modification of TCP Reno is presented that can improve the performance of TCP Reno in terms of its throughput. The modification of TCP Reno is done by estimating the available bandwidth of the network using packet pair (PP) technique. Then this modified TCP Reno is introduced in ERA, which gives better performance than before. Finally, throughput of modified TCP is estimated analytically and compared with the analytically estimated throughput of TCP Reno. Improved performance of modified TCP Reno and modified ERA are also shown by carrying out simulation.

**For more details click here**

**back**

*Title* : *Human Activity Representation, Analysis, And Recognition*  
*Author(s)* : *Chandrashekhar Hedau Varsha*  
*Roll No* : *Y4104036*  
*Supervisor(s)* : *Venkatesh K S*

### *Abstract*

Human Activity Recognition is an active area of research in computer vision with wide scale applications in video surveillance, motion analysis, virtual reality interfaces, robot navigation and recognition, video indexing, browsing, HCI, choreography, sports video analysis etc. It consists of analyzing the characteristic features of various human actions and classifying them. The system consists of following stages: Background subtraction, tracking, feature extraction and classification. We build a motion decomposition approach to analyze the periodicity in human actions. We further propose a novel video compression idea to compress these extracted periodic activities from the videos. Our method exploits the correlation between the frames over longer length of time, of the order of the period of the activity, as compared to the traditional video compression algorithms which use correlation between a few neighboring frames for motion prediction and compensation. We also consider the problem of silhouette normalization for activity analysis. We explore the need for, and propose the method of stance dependent silhouette normalization. We present an approach for Human Activity Recognition using a compact 2D spatio-temporal action representation called Action Energy Image (AEI). Our hypothesis is that the AEI carries useful structure and gross motion information which is sufficient for activity classification. We construct the Eigen Activity Space by performing PCA on AEIs of various activities and use it for the recognition of a test activity sample. The promising results obtained by our method demonstrate the capacity of AEI to discriminate human actions. Our method is robust to anthropometric changes of actors and changes in the action speed. We also propose a novel template GAEI which is gradient of AEI image for action discrimination. We fuse the results of the two classifiers based on AEI and GAEI to enhance the performance of our action recognition system..

**For more details click here**

**back**

***Title*** : ***Signaling With Truncated Root Nyquist Pulses***  
***Author(s)*** : ***George Prince***  
***Roll No*** : ***Y4104067***  
***Supervisor(s)*** : ***Vasudevan Kasturi***

### ***Abstract***

Digital communication systems employing linear modulation are being widely used. It is well known that for distortionless channels, the optimum receiver in a linearly modulated system consists of a matched filter (matched to the transmit filter) and a symbol rate sampler. Further, in order to satisfy the criteria for zero-ISI, a Nyquist pulse must be split equally between the transmitter and the receiver. Thus, the frequency response of the transmitter and receiver is equal to the square root of the frequency response of Nyquist pulse. Ideally the impulse response of the root Nyquist pulse is infinite in time. In this thesis, we study the effect of truncating the root Nyquist pulse in time domain. In fact, we use both computer simulations and analysis to study the effects of truncation of various types of root Nyquist pulses proposed in the literature. It is worth noting that the earlier work in this area are dealt with truncated Nyquist pulses which give ideal zero crossings. However, in our case, since we are dealing with truncated root Nyquist pulses, we do not get zero-crossings in the Nyquist pulse (which is obtained by convolving two truncated root Nyquist pulses).

**For more details click here**

**back**

*Title* : *Comparison Of Various Photonic Packet Switch Architectues Under Random And Bursty Traffic*  
*Author(s)* : *Singhvi Amit*  
*Roll No* : *Y4104006*  
*Supervisor(s)* : *SinghYatindra Nath*

### *Abstract*

Many different photonic packet switch architectures have been proposed to facilitate the widespread deployment of photonic packet switched networks. This thesis discusses a selected number of switch architectures with traveling type buffers and makes a comparison between them in terms of the number of components required, packet loss probability, and latency. Simulations have been done to compare the packet loss probability and latency of different switch architectures. Except for the staggering switch, packet loss probability has been simulated using random traffic model in all switch architectures. In this model, traffic on each input of the switch is assumed to be uncorrelated in time for simplicity although it is unrealistic for high speed services. Later on, time correlation of traffic on each input of the switch has been taken into account by a more realistic bursty traffic model. The simulations have been carried out to study the effect of burstiness on the switch performance. Finally, the scheduling algorithm may have a considerable effect on the performance of the switch, both in the probability of loss and latency. Simulations show the performance improvement in the staggering switch with an optimal scheduling algorithm.

**For more details click here**

**back**

*Title* : *Detection And Tracking Of Moving Objects In Compressed Video*  
*Author(s)* : *Yarakaraju Prasadaraju*  
*Roll No* : *Y4104064*  
*Supervisor(s)* : *Sharma Govind*

### *Abstract*

In many surveillance systems the video is stored in compressed form. It is assumed that the video can be compressed either using the Discrete Cosine Transform (DCT) or the Wavelet Transform (WT). An algorithm for detection and tracking of moving objects in video that is compressed using either DCT or WT is developed. The algorithm estimates the WT of the background scene from the WTs of the past image frames of the video. The WT of the current image is compared with the WT of the background and the moving objects are determined from the difference. In the case of DCT compressed video, the DC values of 8 by 8 image blocks of Y, U and V channels are used for estimating the background scene. The algorithm does not perform inverse transform to obtain the actual pixels of the current image nor the estimated background. This leads to a computationally efficient method and a system compared to the existing motion estimation methods. In a second aspect, size and locations of moving objects and regions in compressed video is estimated from the transformed domain coefficients of the current image, which differ from the estimated background transformed domain coefficients. This is possible because wavelet coefficients of an image carry both frequency and space information. In this way, we are able to track the detected objects in compressed video.

**For more details click here**

**back**

*Title* : *Complexity Scalable 3D Video Coder For Low BIT Rate Applications*  
*Author(s)* : *Agrawal Jai Prakash*  
*Roll No* : *Y4104037*  
*Supervisor(s)* : *Gupta Sumana*

### *Abstract*

The thesis work is primarily concerned with the design of low bit rate 3D videoencoder with advanced features of scalability such as computational complexity, bitrate, spatial and temporal respectively. The proposed codec uses both DCT and DWT in order to exploit the interframe and intraframe redundancies respectively. This approach has been adopted in view of the mixed transforms performing better than single transform methods which are generally suitable for a particular subset of videos. 3D-SPIHT algorithm has been used to encode the transform coefficients with newly devised tree structure. Motion compensation is not used at all. Comparisons of the proposed coder have been made with existing codecs that use 3D wavelet and 3D-SPIHT. The PSNR gain of (0-5 dB) is obtained. The systematic analysis of computational complexity of the proposed coder has been carried out and a parametric framework is given to achieve the complexity scalability. We demonstrate the graceful reduction in complexity of the proposed encoding scheme through the modification in computation of spatio-temporal subbands and their encoding with the help of complexity control parameters. We generate a wide range of rate-PSNR-complexity operating points for different sequences by modifying these options. With the proposed parametric approach, the computational complexity can be gracefully reduced by 20-50% with a little loss in PSNR (0-4 dB). To incorporate the features of bit rate, spatial and temporal scalability a layered bit stream has been generated with multiresolution encoding.

**For more details click here**

**back**



*Title* : *Just Noticeable Distortion Model And It's Application To Video Coding*  
*Author(s)* : *Srinivasulu D*  
*Roll No* : *Y4104026*  
*Supervisor(s)* : *Sharma Govind*

### *Abstract*

Human eyes cannot sense any changes below the just noticeable distortion (JND) threshold around a pixel due to their underlying spatial/temporal masking properties. In this thesis, a new just noticeable distortion (JND) estimator for color video is first devised in the image domain. How to efficiently integrate masking effects together is a key issue of JND modeling. We integrate spatial masking factors with the nonlinear additive model for masking (NAMM). The JND estimator applies to all color components and accounts for the compound impact of luminance masking, texture masking and temporal masking. Extensive subjective viewing confirms that it is capable of determining a more accurate visibility threshold that is close to the actual JND bound in human eyes. Secondly, the image-domain JND profile is incorporated into hybrid video encoding via the JND-adaptive motion estimation and residue filtering process. The devised technique can be applied to any standardized video coding scheme based on motion compensated prediction. It has been implemented in the Motion Pictures Expert Group-2 Test Mode 5 (MPEG-2 TM5) coder. We also estimated the quantization matrix (QM) adaptively from the spatio-temporal JND profile and contrast sensitivity function, quantization matrix is image dependent and each quantizer is fine adjusted so that the compressed image can achieve the lowest perceptual distortion with the allowed bits. We achieved significant perceptual quality, especially at lower bit rates.

**For more details click here**

**back**

*Title* : *Constant Quality Video Coding Using Video Content Analysis*  
*Author(s)* : *Yenneti N Sairam*  
*Roll No* : *Y4104055*  
*Supervisor(s)* : *Sharma Govind*

### *Abstract*

In the literature, several rate control techniques have been proposed to aim at the optimal quality of digitally encoded video under given bit budget, channel rate and buffer size constraints. Typically, these approaches are group-of-picture (GOP) based with the generally questionable assumption that video sequence is stationary within a GOP. For longer, heterogeneous sequences, they become unacceptably complex or struggle with the fundamental problem of model mismatch. In this thesis work, an off-line segment-based rate control approach is proposed for controlling the distortion variation across successive shots of a video sequence when encoding with single-layer (MPEG-4 baseline, MPEG-4 AVC) video codec. Consistent quality is achieved by optimally distributing the available bits among the different segments, based on efficient rate-distortion (R-D) modelling of each segment. The individual segments are defined based on shot segmentation and activity analysis techniques. The algorithm is formulated for three different distribution models: download, progressive download and streaming. The results indicate that the proposed technique improves the quality consistency significantly, while the processing overhead compared to classical two-pass variable bit-rate (VBR) encoding is limited. The proposed algorithm is independent of the chosen codec and Quality measure.

**For more details click here**

**back**

*Title* : *Rate-Adaptive Resource Allocation In Downlink OFDMA  
Wireless Communication System*  
*Author(s)* : *Chakra T V Vivek*  
*Roll No* : *Y3104101*  
*Supervisor(s)* : *Sharma Govind*

### *Abstract*

A downlink wireless system features a centralized basestation communicating to a number of users physically scattered around the basestation. The purpose of resource allocation at the basestation is to intelligently allocate the limited resources, e.g. total transmit power and available frequency bandwidth, among users to meet users' service requirements. Channel-aware adaptive resource allocation has been shown to achieve higher system performance than static resource allocation, and is becoming more critical in current and future wireless communication systems as the user data rate requirements increase. In rate-adaptive resource allocation, subcarrier and power allocation are performed to maximize the overall data rate while achieving the proportional fairness amongst users under a total power constraint. This thesis aims to study the system performance, e.g. total throughput and/or fairness, in OFDMA (Multi-user OFDM) systems with adaptive resource allocation. Some of the recent rate-adaptive resource allocation schemes are discussed in detail along with their performance evaluations. Also a new suboptimal resource allocation scheme, which consists of a new subchannel allocation algorithm and a simple power distribution algorithm among the users is proposed. It has been shown through the simulation results that the proposed suboptimal scheme achieves higher sum capacity of all the users than the existing methods with less computational complexity, while losing a little in satisfying the Quality of Service (QoS) requirements of the users.

**For more details click here**

**back**

*Title* : *Writer Dependent Handwriting Synthesis*  
*Author(s)* : *Gupta Ashish*  
*Roll No* : *Y4104014*  
*Supervisor(s)* : *Venkatesh K S*

### *Abstract*

In this thesis, realistic looking isolated character images indistinguishable from a writer's individualistic writing were pseudo randomly generated by using a statistical model which learns that writer's characteristic handwriting style. Hitherto research focus had been on modeling the human writing process or analyzing dynamic handwriting data, neither of which are viable approaches for widespread application in the growing human computer interaction technology. A writer specific statistical model of the most influential handwriting features was trained from multiple samples of each letter written by that writer from an optimal handwriting sampling text passage. Each sample letter was analyzed and new letters synthesized as a sequence of connected sub-strokes, using control-point extraction and clustering by correspondence search of multiple samples, followed by stroke curve synthesis using spline interpolation functions. Several significant algorithms were tested for each stage of the synthesis procedure to find the techniques optimal for static handwriting data: entropy based threshold for character image extraction; Kuwahara filter for de-noising; Zhang-Suen algorithm for skeletonization; distance transform for control-point selection; shape-context descriptor for control-point correspondence search; thin plate splines for control-point transformation; and interpolating splines for generating stroke curves. Empirical results indicate that the novel combination of handwriting specific algorithms in this thesis can generate realistic synthetic handwriting in a given writer's unique style, of satisfactory quality.

**For more details click here**

**back**

*Title* : *Channel Estimation For Ultra Wide-Band Communication Systems*  
*Author(s)* : *Tandon Mohit*  
*Roll No* : *Y1147213*  
*Supervisor(s)* : *Chaturvedi Ajit Kumar*

### *Abstract*

Ultra wideband systems operate by transmitting rapidly varying sub-nano second pulses. Due to the short duration of these pulses UWB systems are capable of resolving multipaths lying very close to each other and exploit the diversity inherent in the channel. A rake receiver is commonly employed to capture this diversity using the channel information estimated at the receiver. However, even a very small error in delay estimation of the multipaths may lead to severe performance degradation. Thus, channel estimation is critical to diversity combining ultra wideband receiver design. In this thesis, we derive a modified DT bound which lower bounds the mean square error performance of a multipath delay estimator. The proposed bound is shown to be tighter than the previously known CR bound. The bound is also applicable for the case when there is interference from adjacent paths arriving at the receiver. The performance of a diversity combining UWB receiver with imperfect channel estimates has also been studied. We give an in-depth analysis of the various parameters which affect the system performance. It is shown that the performance degradation increases as we increase the number of rake fingers. Further, the performance of the system was studied for different pulses and a single number measure was proposed which was representative of the performance of a pulse in the presence of channel estimation error.

**For more details click here**

**back**

***Title*** : ***Time Hopping Codes For Multiuser Ultra Wide-Band  
Communication Systems***  
***Author(s)*** : ***Singh Rajendra***  
***Roll No*** : ***Y4104072***  
***Supervisor(s)*** : ***Chaturvedi Ajit Kumar***

### ***Abstract***

Recent technology advances allow us to generate pulses of subnanosecond duration making Time Hopping (TH) an attractive option for UWB systems. However, several issues concerning the design of TH codes in UWB systems are yet to be studied in the literature. This thesis addresses the problem of multiuser interference reduction in TH UWB Systems. It is possible to generate TH codes with better correlation properties than random codes, and hence enhance the BER performance of the system. TH codes are similar in construction to FH Codes. In this work, the performance of FH codes as TH codes has been investigated and a family of FH codes have been found suitable for the purpose. Methods already exist in the literature for designing spectrum nulling TH codes to create a spectral null in UWB systems to avoid interference at some particular frequency, but correlation properties of such codes have not been considered. This work provides algorithms to improve the correlation performance of spectral nulling TH codes in UWB systems.

**For more details click here**

**back**

***Title*** : ***Traffic Engineering In Multi-Hop Optical Networks***  
***Author(s)*** : ***Pathak Prem P***  
***Roll No*** : ***Y4104063***  
***Supervisor(s)*** : ***Singh Yatindra Nath***

### ***Abstract***

The transmission capacity of a link in today's optical networks has increased significantly due to wavelength-division multiplexing (WDM) technology. WDM is the most viable technique for utilizing the enormous amounts of bandwidth inherently available in optical fiber. However, the bandwidth offered by the single wavelength in WDM networks is on the order of tens of Gigabits per Second, while most of applications' bandwidth requirements are still subwavelength. The network performance is now mainly limited by the processing capability of the network elements, which are mainly electronic. By efficiently grooming low-speed traffic streams onto high-capacity optical channels, it is possible to minimize this electronic processing and eventually increase the network performance. In this thesis work, we have studied various traffic grooming algorithms for Uniform and Non-Uniform Traffic and devised a new algorithm for Non-uniform Traffic in Unidirectional ring network. With this new algorithm, we have reduced the computational time as compared to existing one. The total number of circles formed with this algorithm are less than or equal to the earlier algorithm.

**For more details click here**

**back**

*Title* : *A Comparative Study Of Protocols For Cooperative Diversity*  
*Author(s)* : *Mishra Kiritee Konark*  
*Roll No* : *Y1147198*  
*Supervisor(s)* : *Chaturvedi Ajit Kumar*

### *Abstract*

Whenever size, power, or other constraints preclude the use of multiple transmit antennas, wireless systems cannot benefit from the well-known advantages of spatial diversity. The concept of cooperation between users has been proposed as a means to provide transmit diversity in the face of this limitation. This technique known as user cooperation diversity, involves multiple single-antenna users forming a partnership, in which each achieves diversity by using their partner's antenna as a relay. Till date, several protocols for cooperation have been suggested in the literature to effectively achieve diversity gains without incurring significant overheads. In the current work, we briefly discuss the existing protocols for cooperation. We then take a closer look at two protocols - threshold and incremental cooperation diversity. Apart from formally proposing the protocols we also derive expressions for computing error bounds and operating rate for these protocols. Even though several cooperative protocols have been proposed, and extensively studied, no work has come up which evaluates the performance of the protocols on a common benchmark. In this work, we lay down a set of strict normalizing conditions, and frame a common black-box system model in which all protocols, can operate and their performance evaluated and compared in a controlled manner. Finally, we apply the various protocols to the system model and compare the performance exhibited by each protocol. Incremental diversity, where applicable, turns out to be preferred mode of diversity, with its higher data rates. Threshold cooperation diversity is to be preferred for low complexity applications and space-time cooperation diversity for noisy inter-user channel condition

**For more details click here**

**back**



*Title* : *Successive Interference Cancellation For FHSS Multiple Access Systems*  
*Author(s)* : *Sahu Neerja*  
*Roll No* : *Y4104058*  
*Supervisor(s)* : *Vasudevan Kasturi*

### *Abstract*

Successive Interference Cancellation (SIC) is studied to improve the system spectral efficiency in Frequency Hopped Spread Spectrum (FHSS) Multiple Access Systems. The SIC algorithm successively cancels interference from users whose symbols have already been estimated. The idea of successively cancelling interference from other users has been previously applied to Direct Sequence Spread Spectrum (DSSS) Multiple Access Systems. In the MFSK/FHSS Multiple Access System, an address code is employed as a hopping sequence to hop the carrier frequency in MFSK. Here we have assumed that the address codes of all the users in MFSK/FHSS MA are known. All the users are time-aligned at the receiver such that simultaneously transmitted symbols completely overlap in time. Then the candidates of the transmitted vector which are regenerated from the time-frequency matrices decoded by all the users' address codes are added with logical OR operation to produce candidates of the received matrix. The candidates of received matrix are utilized in order to estimate a pattern of all users' data symbols which has the rows having the largest number of entries, in the time-frequency matrix. Here in our work we have considered Interference-Only Channel (neither noise nor fading are present). Its BER (Bit Error Rate) performance is evaluated by computer simulation in order to show the improvement of user capacity. Successive Interference Cancellation may either substantially reduce the bit error probability or allow for a large increase in the number of simultaneously transmitting users. It will be shown that the SIC algorithm can be easily implemented and improve system performance considerably..

**For more details click here**

**back**

***Title*** : ***Content Based Video Segmentation And Retrieval In Compressed Domain***  
***Author(s)*** : ***Gautham S R***  
***Roll No*** : ***Y4104031***  
***Supervisor(s)*** : ***Gupta Sumana***

### ***Abstract***

With the rapid proliferation of multimedia applications that require video data management, it is becoming more desirable to provide proper video data indexing techniques capable of representing the rich semantics in video data. In real-time applications, the need for efficient query processing is another reason for the use of such techniques. With most of the video data stored in the compressed form, algorithms working directly on the compressed streams are of great importance. In this thesis we present video segmentation and summarization which exploits the information present in this compressed stream, thereby achieving a computationally efficient and simple modelling of the video databases, which are domain independent. Grouping images into semantically meaningful categories using low-level visual features is a challenging and important problem in content-based image retrieval. We present a novel technique based on the independent component analysis (ICA) which maps the image features from a higher dimensional space to a lower dimension. Retrieval is performed on this reduced space. The classification of images into semantic concepts in the reduced color histogram feature space has been demonstrated. Also content-based image retrieval with reduced histogram feature space has been demonstrated to give results comparable to the existing methods which do not use the reduced space. Finally an attempt has been made to use the independent Gabor texture features for image retrieval. Results obtained are promising.

**For more details click here**

**back**

*Title* : *Turbo Trellis Coded Modulation For Bandwidth Efficient Signaling At Low Signal-To-Noise Ratios*  
*Author(s)* : *Singh Garima*  
*Roll No* : *Y1147135*  
*Supervisor(s)* : *Vasudevan Kasturi*

### *Abstract*

Turbo Codes, proposed by Berrou, et al, represent a breakthrough in the field of coding as their performance in terms of Bit Error Rate are close to Shannon's limit of error correcting performance. However, efficient digital communication schemes should offer efficiency both in terms of power and bandwidth requirements. Improving bandwidth efficiency of Turbo coding schemes has been a major area of investigation so far, as original turbo codes are unsuitable for bandwidth limited communication systems. Employing Trellis Coded Modulation codes as component codes of the generic Turbo codes can offer significant bandwidth efficiency. The use of symbol interleaving instead of bit interleaving reduces the probability of error and can be easily incorporated in Turbo coding scheme. Using the concept of puncturing of systematic information component can greatly increase the spectral efficiency by puncturing the output symbols of each trellis encoder and selecting the puncturing pattern in such a way that the output symbols of the parallel concatenated code contain the input information only once. The decoder is also adapted to suit the modified encoder. Hence, the problem of improving the error rate performance of Turbo Codes using punctured component techniques of Ungerboeck type, is studied. Suitable changes are introduced at the encoder and hence, those required at the decoder end are implemented and several improvements are suggested. Complete set of equations for symbol-by-symbol Maximum a posteriori Probability detection method are presented. The effect of increasing or decreasing the interleaver size or varying the Memory Order on AWGN Channels over the error rate performance is also studied.

**For more details click here**

**back**

*Title* : *The Representation Theory For Relations*  
*Author(s)* : *Santra Tapesh*  
*Roll No* : *Y4104091*  
*Supervisor(s)* : *Venkatesh K S*

### *Abstract*

Signal and system theory as it exist in its present form is the result of development over at least the last two centuries. Diverse areas of science and technology thoroughly accept the basic formulation of this theory and apply it each in their own particular way. Much of the new research is into variations and improvements of the original formulation usually tailored for specific applications. Some of the research has been carried out to generalize this theory into a broader horizon. In our thesis we have tried to approach the problem of signal analysis from a completely different perspective. Instead of considering that the signal space is a metric space, we have introduced a new vision of simultaneous signals, the space of which does not have the notion of any kind of metric. Allowing simultaneous signals broadens the horizon of conventional signal space from the space of all functions to a wider space of all relations. Thus our thesis introduces a representation theory for relations. Our theory is mainly concentrated in finding a spectral representation for relations from a purely set theoretic point of view. We have also developed a system theory which is analogous to the conventional theory of linear time invariant systems but operates in the space of all relations instead of functions. In the final discussions of our thesis we have shown that it is possible to find a numerical representation theory for relations in order to avoid the difficulties posed by the abstract formulations of our representation theory.

**For more details click here**

**back**

*Title* : *Restoration Of Old Color Film Sequences*  
*Author(s)* : *Sekhar Meduri Chandra*  
*Roll No* : *Y4104050*  
*Supervisor(s)* : *Gupta Sumana*

### *Abstract*

Many important events of the past that are of historic, political and cultural significance have been recorded in media which are susceptible to degradation. The quality of the films stored in such media gets reduced after repeated usage. As for example, the film rolls because of their physical nature, deteriorate as a result of their continuous projection for display purposes. Thus, it is extremely important to preserve and restore these video archives. Typical artifacts in degraded video are Blotches (Dirt and Sparkle), Line scratches and noise. Blotches appear as regions of high contrast at random positions in the frame. Line scratches are visible as bright or dark intensity lines oriented more or less vertically over much of the image. Since many i.i.d noises are added to the archived material the noise is treated as Gaussian. In order to preserve the degraded videos, defects must be removed so that the picture quality can be restored. Traditional techniques find blotches by choosing an empirical threshold. Manual control is necessary to completely remove the blotches, because of different pixel value distributions in different scenes of the same video sequence. Also fixed threshold may lead to many false alarms. Manual intervention is a gigantic task as amount of data is large. In this thesis, we propose a threshold free technique to find the blotches that eliminates human interaction and which at the same time reduces the number of false alarms. The proposed method finds blotches pixel by pixel by setting maximum and minimum bounds using motion compensated subimages of the previous and next frames with respect to the  $5 \times 5 \times 3$  sub image of the current frame, to validate the pixel of interest. Blotches are reconstructed treating RGB channels independently by using multi level median filtering. Since the correlation among the RGB channels is high, vector median filtering is used for blotch reconstruction. Many degraded videos are available in compressed format, so reconstruction is also carried out in the YUV channels treating each channel independently. Normalized mean squared error is used for evaluating the performance of blotch area restoration method. Line scratches are detected by dividing the image into sub images to get the benefit from the straight orientation of the line artifact within a sub image. Further, for removal of the line scratches, we used both spline interpolation and median filtering. Finally, to make the restoration system more complete and robust, noise removal is carried out using a steerable pyramid. This gives the best performance in the root mean squared error sense.

**For more details click here**

**back**

**Title** : *Color Correction And Intensity Flicker Removal From Old Film Sequences*  
**Author(s)** : *k Sai kishore*  
**Roll No** : *Y4104039*  
**Supervisor(s)** : *Gupta Sumana*

### ***Abstract***

The video archives of the world contain many important historic, artistic and cultural records that are stored in bulk as archived moving pictures. Many of these historically significant items are in a fragile state and need suitable conservation and restoration. Preservation of visual evidence of important moments in history and of our cultural past is not only of purely scientific value but, is of immense importance in a civilized society. Automated tools for video restoration is crucial in preserving our cultural heritage, since manual image restoration is a tedious and time-consuming process. In this thesis work we developed algorithms for correcting two types of commonly appearing artifacts present in old film and video sequences. They are intensity flicker and color fading. The effect of flicker is a common artifact in old movies. It is perceived as a fluctuation in the brightness of the frames. The aim of this work is to develop and implement algorithms for an automatic detection, and removal of intensity flicker. This method is on the basis of equalizing local intensity mean and variance in a temporal sense. We proposed some important improvements to the existing algorithms. The algorithm for removal of flicker was extended from the case of monochrome frames to color frames. Color fading is often caused by spontaneous chemical changes in the image dyes of color films. We proposed a method for digital color restoration of several old faded movies. This method consists of first removing the side absorptions introduced by the scanning process, and then adjusting the image colors appropriately using correction matrices. This is followed by enhancing the image contrast using histogram manipulation techniques. The proposed correction algorithms were tested on various degraded video sequences. This thesis investigates the influence of intensity flicker on the coding efficiency and evaluates the coding gain achieved by restoring impaired film and video sequences. It is shown that considerable saving in bandwidth is feasible without loss of quality. The objective evaluation of image quality for color corrected video sequences was carried out and results show that considerable improvement was obtained.

**For more details click here**

**back**

*Title* : *Study Of Speaker-Invariant Features For Speech Recognition*  
*Author(s)* : *Praveen G*  
*Roll No* : *Y4104029*  
*Supervisor(s)* : *Umesh Srinivasan*

### *Abstract*

There is considerable variability in the acoustics of speakers in a population enunciating the same sound. One of the dominant factors responsible for this variability is the difference in the average vocal tract length between speakers. This source of variability results in significant degradation in performance for a speaker-independent speech recognition system when compared to a speaker-dependent speech recognition system. In the past, a number of approaches have been proposed to address this problem. The majority of them employ some kind of frequency warping in feature-space to compensate for speaker differences and are referred to as speaker normalization (which includes the popular vocal tract length normalization). Most of the techniques need to estimate a normalization factor for normalization which is computationally expensive. In this work, we review and propose feature vectors which give normalized features without estimating any normalization factor. These techniques are computationally efficient compared to present day techniques for estimating normalization factor. First we review scale transform cepstral coefficients (STCC) which normalize features only by taking magnitude of I-DFT of warped-spectra. The performance of STCC feature vectors is inferior when compared to standard Mel-frequency cepstral coefficients (MFCC). The loss of phase in STCC is attributed to its inferior performance. Later we introduce new features which deal with extracting phase without disturbing the normalization procedure followed in STCC. However these new features do not improve the performance when compared to MFCC, as the speech signals do not satisfy all the conditions required for minimum phase reconstruction. Finally, we proposed another set of features which normalize speaker variabilities by taking average phase for each phoneme instead of reconstructing the phase. The performance is compared with vocal tract length normalized MFCC features. We show that under ideal conditions the performance of average phase features is much higher than vocal tract length normalized MFCC features..

**For more details click here**

**back**

*Title* : *Speaker Normalization Using Frequency Warping*  
*Author(s)* : *Khan Mohd Aamir*  
*Roll No* : *Y4104052*  
*Supervisor(s)* : *Umesh Srinivasan*

### *Abstract*

Even for the same sound, there is considerable amount of variability present in the acoustics of the speech signal among speakers. One of the dominant factors responsible for this variability is the difference in the average vocal tract length between speakers. This source of variability results in significant degradation in performance for a speaker-independent speech recognition system when compared to a speaker-dependent speech recognition system. Vocal Tract Length Normalization (VTLN) is a commonly used speaker normalization approach. It is attractive as compared to many normalization techniques as it is typically dependent on single parameter. Frequency-warping is the most commonly used technique to do Vocal Tract Length normalization. In this thesis different Frequency Warping approaches are investigated to remove the variabilities by modifying the speech spectrum. We have studied the effect of Jacobian on likelihood values and its relation to variance normalization approach. Variance-normalization is used to remove the effect of Jacobian in the cepstral domain. We have done the variance-normalization for all frequency warping functions and indeed got a better performance.

**For more details click here**

**back**



*Title* : *Secure Data Communication Using Synchronized Chaotic Oscillators*  
*Author(s)* : *Islam Anarul*  
*Roll No* : *Y4104009*  
*Supervisor(s)* : *JohnJoseph& Sivaprakasam Sivaraman*

### *Abstract*

In our work we present the basics of a possible secure communication scheme, using modified Wien-bridge oscillator based on CFOA as the source of chaos generation. We demonstrate the efficient encoding, transmission and efficient decoding of message using a chaos generator and synchronized transmitter – receiver chaotic circuits. Initially, we started our work with Numerical Simulation (Simulink) of the state space coupled equations of the modified Wien- bridge oscillator. Simulations have been carried out by numerically integrating the state space equations while, later, more realistic simulations have been performed by using SPICE with accurate models of the electronic devices. The behavior of the experimental setting is in agreement with the simulations. After confirming message recovery with numerical simulation we implement the complete scheme of secure communication with electronic circuits. Initially, we started our work on studying the time evolutions of the chaos generator and their Fast Fourier Transforms to identify the chaos regimes of the chaos generator with respect to various operating parameters of the circuit. Decoding of a message requires synchronization of two chaos generator circuits viz., the transmitter and the receiver. For synchronization a receiver chaotic system is constructed which is identical to the transmitter and one of the chaotic outputs of the transmitter is coupled as an input to the receiver. The result is that the two circuits become synchronized and generate (nearly) identical chaotic signals. After confirming the synchronization between the transmitter and receiver chaotic system we added a message to the drive chaotic system and the encoded message is transmitted to the response chaotic system. Message is decoded at the receiver by feeding the output of the transmitted chaos and receiver chaos to a subtractor circuit. This resulted in good message recovery. The effectiveness of decoding depends on the quality of synchronization between the transmitter and receiver.

**For more details click here**

**back**

*Title* : *Analysis And Simulation Of A Matrix Converter-Fed Stator Flux Oriented Vector Controlled Synchronous Motor Drive System*  
*Author(s)* : *Upadhyay Vivek Kumar*  
*Roll No* : *Y1147407*  
*Supervisor(s)* : *Das Shyama Prasad*

### *Abstract*

The present work is aimed at analysis, design and digital computer simulation of a matrix converter-fed stator flux oriented vector controlled synchronous motor(SM) drive system for possible applications in lifts, escalators, rolling mills, centrifuges and eccentric machines. A three-phase ac to three-phase ac matrix converter has been designed and is followed by the design and digital simulation of a flux-feedback type stator flux oriented vector control drive system. The response of the drive to step change in speed and torque, and speed and torque reversals is studied. It is observed that the drive performance is satisfactory both under steady state and transient conditions. Keywords: Digital simulation, Matrix converter, Modulation function, Synchronous Motor, Scalar control, Vector control, PI controller, Stator flux orientation, Flux-feedback control.

**For more details click here**

**back**

**Title** : *Design, Simulation And Implementation Of A Single-Phase Optimized Unified Power Quality Conditioner*  
**Author(s)** : *J Phani Kumar*  
**Roll No** : *Y4104061*  
**Supervisor(s)** : *Das Shyama Prasad*

### ***Abstract***

This thesis deals with an optimized Single-Phase Unified Power Quality Conditioner(UPQC), which aims at the integration of series active and shunt activepower filters with minimum VA loading of UPQC. The shunt active filter is aSTATCOM, which is operated in current controlled mode and compensates instantaneouslyfor the nonlinearities and reactive component of the load current.Whereas, the series active filter is a Dynamic Voltage Restorer (DVR) which regulatesthe load voltage. Damping of the DVR is improved by using multi-loopfeedback controller. The scheme is validated by simulation results and laboratoryexperimental tests with a PC-based system.Keywords: Unified Power Quality Conditioner (UPQC), Minimum VA Loading,Optimum UPQC

**For more details click here**

**back**

*Title* : *Analysis Of PWM Techniques By Double Fourier Series Method*  
*Author(s)* : *Kaja Gopi Krishna*  
*Roll No* : *Y4104034*  
*Supervisor(s)* : *Joshi Avinash*

### *Abstract*

Several modulation techniques are present in the literature which will have specific advantages when used with respect to several available combinations of converters. Parameters such as switching frequency, distortion losses, harmonic generation, WTHD and speed of response are typical issues which must be considered for comparing these available techniques when used for specific purpose. So analysis of all these methods is very important before applying them to any converter topology. In the present work Double Fourier Series analysis technique is used for the determination of the expressions for the modulation signals used in the carrier-based modulation, space vector modulation and generalized discontinuous PWM modulation for two-level and three-level, three-phase voltage source inverters. Harmonic spectra of all these methods are plotted from the analytical expressions obtained. Simulation results using PSCAD/EMTDC validate the expressions derived for all the modulation techniques considered.

**For more details click here**

**back**

***Title*** : ***Digital Power Quality, Energy Audit And Communication Device***  
***Author(s)*** : ***Singh Gurpreet***  
***Roll No*** : ***Y4104035***  
***Supervisor(s)*** : ***Kalra Prem Kumar***

### ***Abstract***

This thesis describes a new approach for collecting information on power quality, reliability and also power auditing. This approach make possible the data collected to be presented in a meaningful way to electricity consumers and suppliers for enabling more informed decisions regarding electricity reliability. The system makes possible the customers to obtain information on the most significant power quality events, i.e. voltage sag, swell and interruptions. The system also offers widespread access to information on power quality collected from multiple sites and the potential for capturing information on the impacts of power quality problems. This enables a wide variety of analysis to improve system reliability

**For more details click here**

**back**

**Title** : *Application Of Power Frequency Estimation Algorithms For Operation Of Custom Power Devices*  
**Author(s)** : *Chawla Monika*  
**Roll No** : *Y4104053*  
**Supervisor(s)** : *Ghosh Arindam & Joshi Avinash*

### ***Abstract***

If the fundamental frequency varies dynamically in a power system, the voltage control of custom power devices based on constant frequency winding is affected significantly. The impact of supply frequency variation on the performance of a Distribution Voltage Controller (DVC) and a Distribution Static Compensator (DSTATCOM) that is operating in a voltage control mode has been studied. It has been shown by TSCM/EMTC simulations that a capacitor fed DSTATCOM will be unable to hold the bus voltage in such event. If on the other hand, a dc battery supplies the DSTATCOM or DVC, the battery ends up supplying the entire real power demand of the load. To avoid these problems, the frequency of the bus voltage that has to be regulated by the DSTATCOM or DVC must be synchronized with the system frequency. The present work discusses two frequency estimation strategies that when used in conjunction with a DSTATCOM or DVC can hold any distribution bus voltage constant at system fundamental frequency even when the supply frequency varies. The first is based on DFT technique that can accurately estimate two frequencies even when they are very close to each other. This method is characterized by immunity to reasonable amounts of noise and harmonics in power systems. The second method is based on symmetrical component extraction (5 sample method). The performance of the proposed techniques is illustrated on several scenarios by computer simulation. Once the knowledge about the frequency is available, the custom power devices can then be made to operate in synchronism with the estimated source frequency.

**For more details click here**

**back**

***Title*** : ***Power Flow Control Using A 5-Level Converter Based Unified Power Flow Controller***  
***Author(s)*** : ***Kumar D Anil***  
***Roll No*** : ***Y4104024***  
***Supervisor(s)*** : ***Ghosh Arindam&\_Joshi Avinash***

### ***Abstract***

The Unified Power Flow Controller (UPFC) is the most versatile Flexible AC Transmission System (FACTS) device available. It can be used for regulating powerflows, improving transient stability and voltage stability etc. This thesis examines the ability of the UPFC to selectively and simultaneously control the real and reactive powerflows in a transmission system. The UPFC consists of two voltage source converters connected back-to-back through a dc link. One of the converters is connected in shunt with the transmission line and the other converter is in series. The chopper stabilized five-level diode clamped multilevel converters have been employed as the shunt and series converters. Phase-disposition pulse width modulation scheme has been used for generating the firing pulses for the converters. Proportional and integral controllers, which compare the reference real and reactive power with the measured real and reactive powers to provide the modulation index and phase angle of the reference wave for pulsewidth modulation have been designed. The power control options of the UPFC are compared with those of the STATCOM through PSCAD/EMTDC simulation. The difference in the performances of these two FACTS controllers is further highlighted by employing them for enhancing transient stability of a single machine infinite bus system. The reference real and reactive powers are generated based on the rotor frequency deviations..

**For more details click here**

**back**

**Title** : *Development Of Adaptive Supplementray Feedback Controller For GUPFC*  
**Author(s)** : *Tripathy Praveen*  
**Roll No** : *Y4104065*  
**Supervisor(s)** : *Singh Sri Niwas*

### ***Abstract***

In deregulated environment, to meet all kinds of transactions, there is a need of some Flexible AC transmission system (FACTS) controller, which controls the active and reactive power in the transmission lines below their thermal limit. These FACTS controllers are the natural choice for the current deregulated power system. The FACTS controllers with the supplementary feedback controller enhance the transient stability margin, and therefore improve dynamic ATC of the line. This thesis work has major focus on assessment of transient stability of 2 - area 13- bus test system, with four number generators, having 2 numbers of generators in each area. Generalized Unified Power Flow Controller (GUPFC) which is a FACTS controller, is used in this thesis and a supplementary feedback controller is designed and tuned for the test system. The assessment of transient stability for a fault in the 2- area , 13- bus test system has been first carried out for base case scenario. It was observed that there were few underdamped modes with damping ratio less than 0.05 in the system. With the placement of GUPFC in the tie line, the critical eigenvalue has shifted to the left in the s-plane, and improving the small signal stability of the system. Proper selection of supplementary feedback controller parameters improves the stability of the system. The classical supplementary feedback controller requires tuning of the gain parameters every time when the operating condition changes, which is not suitable for online application. Adaptive Neuro-Fuzzy Inference Systems (ANFIS) based supplementary feedback controller is developed for the test system. The performance of this feedback controller is tested on the above system..

**For more details click here**

**back**



***Title*** : ***Application Of Self Organizing MAP Algorithm And Extended Relation Function Method For Power Transformer Fault Diagnosis***  
***Author(s)*** : ***Chandra Ch Subhash***  
***Roll No*** : ***Y3104094***  
***Supervisor(s)*** : ***Singh Sri Niwas& Biswas Bikash***

### ***Abstract***

Incipient faults in power transformers can reduce the life and reliability by degrading the oil and cellulose insulation, leading to the formation of dissolved gases. Although established approaches that relate these dissolved gas information to the condition of power transformers are already developed, it is discussed in this thesis that they still contain some limitations. In view of that, this thesis presents two alternative approaches for the analysis of dissolved gas data, which can produce more convincing interpretation and fault diagnosis. The first approach, which is based on the self-organizing map, helps to unearth the hidden information within the dissolved gas records to enhance our understanding on the health of the power transformer. The results have been compared and validated using conventional interpretation schemes. The second approach is a power transformer fault diagnosis method based on Extension theory. Compared with other Artificial intelligence based methods, the proposed method does not require particular artificial parameters and learning processes. Simulation results show this method can overcome the drawbacks of conventional three-ratio method, such as no matching and inability to diagnose multiple faults, thus greatly increases the diagnosing accuracy. Both the methods have been proven to be capable of enhancing the condition monitoring of power transformers.

**For more details click here**

**back**

*Title* : *Design, Simulation And Realization Of A Wideband Shunt Hybrid Active Filter*  
*Author(s)* : *Sen Bhaskar*  
*Roll No* : *Y4104021*  
*Supervisor(s)* : *Sensarma Partha Sarathi*

### *Abstract*

Proliferation of power electronic loads, and their contribution to harmonic pollution in the distribution system has made the power utilities to set standards on the maximum harmonic content in the current drawn by loads. Utilities are beginning to implement harmonic standards such as IEEE 519 for industrial and commercial consumers. Passive filters consisting of capacitors and inductors have long been used to reduce harmonics. Passive filters offer a cheap and simple solution for harmonic mitigation. However, passive filters can become overloaded in the presence of source voltage harmonics. Active filters overcome the majority of the drawbacks of the passive filters. Active filters provide an 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 VA rating requirement. Hybrid filters offer a cost effective and practical solution for harmonic filtering and harmonic isolation for large rated nonlinear loads. In this thesis, a wideband shunt hybrid active filter for harmonic current mitigation is investigated and experimentally verified. The basic circuit is based on using a parallel resonant LC circuit tuned at fundamental frequency and a small-rated voltage source inverter (VSI). The band-stop property of parallel resonant circuit, is used to prevent flow of fundamental current into the shunt branch. Low impedance is offered to harmonic components enabling use of a small rating VSI. This work presents the hardware and control algorithm for a wideband hybrid active filter. Depending on the controller bandwidth, the hybrid parallel active filter is capable of compensating multiple harmonic components. The controller was implemented using a 16 bit fixed point DSP platform. Gate drive, inverter, current sensors, voltage sensor, protection card was used to realize the wideband shunt hybrid active filter.

**For more details click here**

**back**

..

*Title* : *Optimal Bidding Strategies In A Competitive Electricity Market Using A Particle Swarm Optimization*  
*Author(s)* : *PunnaShiva Kumar*  
*Roll No* : *Y4104068*  
*Supervisor(s)* : *Singh Sri Niwas*

### *Abstract*

Restructuring of electricity supply industry introduced competition and established markets wherever possible. In a competitive electricity market, developing the optimal bidding strategies to maximize the profit is a major concern for generating companies as their profits depend on their bids. The objective function to build optimal bidding strategy is a nonlinear and non-differentiable function. It is difficult to handle optimization problems having such objective functions by the conventional optimization methods, since these methods may either fail to obtain feasible solution or get trapped on local optima. This thesis has introduced the use of Particle Swarm Optimization (PSO), a population-based, random search algorithm with ability to handle nonlinear and non-differentiable objective function easily, to develop optimal bidding strategy for power suppliers. Particle swarm optimization has been used for the first time to solve optimal bidding strategy problem for block bid model as well as linear bid model. Non-smooth production cost function with valve-point effects has been considered for generator in linear bid model. Uncertainties in rivals' bidding behavior have been accounted as probability distribution functions. Simulations have been carried out considering uniform, normal and discrete probability distributions for rivals' bids. Monte Carlo method has also been used to solve the problem by PSO in case of normal distribution of rivals' uncertainty for both block bid and linear bid models. In block bid model, it has been observed that PSO is superior to dynamic programming approach and while using Monte Carlo approach, PSO outperformed Genetic Algorithm. The simulation results have also confirmed fast convergence of PSO in reaching optimal value for block bid model as well as linear bid model.

**For more details click here**

**back**

**Title** : *Analysis, Design And Implementation Of A Three-level Neutral Point Clamped (NPC) Regenerative Front-End Converter For Induction Motor Drive*

**Author(s)** : *Dixit T V*

**Roll No** : *Y4104089*

**Supervisor(s)** : *Das Shyama Prasad*

### ***Abstract***

The present work addresses the design and development process of a three-phase three-level utility friendly AC-DC converter for induction motor drive application. The three-phase three-level converter has been fabricated using a 7 - layer planar bus structure. The major advantage of planar busbar fabrication is to eliminate the stray inductance caused by wire bound connection of devices. The analysis of packaging layout shows possible options to reduce the parasitic inductance, better noise attenuation and improved system reliability. The DC link capacitor design, heat sink selection and philosophy of decoder-cum-lockout circuit have been explained. Second part of the thesis contains simulation and experimental investigation of a three-phase three level NPC utility friendly AC-DC Front-End Converter (FEC), which has the capability of bidirectional power flow at the unity power factor. Steady state analysis has been made and a closed loop controller has been designed in dqo-reference frame. Well known hysteresis current control technique is incorporated with PI-controller for ring IGBTs. Since the three-phase three-level AC-DC converter (FEC) is bidirectional, it can also be used as a DC-AC three-level inverter for driving a three-phase load. The FEC is also used to drive an RL load and induction motor load. The overall system is implemented with a PC-based controller to validate the control scheme.

**For more details click here**

**back**

*Title* : *Simulation And Implementation Of A Speed Sensorless Indirect Vector Controlled Induction Motor Drive System*  
*Author(s)* : *Ravisankar K*  
*Roll No* : *Y4104040*  
*Supervisor(s)* : *Das ShyamaPrasad & Behera Laxmidhar*

### *Abstract*

Speed sensorless indirect vector control of induction motors is an advanced control strategy in the field of adjustable speed drives. In this control, the speed of the motor is estimated by using the speed estimation methods. In the present work, "Speed Adaptive Flux Observer" technique has been simulated and experimentally implemented. This estimation technique is based on the theory of Luenberger observer and Lyapunov's theory of stability. This observer uses the electrical model of induction motor in stationary reference frame and a feedback loop with the measured plant variables. The speed estimated by this observer has been used in the indirect vector controller to compute the rotor flux vector angle i.e., the angular position of the rotor flux linkages phasor with respect to stationary reference frame. This angle can be used to transform the current components computed by the indirect vector controller into stationary reference frame. This drive scheme is advantageous than a traditional indirect vector controlled one as it eliminates the necessity of a speed sensor to compute the field angle. The complete drive system has been simulated using MATLAB-SIMULINK. A PC-based control scheme with necessary hardware developed in the laboratory. The test results from the experimental setup are compared with the simulation results. The performance of the drive system is found to be satisfactory. Keywords: Speed sensorless vector control, Indirect vector control, Induction motor, Two-level inverter, PC-based implementation, Speed adaptive flux observer.

**For more details click here**

**back**

*Title* : *Improvement Of Current Dynamics During Controller Saturation In AD-STATCOM*  
*Author(s)* : *Bachana Ravikanth*  
*Roll No* : *Y4104074*  
*Supervisor(s)* : *Sensarma Partha Sarathi*

### *Abstract*

In this thesis, the dynamic analysis of currents during controller saturation of STAT-COM connected to the Point of Common Coupling (PCC) is presented. Closed-form solutions of the STATCOM currents are obtained using a piecewise linear, state-space averaged model of the STATCOM under the linear and saturated regimes of the current controller. Using these results, a composite control approach which overcomes the constraint of bit sizes on controller platform is proposed. The proposed approach improves the current dynamics during controller saturation, while simultaneously limiting the reference voltage within the modulation range. This ensures that no lower order harmonics are introduced in the VSI currents, resulting in simplification of the ripple filter design. Simulation and experimental results obtained are compared with those from existing algorithms. The simulation model includes device switching and uses multi-rate sampling, for the physical plant and controller, to reflect major non-idealities of a practical system. The experimental verification is performed on a low voltage system, with controller platform built on a 16-bit DSP. It is shown from the simulation and experimental results that the proposed approach results in faster current dynamics during saturation. A scaled down distribution system is used with a D-STATCOM for testing the saturation algorithms. The controller platform is built on a 16-bit fixed point DSP. The D-STATCOM includes a two level inverter card, gate driver cards, voltage sensor cards, current sensor cards and a protection card..

**For more details click here**

**back**

*Title* : *Design And Implementation Of A Low Cost  
Microcontroller Based Single Phase Power Analyzer*  
*Author(s)* : *Nagireddy Sunil*  
*Roll No* : *Y4104086*  
*Supervisor(s)* : *Das Shyama Prasad*

### *Abstract*

In the present work, a cost-effective microcontroller-based single phase digital instrument has been developed which can measure and display the magnitudes of the harmonics present in the voltage and current signals. In addition, the instrument is made to display the Total Harmonic Distortion (THD) and active power consumed. The proposed instrument adopts the Discrete Fourier Transform (DFT) technique in order to estimate the magnitudes of harmonics. A good performance to cost ratio is achieved by selecting a low cost microcontroller (PIC16F877) with suitable inbuilt modules. Implementation problems of DFT in estimating harmonic magnitudes are overcome by efficiently using the inbuilt modules of the microcontroller. Applying DFT technique directly to the samples of continuous time signals to estimate the spectral coefficients will end up in large errors, if the sampling frequency is not an integral multiple of fundamental frequency of measuring signal. And in real time, the fundamental frequency of voltage and current signals varies continuously depending on circuit conditions. In order to overcome this problem, the sampling frequency will be varied depending on the fundamental frequency of signal to be measured so that sampling frequency is an integral multiple of fundamental frequency. Also, precautions are taken to overcome the aliasing effect. An experimental prototype of the single phase meter has been built. The developed meter measures magnitudes of current and voltage harmonics up to 11th order, THD and average power consumed in a single phase circuit successfully. Key Words: DFT (Discrete-time Fourier Transform), THD (Total Harmonic Distortion), Aliasing effect, Nyquist rate, PIC 16F877 microcontroller.

**For more details click here**

**back**

*Title* : *Voltage Stability Assessment And Enhancement Of NEPAL Power System*  
*Author(s)* : *Sapkota Bishnu Prasad*  
*Roll No* : *Y4104023*  
*Supervisor(s)* : *Srivastava S C & Singh Sri Niwas*

### *Abstract*

Ability to maintain voltage stability has become a major challenge in modern power systems due to increased loading and continuous growth of interconnections. Several incidences of voltage instability and collapse have been triggered by tripping of a critical line or some other form of contingency. The term voltage security means the ability of a system not only to operate stably, but also to remain stable following credible contingencies. FACTS controllers have been effective in providing corrective and preventive actions against voltage collapse. However, due to high cost of these controllers, and to get a maximum enhancement in the voltage stability margin, these should be placed optimally in the power system. Nepal power system is mainly hydrodominant, having power plants located far away from load centers. During peak hours, these are operated near to full load capacity and have to supply power through long transmission lines. However, no systematic studies of static and dynamic voltage stability of the Nepal power system have been carried out so far. This thesis presents a detailed analysis of static and oscillatory voltage stability of Nepal power system. Following aspects of voltage stability issues have been studied.

- Static and oscillatory voltage stability analysis for the base case.
- Voltage stability based contingency analysis utilizing a modified reactive support index to identify a set of critical contingencies. The results have been compared with true ranking obtained by running continuation power flow.
- Optimal location of SVC to enhance static voltage stability analysis using a sensitivity based approach and to study its impact on static voltage stability margin.
- Optimal location of SVC and TCSC to increase oscillatory voltage stability margin based on a set of state participation factors to the critical mode and to study their impact on the oscillatory voltage stability margin enhancement.

The studies carried out on Nepal power system reveal that the base case scenario is quite vulnerable to voltage stability and system may experience voltage instability even for a small increase in load under system intact as well as contingency cases. Placement of SVC alone, TCSC alone, and both together have substantially increased the static and oscillatory voltage stability margins.

**For more details click here**

**back**



**Title** : *Transmission Cost And Loss Allocation Methods In Competitive Electricity Markets*  
**Author(s)** : *Reddy N Venkateswara*  
**Roll No** : *Y4104096*  
**Supervisor(s)** : *SrivastavaS C*

### ***Abstract***

Restructuring of electricity supply industries requires open access to the transmission system to allow competition at wholesale and retail levels. In most of the competitive electricity markets, system losses are not accounted in the primary energy trading and it is arranged by system operator as an ancillary service. Market participants are required to pay for the loss make-up as well as the transmission system usage. Hence, allocation of transmission cost and losses are some of the prominent issues to be considered in the electricity market. This thesis has suggested few methods for the transmission cost and loss allocation amongst the transacting parties in a fair, systematic and transparent manner. A modified Equivalent Bilateral Exchanges method, based on AC Power Transfer Distribution Factors (ACPTDFs) has been suggested to allocate the transmission costs amongst generators and loads. The simulations have been carried out on IEEE-14 bus and IEEE-118 bus systems. The results have been compared with an existing Equivalent Bilateral Exchanges method, based on DC Power Transfer Distribution Factors, and a proportional sharing approach. The proposed method presents several advantages, as it is independent of the choice of slack bus and also takes into account the effects of counterflows in the network. A new set of Current Square to Power Injection Distribution Factors (CSPIDFs) have been proposed, which are computed from the base case NRLF results. These factors have been utilized to allocate the transmission losses amongst generators and loads. The simulations have been carried out on IEEE-14 bus and IEEE-118 bus systems and the results have been compared with a Pro Rata based method and an existing Equivalent Bilateral Exchanges method. The proposed CSPIDFs method, to allocate the losses, considers the effect of counterflow problem. It is more stable and nonvolatile to small changes in the network conditions.

**For more details click here**

**back**

*Title* : *Angular Stability Enhancement Of NEPAL Power System Using Stabilizing Controllers*  
*Author(s)* : *Mahendra A C*  
*Roll No* : *Y4104048*  
*Supervisor(s)* : *Srivastava S C& Singh Sri Niwas*

### *Abstract*

Damping of power system oscillations is one of the major challenges to power system engineers for reliable operation of the system. Power System Stabilizer (PSS), a supplementary controller in the exciter circuit, is the most widely used for damping electromechanical oscillations. Besides this, Flexible AC Transmission System (FACTS) with Power Oscillations Damping (POD) controller can be used for the improvement of angle stability. This thesis work is concentrated on assessing the angular stability of the Nepal power system and design of power system stabilizers and Static Var Compensator (SVC) supplementary controller for improving the system damping. The assessment of small signal and transient stability for a fault in the Nepal power system as well as WSCC–9 bus system has been first carried out for a base case scenario. It was observed that there are poorly damped modes with damping ratio less than 0.05 in both the systems and, hence, the proper stabilizing controllers are essential for stability enhancement. Power system stabilizers were, then, considered for effective damping in both the systems and their optimal locations were determined using participation analysis. It is found that PSS at one of the generators effectively damps oscillations in the WSCC–9 bus system. However, single PSS does not improve the damping sufficiently in the Nepal power system. Hence, three PSS at different generators have been considered. This effectively improves the small signal stability and transient stability of the system. The PSSs improve damping ratio of critical mode and reduce the settling time of oscillations in contingency and load increase cases, as well. The optimal location of SVC has been obtained using participation of the load bus voltage states to the most critical eigenvalue and the effective input to the controller has been determined using residue method. Significant improvement in the damping ratio of the most critical eigenvalue has been observed with the SVC supplementary controller in the WSCC–9 bus system, but only slight improvement was observed in case of Nepal power system. Hence, the impact of SVC, along with PSSs, has been studied in the Nepal power system. The maximum improvement in the damping ratio and the settling time under a 3 phase fault has been observed with the SVC and PSSs, placed simultaneously as compared to only SVC alone or only power system stabilizers..

**For more details click here**

**back**

**Title** : *Performance Analysis And Control Of DG Supported Distribution Systems*  
**Author(s)** : *Rajvanshy Abhinav*  
**Roll No** : *Y4104002*  
**Supervisor(s)** : *Joshi Avinash*

### ***Abstract***

The traditional approach in an electrical power system has been to have centralized large capacity power plants feeding power to distant load centres through an extensive transmission and distribution network. Due to environmental concerns regarding pollution, accidents and loss of forested area, Distributed Generators have emerged as a viable alternative to conventional power generation. DG provides electric power thereby eliminating the need to upgrade transmission lines and increase the capacity to remote power plants. The connection of DG to a distribution system has been a topic of research that examines various power quality and protection issues. A major issue has been that of voltage regulation, which can be improved or degraded by the connection of DG. This thesis proposes a technique by which a DG can provide voltage support to the distribution system by injecting reactive power in addition to real power. In this thesis, separate wind-turbine and micro-turbine based generation systems have been considered. These energy sources are coupled to an induction generator which is interfaced to the grid through a rectifier-inverter pair. The objective is to inject a scheduled amount of real and reactive powers into the grid while maintaining the balance between the input and output power. In case of micro-turbine based DG, on-line NRLF is run to generate the reference real and reactive powers to be injected into the grid. A separate PI controller has been incorporated to regulate the micro-turbine fuel input to compensate for changes in the load demand that would normally have been met by the utility. Whereas, wind-turbine based DG injects the real power into the grid depending upon the prevailing wind speed. In this case, DG remains unaffected by the variations in load demand and the surplus power is fed by the utility itself. The simulations have been done using PSCAD/EMTDC and the controller parameters are calculated using MATLAB.

**For more details click here**

**back**

*Title* : *Double Vector Control Of Dynamic Voltage Restorer Using Improved Phase Locked Loop*  
*Author(s)* : *Sinha Rakesh Kumar*  
*Roll No* : *Y4104073*  
*Supervisor(s)* : *Sensarma Partha Sarathi*

### *Abstract*

The most common form of power quality disruption is the voltage sag, which accounts for about 70% of all power disturbances. Modern industrial electrical and electronic equipments are very sensitive to voltage sags. Equipments life span and efficiency are badly affected by the frequent small voltage sags. Severe voltage sags may cause total damage of equipments. To overcome voltage sag problems, most commonly used device in the distribution line is Dynamic Voltage Restorer (DVR). DVR injects the required sag voltage at appropriate frequency and phase to maintain the load voltage constant. There are different voltage injection methods and control strategies for DVR. In the thesis Minimum Energy Injection method and Double Vector Control strategy has been adopted to control the rms value of the load voltage. Advantage of this control strategy lies in the control of all the states of the system. Synchronous Rotating Frame (SRF) method has been adopted to implement the controller in the d-q frame. In this method correct phase information of load current is required to inject the voltage at correct frequency and phase. This is done by some sort of Phase Locked Loop (PLL). In this thesis, an improved algorithm for realizing a PLL for three phase system and single phase system is reported. The reported approach results in fast dynamic response and negligible distortion in PLL output, under severely distorted utility conditions, even with appreciable DC offset in input signals. Also, the locking time obtained is independent of the level of utility distortion. So this PLL is eminently suitable for decoupled control of active and reactive power in all Custom Power devices, including DVR. Important design details are provided which are supported with simulation results. These are experimentally verified and compared with existing methods to highlight the improvements. Double Vector control strategy for the DVR has also been experimentally verified. Existing and the proposed PLL schemes and the DVR controllers have been implemented using 16-bit fixed point DSP (TMS320F240). Gate Drive Card, Voltage Sensor Card, Current Sensor Card, Protection Card, Inverter Card and Passive elements are used to realize the PLL schemes and DVR control.

**For more details click here**

**back**

*Title* : *Optimal Placement And Operation Of Distributed Generators In Power Systems*  
*Author(s)* : *Sethi Gobinda Chandra*  
*Roll No* : *Y4104032*  
*Supervisor(s)* : *Srivastava S C & Singh Sri Niwas*

### *Abstract*

Conventionally, the electricity has been generated by using large size power plants, normally located far away from the load centers, causing the power to be transported using extensive transmission and distribution network. With the advancement of technologies for small size generators having increased efficiency, use of distributed generation (DG) is becoming popular. The DGs can be installed near to the load centers in the distribution network, thus, reducing the system transmission loss, minimizing the investment on transmission network and, hence, improving the overall efficiency and reliability of the system. It is important to find the optimal location for placement of DGs and evolve operating strategy of these generators in conjunction with grid supply to ensure minimum cost and loss in the system. An attempt has been made in this thesis to find the optimal location for DG placement in order to minimize system loss. In addition, strategies have been evolved for finding the optimal settings of DGs. The main contribution of the research work has been to suggest a loss sensitivity factor for optimal placement of DGs and use of an optimal power flow based formulation to determine their optimal settings. Several case studies, considering different configurations of the network, have been performed for finding the optimal locations of DGs. For determining optimal outputs of DGs, two different formulations have been suggested, one based on maximization of output of the DGs and the second based on economic load dispatching criterion. The suggested methods have been applied on 15-bus and 52-bus distribution systems. The sensitivity factors based approach has proved its effectiveness in finding the optimal location of DGs, which has resulted in reduced system loss in all the case studies and configuration of the network. The optimal settings of DGs obtained from the proposed optimization based formulations have significantly reduced the real and reactive power losses and improved the voltage profile. Out of the two optimization criteria used, the one based on maximization of DG output has resulted in slightly better voltage profile and system loss.

**For more details click here**

**back**

*Title* : *Design Development And Implementation Of Minimum VA Rated UPQC*  
*Author(s)* : *Srinivas N V N S*  
*Roll No* : *Y4104083*  
*Supervisor(s)* : *Sensarma Partha Sarathi*

### *Abstract*

Electric utilities and end users of electric power are becoming increasingly aware of the quality of power now-a-days. The power quality problem refers to any problem that manifests itself in the deviations from the normal values of voltage, current and frequency. Any deviation from the ideal condition indicates deterioration in the quality of power distributed and hence the economic value goes down. The quality of power supplied has direct economical impact on consumers. Now-a-days utilities are making it mandatory for loads to operate at near unity power factor. With various types of non-linear loads operating in power systems, problems like re-active power, harmonics in current and voltage are being encountered more frequently. With increasing short circuit ratios of systems, occurrence of faults increase the amount the voltage sags at different buses in the system. These voltage sags cause sensitive loads to trip and cause economic losses to the consumer. Simple yet effective solutions have been prescribed in the literature for these problems. They include conventional passive element based compensation strategies. But the response time offered by these compensators is less and further the compensation is in discrete steps. The next generation compensators were based on thyristors. These days very advanced compensators based in IGBTs are in use which provide flexibility in control and application. This thesis presents the use of one such device called the Unified Power Quality Conditioner (UPQC). UPQC comprises two devices called the Distribution STATic COMpenstor (D-STATCOM) and the Dynamic Voltage Restorer (DVR). The UPQC offers a good solution to mitigate almost all known power quality problems. Here the application of UPQC to correct power factor of a load and to mitigate voltage sags is illustrated. The techniques in voltage injection have also been presented. One particular technique has been identified to give a minimum VA rating of the UPQC device. The VA rating of this configuration has also been derived and shown to be the minimum. The controllers for D-STATCOM and DVR have been implemented using TMS320F240 DSP. A low voltage prototype of the UPQC has been implemented and tested with the same. A voltage sensor card and an inverter card have been developed and used in the experiment.

**For more details click here**

**back**

*Title* : *A Stochastic Model For Electric TREE Progression Due To Partial Discharges Within Tree Tubules*  
*Author(s)* : *Singh Satbir*  
*Roll No* : *Y3104084*  
*Supervisor(s)* : *Gupta Nandini*

### *Abstract*

Reliability of high voltage equipment, cables, bushings etc. depends, to a large extent, on the quality of insulation used therein. The failure of power apparatus usually occurs in an insulation part which sustains electric field rather than a conductor part which carries electric current. A solid insulation system when subjected to electrical stresses may suffer irreversible changes of material properties with time, thus reducing progressively the quality of insulation in enduring the stress itself. The performance of the solid insulation which is supporting conductors at high potential, therefore, determines the life of every apparatus and device. Electrical treeing is one of the principal mechanisms by which insulation degrades over time and failure occurs in power apparatus like cables and bushings. Electrical trees are initiated by high divergent fields in local regions caused by local stress enhancing factors like imperfections such as electrode asperities, conducting inclusions (point electrode), or partial discharges taking place within a gas filled cavity. In general there are two major stages in the development of an electrical tree before it can cause electrical failure. First is the inception stage, the period before discernible damage is found in the form of a small tube or cavity at high stress point, large enough to support partial discharges. Under continual field application, the electrical tree propagates across the insulation following inception. During propagation, the electrical tree can adopt complex structures which are categorized as tree-like trees, bushy trees and bush-branch trees. Tree-like trees are characterized by an adequate progression in the axial direction with moderate branching, while bushy trees are characterized by a greater expansion in the horizontal direction and considerable branching. Bush-branch trees lie somewhere between these two extremes. Propagation of electrical tree channels into dielectrics with subsequent bridging of the electrode gap is one of the main causes for failure of solid insulation. The mechanism by an electrical tree propagates is still not very clear, despite considerable research efforts. The greatest challenge in the study of tree propagation is determination of the mechanistic origin for branching and the consequent wide range of structures that ensue (tree-like, bushy, bush-branch trees). One aspect that needs investigation is correlation between partial discharge behaviour within the tree tubules and tree progression. The present work concentrates on the mechanism of tree propagation. In this work existing stochastic models have been extended to study the effects of such partial discharges in the form of charge deposition on tubule walls. A needle-plate geometry is used in order to simulate a field-enhancing protrusion attached to the high voltage electrode. Accurate computation of electric field distribution after each step of tree extension has been performed using Finite Element Method. Computer simulated trees have indicated that charge on the channel walls play a crucial role in development of bushy or bush-branch trees.

**For more details click here**

**back**

**Title** : *Variable Gain Controllers For Nonlinear Systems Using T-S Fuzzy Model*  
**Author(s)** : *P Prem Kumar*  
**Roll No** : *Y3104065*  
**Supervisor(s)** : *Behera Laxmidhar*

### ***Abstract***

This thesis is concerned about the stability analysis and controller design for nonlinear systems using T-S fuzzy model. This work has been carried out with a objective to design variable gain controllers for stabilization of nonlinear system and test their performance on some benchmark problems. The T-S fuzzy model approximates the nonlinear system as a fuzzy cluster of linear systems. A Fuzzy Neural network topology is used to identify the subsystems of T-S fuzzy model. Linear stabilizing controllers are designed for the subsystems and the overall control law is obtained by fuzzy blending of those individual controllers. It is thoroughly investigated whether the overall system can be made stable by stabilizing the individual linear subsystems. The fuzzy blending of individual local controllers results in a global control law with variable gain. In this context, nonlinear PID and quadratic regulators are designed for stabilization. Two novel control schemes with variable state-feedback gains are proposed to stabilize a T-S fuzzy system, using the concept of robust control theory. The T-S fuzzy model is expressed as a linear plant with nonlinear disturbance terms in both schemes. In Controller I, the T-S fuzzy model is expressed as a linear plant around a nominal plant arbitrarily selected from the set of linear subsystems that the T-S fuzzy model consists of. The variable gain then becomes a function of a gain parameter that is computed to neutralize the effect of disturbance term which is in essence the deviation of the actual system dynamics from the nominal plant as the system traverses along a specific trajectory. This controller is shown to stabilize the T-S fuzzy model. In Controller II, individual linear subsystems are locally stabilized. iii Fuzzy blending of individual control actions is shown to make the T-S fuzzy model Lyapunov stable. Although applicability of both control schemes depend on norm-bound on unmatched state-disturbance, this constraint is more relaxed in case of Controller II. Through simulation on various benchmark problems, it is established that the Controller I and II outperform the existing controller. The control of redundant manipulator with various intelligent control strategies have been analyzed briefly. The redundancy is exploited to do additional tasks such as collision avoidance using the configuration control scheme. The proposed controllers viz. Controller I and II are tested on a planar two link redundant manipulator. The Lyapunov fuzzy Controller is extended to MIMO systems and its performance is validated through simulation, on a horizontal plane redundant manipulator. IV

**For more details click here**

**back**



**Title** : *Electric Field Distortion And Stress Control At The Crossing Of Transmission Lines*  
**Author(s)** : *Singh Amit*  
**Roll No** : *Y1147039*  
**Supervisor(s)** : *Arora Ravindra*

### ***Abstract***

The transmission lines are one of the integral part of high voltage power system. The HV transmission lines are used to transmit the power from the generation stations to the load centres. This thesis deals with the estimation of electric field at the transmission lines under different conditions. The tool used for the estimation of field is FEMLAB. FEMLAB is a finite element modeling and solver software package for various physics and engineering applications. FEMLAB also offers a smooth interface to MATLAB and its toolboxes for a large variety of preprocessing and post processing possibilities. It solves by iteration method and estimates the field and potential by convergence. Investigations have been made to estimate the distortion and enhancement of the field when one low voltage transmission line passed below a higher voltage transmission line. Due to the enhancement of the field at the crossings there is increase in corona activity and hence the EMI increases. Some methods are suggested to minimize the electric field intensity at the lines and to reduce the corona activity. Besides this, the advantage of increasing the number of conductors in a bundle is also investigated. It brings down the electric stress to a much lower level.

**For more details click here**

**back**

**Title** : *Performance Evaluation Of Ceramic Insulators Under Pollution With And Without RTV Coating*  
**Author(s)** : *Yadav Satyendra Kumar*  
**Roll No** : *Y4104079*  
**Supervisor(s)** : *Arora Ravindra*

### ***Abstract***

Environmental contamination of outdoor porcelain and glass high voltage insulators has been a long-term source of severe pollution flashover problems, which result in power outages and losses together with reduced reliability. Even if flashover does not occur, normal polluted porcelain and glass insulators, particularly in wet and foul weather conditions, are a cause of intense Electromagnetic Interference (EMI) due to surface discharge (tracking), for nearby communication network. Several options are used in practice to tackle this problem, but surface treatment of normal insulator by hydrophobic RTV coating material is emerging as a popular option. This thesis deals with performance evaluation of Room Temperature Vulcanized (RTV) Silicon Rubber coated porcelain insulators. For this purpose a normal cap and pin type porcelain insulator disc was used. Insulator disc performance in terms of flashover voltage with and without RTV coating under dry, fine water droplet deposition on the top surface and in polluted surface condition was experimentally investigated. For pollution severity representation, a concept of "Equivalent Salt Deposition Density (ESDD)" was used. It is universally used to represent any kind of soluble salt deposition in terms of equivalent NaCl salt deposition under standard conditions. Effect of RTV coating on insulator creepage current suppression was also observed, when porcelain insulators with and without coating were energized for about a whole day under mist of tap water spray. Some experiments were also performed to elaborate loss and recovery of hydrophobicity of RTV silicon rubber layer, when layer was placed under tap water for 30 hours, and when layer was exposed to corona discharge. Results show that RTV coating comes out to be very effective to improve pollution flashover performance of normal porcelain insulator, particularly at low pollution level. However, for higher pollution level RTV coated insulator flashover voltage performance goes down in the same way.

**For more details click here**

**back**