

M.TECH. THESIS ABSTRACTS 2005

Sr No	Area	Page No
1	Microelectronics, VLSI & Display Technology	9-22
2	RF Microwaves& Photonics	23-37
3	Signal Processing, Communications & Networks	38-71
4	Power and Control	72-94

Microelectronics , VLSI & Display Technology

Sr No	Title	Supervisor	Page No
1	Selective Buried Oxide(SEL-BOX) MOSFET- Comparative Analysis With Existing Technologies	Iyer S Sundar Kumar	9
2	A Charge Transfer Graph Based Technique For Testing Of Switched Capacitor Circuits	Mazhari Baquer	10
3	Efficient Organic Light- Emitting Diodes Employing Mobility Hetero-Structure	Mazhari Baquer	11
4	Sub-Threshold Modeling Of Short-Channel Effects (SCEs) In Double-Gate (DG) MOSFETs	Qureshi Shafi	12
5	Study Of Organic Insulator-Semiconductor Interface In Thin Film Transistors	Iyer S Sundar Kumar	13
6	A Study Of Charge Injection In ITO/PEDOT/MEH-PPV/Ca/AI PLEDS And Lift-Off Process In Positive Photo Resist	Mazhari Baquer& Narain Jitendra	14
7	Modeling Of Carrier Blocking And Recombination In Bilayer Organic Light-Emitting Diode	Mazhari Baquer	15
8	An Advanced And Explicit Based Compact MOSFET Model Incorporating The Quantum Mechanical Effects	Dutta Aloke	16
9	A Study Of Organic Semiconductor Polymer Material And Device Structures For Application In Optical Detectors	Mazhari Baquer& Anand R S	17
10	Angular And Spectral Dependence Due To Layered Structure In Organic Light Emitting Diode	Iyer S Sundar Kumar	18
11	MEHPPV/CNPPV Based Organic Solar Cells	Iyer S Sundar Kumar	19
12	Implementation Of VME bus Interface Controller, VIC1.0 On Programmable Logic Device	Mazhari Baquer	20
13	Pentacene Based OTFT Inverter Circuits On F;Exible Substrates	Mazhari Baquer& Kumar Satyendra (PHY)	21
14	Synthesis And Characterization Of Carbon Nanotubes On The Surface Of Carbon Fiber For Structural Application	Kar Kamal Krishna	22

RF Microwaves& Photonics

Sr No	Title	Supervisor	Page No
1	Effect Of Human Motion On Indoor Wireless Channel- A Study	Harish A R	23
2	Simulation Of Suspended Spiral Inductor On GaAs Substrate	Das Utpal	24
3	Design Of A Third Order Cascaded (2-1) Sigma-Delta Modulator	Biswas Animesh	25
4	A Study Of Microwave Active Filters	Sachidananda M	26
5	Comparison Of Circular And Rectangular Suspended Spiral Inductor On GaAs Substrate	Das Utpal	27
6	Inductance Based Switching Voltage-Regulator For System-On-Chip (SOC) Applications	Biswas Animesh& Sensarma ParthaSarathi	28
7	Full Wave Analysis Of Shielded Single And Off-Layered Coupled Non-Radiative Dielectric(NRD) Guides For Millimeter Wave Propagation	Biswas Animesh	29
8	EM Wave Propagation Studies In Periodically Loaded Transmission Line Based Metamaterials	Harish A R	30
9	A Truncated Substrate EM Coupled Patch Antenna	Sachidananda M	31
10	Studies On Propagation Properties Of Indoor Optical Wireless Diffuse Channels	John Joseph	32
11	Microstrip-Patch Discontinuity Characterization Using FDTD Technique	Sachidananda M	33
12	Studies On The Effect Of Rain, Fog, And Smog On Outdoor Optical Wireless Links	John Joseph	34
13	Electromagnetic Field Prediction And Antenna Identification In An Indoor Wireless Environment	Harish A R	35
14	Investigation Into SPR Based -Optical Sensors	Ghosh Anjan Kumar	36
15	Full Wave Analysis Of A Coaxial Waveguide Based Power Combining Structure using 3DTransmission Line Matrix (TLM) Method	Biswas Animesh	37

Signal Processing, Communication & Networks

Sr No	Title	Supervisor	Page No
1	On Error Exponent In Lossy Source Coding	Bansal Rakesh K	38
2	Analytical Evaluation Of Fourier-Bessel Series Expansion And Finding A Condition For Maximum Coefficient	Sircar Pradip	39
3	Improving The Diversity And Coding Gain Of Quasi Orthogonal Space Time Block Codes	Vasudevan Kasturi	40
4	Multiscale 3D Edge Detection Algorithm Using Wavelet Domain Vector Hidden Markov Tree	Sharma Govind	41
5	Analysis And Annotation Of Cricket Videos	Venkatesh K S	42
6	Parameter Estimation Of Signal With Multiplicative Noise Using Higher Order Statistics	Sircar Pradip	43
7	Processor Composition, Complex Sets And Hyperprocessing	Venkatesh K S	44
8	Simulation Studies If OFDM Based Powerline Communication System	Vasudevan Kasturi	45
9	A Timing Recovery Algorithm For Distortionless Channels	Vasudevan Kasturi	46
10	Iterative Timing Recovery	Vasudevan Kasturi	47
11	Comparative Study Of Effect Of Dispersion On Different Pulse Shapes In An Optical Fiber Link	Singh YatindraNath	48
12	Mathematical Analysis Of SOA Based 2r Regenerator	Singh YatindraNath	49
13	Investigations Into Incremental Multi-Camera Self-Calibration	Venkatesh K S	50
14	An Adaptive Probabilistic Routing Algorithm	Singh YatindraNath	51

15	Upper Bound On The Performance Of Subscriber Access Networks For Downstream Traffic Considerations For Broadband Applications	Singh Yatindra Nath	52
16	A Fast And Robust Correspondence Algorithm For View Synthesis	Venkatesh K S	53
17	Foreground Extraction And Object Tracking	Venkatesh K S	54
18	Study Of Multiwavelet And Its Application To Image Processing	Gupta Sumana	55
19	Face Detection Using Morphological Associative Memories	Sharma Govind	56
20	Fully Optical Decoder Using Optically Controlled Optical Switch	Singh Yatindra Nath	57
21	A Timing Recovery Algorithm For Linearly Modulated Digital Signals Transmitted Through Distortionless Channels	Vasudevan Kasturi	58
22	Interleavers In Turbo Codes : Some New Results	Banerjee Adrish & Chaturvedi Ajit Kumar	59
23	A Method For Tonic Selection For Indian Music Singers	Sircar Pradip	60
24	Multisensor Image Registration And Fusion	Mazhari Baquer & Gupta Sumana	61
25	A New Energy Based Interpolation Method For Speech Coding	Ray G C	62
26	Differential Detection For Differential Orthogonal Space-Time Modulation With APSK Signals	Chaturvedi Ajit Kumar	63
27	Inter Person Voice Conversion Using Factor Analysis	Ray G C	64
28	LDPC Codes : Bounds On The Rate For FSMCs And Some Results On Minimal Stopping Sets	Chaturvedi Ajit Kumar	65

29	Local Tomography Using Multiscale Radial Sampling And Interpolation	Ray G C	66
30	Power Efficient Video Transmission On CDMA Based Wireless Networks	Chaturvedi Ajit Kumar & Gupta Sumana	67
31	Environment Mapping Using Monocular Image Sequences	Venkatesh K S	68
32	Feature Assisted Fast Motion Estimation, Error Concealment And ROI Identification In Video Codecs	Gupta Sumana	69
33	Study Of Dual- Phase Continuous Phase Modulation For Direct Sequence Spread Spectrum	Chaturvedi Ajit Kumar	70
34	New Techniques For Audio-Visual Speech Recognition	Ray G C	71

Power & Control

Sr No	Title	Supervisor	Page No
1	Design And Development Of Custom Power Devices With Sliding Mode Control	Das Shyama Prasad	72
2	Study Of Bifurcation And Chaos In Current- Mode Controlled CUK Converter	Joshi Avinash & Ghosh Arindam	73
3	Static Synchronous Series Compensator (SSSC) Based Damping Controller For Damping Out Low Frequency Oscillations In A Power System	Das Shyama Prasad	74
4	Integration Of GIS/GPS In Electric Power Distribution Automation	Singh Sri Niwas	75
5	Simulation And PC-Based Implementation Of A Vector Controlled Synchronous Motor Drive	Das Shyama Prasad	76
6	A Utility Friendly Three-Level High Performance Induction Motor Drive System	Das Shyama Prasad	77
7	Signal Propagation In Neuron And Its Dynamical Behavior	Kalra Prem Kumar	78
8	Intelligent Controller Design For Configurable Control Systems	Behera Laxmidhar	79
9	Space Vector Modulation Of Dynamic Voltage Restorer To Improve Power Quality	Ghosh Arindam Joshi Avinash	80
10	Design And Simulation Of A Harmonic Compensator In Power Systems Using Hybrid Parallel Active Filter	Sensarma ParthaSarathi	81
11	Design And Tuning Of Power System System Stabilizer For Kaiga Nuclear Power Plant	Singh Sri Niwas	82
12	Vector Control Of A Permanent Magnet Synchronous Motor	Behera Laxmidhar	83

13	Simulations And Experiments In Robotic Systems: A Simple Robotic ARM And An Eight DOF Biped Humanoid Robot	Behera Laxmidhar & Dutta Ashish (ME)	84
14	Optimal Reactive Power Planning And Pricing Analysis In A Competitive Electricity Market	Kalra Prem Kumar	85
14	Full Bridge Zero-Voltage-Switching Converter For Wide Load Range Applications	Sensarma Partha Sarathi	86
15	Fault Identification And Location Electrical Distribution Networks Using Ann And Wavelet Transform	Srivastava S C	87
16	Identification Of Projects Under Clean Development Mechanism And Their Impact On Generation Planning Of Indian Power System	Srivastava S C	88
17	Simulation And Performance Evaluation Of 3-Phase High Power Unified Power Quality Conditioner For Power Distribution Systems	Das Shyama Prasad	89
18	Design Simulation And Development Of An Uninterruptible Switched-Mode Power Supply For Personal Computers	Das Shyama Prasad	90
19	Switching Control Strategies For A Reaction Wheel Pendulum	Behera Laxmidhar	91
20	Dynamical Aspects And Learning In Biological Neuron Models	Kalra Prem Kumar	92
21	Load Compensation Of Distribution System Using Dstatcom Based On Five-Level Diode Clamped Multilevel Inverter	Ghosh Arindam & Joshi Avinash	93
22	Optimal Reactive Power Planning And Pricing Analysis In A Competitive Electricity Market	Kalra Prem Kumar	94

Title : *Selective Buried Oxide (SEL-BOX) MOSFET-Comparative Analysis With Existing Technologies*
Author(s) : *Chander Pal*
Roll No : *Y3104018*
Supervisor(s) : *IyerS Sundar Kumar*

Abstract

For more details click here

back

Title : ***A Charge Transfer Graph Based Technique For Testing Of Switched Capacitor Circuits***
Author(s) : ***Himanshu Kamra***
Roll No : ***Y3104018***
Supervisor(s) : ***Mazhari Baquer***

Abstract

Switched capacitor circuits constitute an important class of analog circuits. In this work a new method for testing of Switched Capacitor (SC) circuits has been described. The SC circuit is modeled as a charge transfer graph. Based on the differences between the graphs of good and faulty circuit, one or more paths are identified such that upon their sensitization the difference in output voltage of the good and faulty circuit becomes appreciable. The proposed technique is illustrated with a wide range of SC circuits. Based on the new test methodology, BIST (Built In Self-Test) and DFT (Design For Test) techniques have been proposed.

For more details click here

back

Title : ***Efficient Organic Light- Emitting Diodes Employing
Mobility Hetero-Structure***
Author(s) : ***Sudhir Bapna***
Roll No : ***Y3104095***
Supervisor(s) : ***Mazhari Baquer***

Abstract

Single layer organic light-emitting diodes (OLEDs) suffer from the problem of low internal quantum efficiency due to imbalance in electron and hole mobility. Although bilayer devices based on energy hetero-structures can overcome this problem, they introduce complexity in fabrication and require a careful selection of two types of organic material. In this work a new device structure is proposed that achieves high efficiency by using only a single organic material. The device is formed by employing a mobility hetero-structure in which mobility of one of the semiconductor layers is reduced with respect to the other layer of the same organic semiconductor. Simulation results comparing the proposed device with conventional single and bilayer devices are presented.

For more details click here

back

Title : *Sub-Threshold Modeling Of Short-Channel Effects (SCEs) In Double-Gate (DG) Mosfets*
Author(s) : *Gaurav Chhabra*
Roll No : *Y3104029*
Supervisor(s) : *Qureshi Shafi*

Abstract

Double-Gate (DG) MOSFETs are becoming the most promising device structures for scaling in nanometer range. In view of anticipated role of DG MOSFET in digital, analog and mixed signal device applications, modeling and simulation of the device behaviour has assumed considerable importance. In this work Sub-threshold behavior, which determines the switching characteristics and the short-channel immunity of the device, has been studied. Physics based analytical sub-threshold model for un-doped DG MOSFET is proposed. The model results were compared with numerical simulation results of 2-D device simulator (ATLAS). A good agreement was found between the proposed model and the numerical simulation results. The strength of the model is that it is physics based and simple and yet capable of predicting the device behaviour reasonably accurately.

For more details click here

back

Title : *Study Of Organic Insulator-Semiconductor Interface In Thin Film Transistors*
Author(s) : *Gupta Aarti*
Roll No : *Y3104004*
Supervisor(s) : *Iyer S Sundar Kumar*

Abstract

This thesis explores the replacement of the inorganic insulator layer in an organic thin film transistor (OTFT) with an organic material. Organic layers are usually easier to deposit compared to inorganic layers, thus lowering fabrication cost. OTFTs with an inorganic polymer insulator, polymethylmethacrylate (PMMA) and an organic polymer semiconductor, poly(3-octylthiophene) (P3OT) have been fabricated. The C-V and I-V characterization of these devices has been done in order to study the insulator-semiconductor interface properties, which have a dominant influence on device performance and stability. Dynamic capacitance voltage measurements on the devices show a p-type semiconductor. These semi-conducting layers are about 30 nm thick and are fully depleted. A doping concentration of approximately $1.4 \times 10^{17} \text{cm}^{-3}$ has been estimated by analytical calculations. Interface-state densities with a maximum value of $1.7 \times 10^{21} \text{cm}^{-2} \text{eV}^{-1}$ have been estimated in the devices fabricated by comparing the experimental C-V curves with theoretical ideal curves.

For more details click here

back

Title : *A Study Of Charge Injection In Ito/Pedot/MEH-PPV/Ca/Al PLEDs And Lift-Off Process In Positive Photo Resist*
Author(s) : *Talari Manojaya*
Roll No : *Y3104102*
Supervisor(s) : *Mazhari Baquer*

Abstract

To meet the challenges of the PLED technology, we have made an attempt to find the nature of currents in the ITO/PEDOT/MEH-PPV/Ca/Al device. Hole only devices are fabricated to observe the dependence of hole current on the thickness of the injection layer in the device with gold as cathode. A similar study has been done for electron only device with magnesium as anode. Both the studies provide the necessary information to design a device having a better charge balance which ultimately leads to improvement in efficiency. We had also made an attempt to optimize Lift-Off:- Image reversal process with positive photoresist for display application.

For more details click here

back

Title : *Modeling Of Carrier Blocking And Recombination In Bilayer Organic Light-Emitting Diode*
Author(s) : *Saurabh Sharma*
Roll No : *Y3104085*
Supervisor(s) : *Mazhari Baquer*

Abstract

Bilayer Organic light-emitting diodes attain high quantum efficiency by ensuring recombination of electrons and holes close to organic-organic interface through blocking of flow of more mobile holes to the cathode. In this work, simulation results are presented which describe the impact of various device parameters such as carrier mobility, electron and hole-transport layer thicknesses, energy offsets at the organic interface and applied voltage on the hole-blocking efficiency of an organic-organic interface. An analytical model is described which provides insight into the impact of the above mentioned parameters on the hole-blocking. Further, a new method for estimating the level of Current Balance of a bilayer OLED with the measurement of the device currents has been proposed. The Current Balance, which is otherwise difficult to assess, is estimated using a simple ratio of the device currents. Various device parameters which affect the current balance of the device have been studied.

For more details click here

back

Title : *An Advanced And Explicit Based Compact Mosfet Model
Incorporating The Quantum Mechanical Effects*
Author(s) : *Dipanjan Basu*
Roll No : *Y3104023*
Supervisor(s) : *Dutta Alope*

Abstract

A compact surface-potential-based MOSFET model has been proposed in this work here that takes into account the quantum mechanical effects that arise in deep submicron MOSFETs characterized by high substrate doping and thin effective oxide thickness. To model the quantum mechanical effects on the surface potential, the coupled Schrodinger's and Poisson's equations have been solved by using a variational wave function approach, as proposed by Fang and Howard [1]. The resulting surface potential model is analytical, technology mapped, and completely continuous over the entire range of operation. The surface potential and the inversion charge density calculated using this model show good match with the results of the numerical simulations obtained from a coupled Schrodinger-Poisson solver for a wide range of substrate doping and oxide thickness. The simulated current values match closely with the experimental results published elsewhere. The device small-signal parameters, e.g., transconductance, output conductance, etc., pass the standard benchmark tests suggested by Suyama and Tsvividis [2] qualitatively, thereby validating the approach of the model presented.

For more details click here

back

Title : *A Study Of Organic Semiconductor Polymer Material And Device Structures For Application In Optical Detectors*
Author(s) : *Sheetal Liladhar Barai*
Roll No : *Y3104088*
Supervisor(s) : *Mazhari Baquer & Anand Raghubir Singh*

Abstract

In this work, polymer photo-detectors having good electrical and optical characteristics have been demonstrated. It is shown that pure MEHPPV, an electroluminescent material can be used as active material in organic photodetector. Further, devices fabricated using blends of MEHPPV with PCBM as photoabsorbing layer has an order of improved photoresponse with respect to the device having only MEHPPV as active layer. The optimization of the processing conditions and change of device structure has been done in order to get good quality devices. It is shown that the use of aromatic solvent leads to best results. The photoresponse in the device with polymer dissolved in 1-2 Dichlorobenzene is found to be better with maximum ratio of photo current to dark current as 29.9 at -2.2 V, whereas the leakage current in the device with MEHPPV dissolved in Chlorobenzene is less. The thickness variation of the active layer is incorporated and it is observed that photo-response is better in the device with thinner active layer. The maximum ratio of the photocurrent to the dark current is in the thinner device that is 29.51 at very low bias voltage of -0.8V. The leakage current is reduced to -9×10^{-9} A/cm² as the active polymer layer thickness is increased. The device using blend of MEHPPV: PCBM in 1:1 proportion shows a very high ratio of photocurrent density to dark current density that is 2324.07 at a very low applied bias of -0.6V. The physical demonstration of the photo-detector using MEHPPV: PCBM (1:4) as photoabsorbing layer using an OP-AMP photodetector circuit has been made. The response time of the detector at 680 Q load was measured to be 450 ns and calculated capacitance value is 0.566 nF.

For more details click here

back

Title : *Angular And Spectral Dependence Due To Layered Structure In Organic Light Emitting Diode*
Author(s) : *Ravi Kumar M N*
Roll No : *Y3104074*
Supervisor(s) : *Iyer S Sundar Kumar*

Abstract

The light emission out of multilayer organic light emitting devices can be modeled by taking into account of the location of light generation and its extraction out of the device. Optical interference effects due to the multiple layers play a crucial role in the extraction of light. This work deals with the modeling of the light using the multilayer stack theory. Thickness and other parameters of the organic layers play a crucial role. Multilayer OLEDs have also been fabricated with PPV and CNPPV. Models for the optical extraction for various thicknesses are used to find the best combination of the parameters for a given set of materials. The angular variations of the intensity of light for the devices are characterized. Degradation of the OLEDs in the presence of light, oxygen, and moisture is known to be most important reason limiting the lifetime of the devices fabricated using light emitting polymers. In this work, degradation in light emitting polymer PPV that we encountered is documented and studied. Simulation work to determine the modulation factor as a function of angle, wavelength and location of light generation for a multilayer stack device has been carried out. These results can be used in further study of Electroluminescence of an OLED.

For more details click here

back

Title : *MEHPPV/CNPPV Based Organic Solar Cells*
Author(s) : *Gautam BodhRaj*
Roll No : *Y3104016*
Supervisor(s) : *Iyer SSundarKumar*

Abstract

The emergence of plastic electronics has enthused a lot of researchers, as it promises to make the electronic equipment 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 technologies till today. Polymer solar cells are gaining attention due to their low fabrication cost as compared to the inorganic ones, with an added ease of fabrication on flexible substrates. Conventional bilayer polymer cells have got the disadvantage of very low efficiencies due to very poor exciton dissociation rates. Blended structures are the most promising recipe for this application as they overcome the aforementioned drawback by providing the necessary sites for the dissociation of exciton within the required one diffusion length range. A wide variety of blends have been studied all around the world. MEHPPV/CNPPV blend is a well-known polymer combination for the study of photovoltaic effect. This combination has got suitable HOMO-LUMO barriers to enable charge separation. In this work, this blend structure has been fabricated, and the observed characteristics have been analyzed.

For more details click here

back

Title : *Implementation Of VME Bus Interface Controller, VIC1.0
On Programmable Logic Device*
Author(s) : *Gupta Nidhi*
Roll No : *Y3104057*
Supervisor(s) : *Mazhari Baquer*

Abstract

Versa Module Europa (VME) bus is used in a wide variety of applications. VME board functionality and their interfaces vary quite widely from application to application. Present design, the VMEbus Interface Controller (VIC 1.0) is targeted for the VME board having VME System Controller with VME master capability. It is fully compliant to the VME specifications (IEEE 1014-1987) supporting A16/A24/A32 address modes and D8/D16/D32 data modes (read/write/read-modify-write). External buffers are required to meet VMEbus current driving capabilities. VMEbus timing is guaranteed by using a system clock of 64MHz. A synchronous design approach is used to simplify interfacing to the asynchronous VMEbus. The local bus interface of VIC1.0 emulates Motorola MC68020 processor interface. The VIC 1.0 is designed using Quartus II 4.2, Altera design software and is implemented on Altera MAX7000S series CPLD EPM7256SRC208-7 with a target frequency of 64MHz. Synthesis resulted in 98% device utilization in terms of macrocells. The maximum frequency of operation after placement and routing is 93.34MHz which is much higher than the target frequency.

For more details click here

back

Title : *Pentacene Based Otft Inverter Circuits On F;Exible Substrates*
Author(s) : *Harshal Anant Sakhale*
Roll No : *Y3104033*
Supervisor(s) : *Mazhari Baquer&Kumar Satyendra(PHY)*

Abstract

This thesis deals with the fabrication and characterization of the saturated load inverter circuits using pentacene based organic thin film transistors. The design strategy was adopted with this aim in mind. The physics of organic semiconductors and thin film transistors is described. The physics of OTFTs is explained with the available model for hydrogenated amorphous silicon thin film transistors. The design methodology used for saturated load inverter circuits is also presented in this work. The simulations were done using AIM SPICE to determine the appropriate OTFT dimensions. The existing process allowed the fabrication of OTFTs of 400 nm and 50 nm and 10 nm widths. The length of the channel was kept constant at 10 nm as a design rule since it was easier to control the length of this dimension with the existing photolithography process. DC analysis showed that a threshold voltage of -7 volts leads to an optimum value for Noise Margin assuming the rest of the parameters remain the same. The high OFF currents dominate the inverter DC characteristics and the transient response. The high OFF currents present in un-patterned pentacene layer in OTFT can be modelled with a shunt resistance. The effect of the high OFF currents is to decrease the rise time and to increase the output pull-down voltage to -7 volts. The small rise time enables the inverter circuits to operate normally even at frequencies as high as 1 KHz which is 100 times greater than the operating frequency seen in simulations. The layout for the inverters was designed with the layout editor L-EDIT. The fabrication process is documented and is followed by the description of the measurement setup and the characterization results. Physical phenomena observed during measurements which were specific to organic thin film transistors are documented in relevant sections. The current humps were observed in the $\log(I_{ds}V_{gs})$ curve which are a result of release of deep trap states by negative bias. The physical patterning of the pentacene layer decreased the OFF currents by 3 orders of magnitude. The major observations obtained through this work are reported and the scope for future work is opened. IV

For more details click here

back

Title : *Synthesis And Characterization Of Carbon Nanotubes On The Surface Of Carbon Fiber For Structural Application*
Author(s) : *Agnihotri Prabhat Kumar*
Roll No : *Y221204*
Supervisor(s) : *Kar Kamal Krishna(MSP)*

Abstract

The mechanical properties are always critical parameters to determine the performance of composite materials in structural applications. These can be improved by increasing the interfacial shear strength of the fiber-matrix interface. The most promising way to increase the interfacial shear strength is to grow the nano-particles or nanotubes on the surface of fiber. Since carbon nanotubes have a young's modulus of the order of 1.25 TPa, so it could be a strong candidate for structural applications. In the present work, carbon nanotubes have been grown on the surface of carbon fiber through chemical vapor deposition technique using nickel as a catalyst. The catalyst has been coated on the carbon fiber by dip coating. An effort has been made to optimize the process parameters for dip coating. The as-received carbon fiber, catalyst coated carbon fiber and carbon nanotube coated carbon fiber samples have been characterized using Scanning Electron Microscopy, Energy Dispersive Analysis of X-rays, Transmission Electron Microscopy, Thermogravimetric Analysis, Dynamic Mechanical Analysis, BET (Brunauer, Emmett and Teller) Surface Area Measurement, X-ray Diffraction Technique, I-V characteristics and Saturation Magnetization Measurements. The diameter and length of carbon nanotubes, grown on the surface of carbon fiber, has been found to be -40nm and -9000nm respectively. To see the performance in structural applications, composites have been made using polyester resin as a matrix and as received-, catalyst coated- and carbon nanotube coated carbon fibers as reinforcement. An improvement in the storage modulus has been observed in the case of carbon nanotube coated carbon fiber in comparison to as-received and catalyst coated carbon fibers.

For more details click here

back

Title : ***Effect Of Human Motion On Indoor Wireless Channel- A Study***
Author(s) : ***Dattu G B R***
Roll No : ***Y3104025***
Supervisor(s) : ***HarishA R***

Abstract

The channel characterization plays an important role in a wireless network. The channel characteristics change with time in a WLAN environment, mainly due to the changes in the environment, rather than the movement of the client card, attributable to human movement in the indoor environment. To study the effect of human movement on indoor radio propagation extensive measurements have been carried out using a network analyzer, set to an IF frequency of 1.2 kHz emulating narrow band measurements. The purpose of this work is to study the effect of human motion on indoor wireless channel in an environment similar to that where WLAN systems operate. The experiments were performed in a laboratory environment, consisting of furniture, equipment and partition walls. In order to study the effect of human movement typical movement patterns observed in the actual environment, have been simulated and S21 values of magnitude and phase are recorded. The received signals as a function of time have been recorded at 2040 Hz for these movement patterns, statistical analyses have been carried out and suitable probability density function fits are suggested.

For more details click here

back

Title : *Simulation Of Suspended Spiral Inductor On GaAs Substrate*
Author(s) : *Jain Manish*
Roll No : *Y3104050*
Supervisor(s) : *Das Utpal*

Abstract

Monolithic integrated lumped planar inductors on a chip and this is highly undesirable towards miniaturization of the chip size. Also, the required frequency of operation has steadily increased over the years. As MMICs are now used in the Millimeter-Wave region, it is required that low-loss inductors operate at these frequencies. In this work, a suspended spiral inductor has been modeled which can be embedded in a polymer-based magnetic material. An equivalent model of the inductor, with values of the different elements, has been simulated including the skin effect and the proximity effect structures on GaAs/AlGaAs substrates. Variation of different parameters such as which fulfills the projected requirement at a small On-Chip area.

For more details click here

back

Title : *Design Of A Third Order Cascaded (2-1) Sigma-Delta Modulator*
Author(s) : *Madhunapantula Praveen*
Roll No : *Y3104064*
Supervisor(s) : *Biswas Animesh*

Abstract

The use of oversampling sigma-delta ($\Sigma\Delta$) modulators in the integration of high-resolution analog-to-digital converters has shown promise for overcoming the analog component limitations inherent in modern VLSI technologies. The design of a switched-capacitor (SC) $\Sigma\Delta$ modulator with third order (2-1) cascaded (MASH) architecture for 320 KHz baseband bandwidth is presented in this work. A behavioral model for a SC $\Sigma\Delta$ modulator is presented, where most of its nonidealities are considered and performed the time domain behavioral simulations. A low power, fully differential operational transconductance amplifier (OTA) is used in the transistor level design. The transistor level SC $\Sigma\Delta$ modulator is implemented using 0.25 μm CMOS technology with a single 3V power supply. For a 50 KHz input signal, the modulator achieves a signal-to-noise ratio (SNR) of 83 dB with an oversampling rate of 64.

For more details click here

back

Title : *Study Of Microwave Active Filters*
Author(s) : *Manoharan M*
Roll No : *Y3104126*
Supervisor(s) : *Sachidananda M*

Abstract

In this thesis work, two new active filter designs are proposed and one existing active filter design is improved. First filter design was concentrated on improving the noise figure. In feed forward path of this filter, Low noise figure MMIC amplifiers are used with gain equal to required passband to stop band rejection. In feedback path lumped element band stop filters are used along with one MMIC amplifier. This amplifier improves the band edge rejection significantly. Design procedure and stability analysis of this filter are presented with an example. Second filter design configuration improves the pass band to stop band rejection and insertion loss of lumped element Bandpass filter. These two drawbacks of compactly realizable lumped element filters are overcome by using Tuned circuits along with Lumped element filter. Detailed analysis of tuned circuit, design procedure and stability analyses of the filter are presented. In third filter design, an improvement over existing active resonator microstripline Bandpass filter design has been done. Design steps involved in calculating of active loop length and gap between resonator and active loop has been given in detail, This calculation facilitates to avoid the use of attenuator and phase shifter in active loop, which are used in the previous work. To verify the proposed design procedure, experimental work has been carried out.

For more details click here

back

Title : ***Comparison Of Circular And Rectangular Suspended
Spiral Inductor On GaAS Substrate***

Author(s) : ***Ratan Basu***

Roll No : ***Y3104073***

Supervisor(s) : ***Das Utpal***

Abstract

For the inductor to be loss-less it is necessary that the heavily doped material (such as n+ GaAs) should be kept at a reasonable distance from the inductor magnetic field lines. This is particularly difficult for Optoelectronic Integrated circuits (OEICs) since the substrate used for photodiodes, lasers, modulators, and switches invariably uses n+ substrate. AlGaAs layer above the n+ GaAs substrate has been sacrificed making the spiral suspended in the air. Because of this air gap below the spiral the capacitance has reduced exponentially due to low dielectric constant of air. This inductor has been simulated with dramatic improvement of SRF (self resonance frequency) well above 40 * Ghz due to low value of capacitance and inductance. The value of inductance can be enhanced by covering the spiral with high permittivity polymer if necessary. Smaller area as well as air-gap below the spiral has added an extra dimension to this work. Since the spiral is suspended in the air, so bending of the whole structure is numerically calculated and compared with different structure to reach some invaluable conclusions. The objective of this inductor will be implemented specially in Bias-T for avalanche * photodiode for 10Gbps optoelectronic system and if possible for 40Gbps system.

For more details click here

back

Title : *Inductance Based Switching Voltage-Regulator For System-On-Chip (SOC) Applications*
Author(s) : *Garg Sandeep*
Roll No : *Y3104082*
Supervisor(s) : *Biswas Animesh& Sensarma ParthaSarathi*

Abstract

As process technology scales, greater and greater functionality are being integrated on a single chip or within a package. Designs are emerging involving multiple supply voltages within an IC. With increased power consumption and reduced supply voltages, the demand for larger currents from external power supplies have created an increasingly significant power generation and distribution problem (both on-chip and off-chip) with each new technology generation. With this trend, efficient power management is an emerging concern in today's System-on-Chip (SoC). The external I/O pad voltages have more or less doesn't changed much (they have been around 5.0V, 3.3V since these are generally used for interfacing with external world.) but the core voltages have been scaling down to 1.8V, 1.5V, 1.2V, 0.9V and below. So, the use of DC-DC converters is inevitable. For a regulator to be designed for SoC applications, it is necessary that it obeys the EMC requirement of the electrical devices i.e. it doesn't interfere with the normal functioning of other neighboring blocks. Inductive voltage drop at the I/O pads due to sudden inrush of high current should be taken care, as it reduces the effective input voltage. For reliable operation, the signal integrity should be maintained and the design should incorporate features to avoid the effects of electromigration and no transistor should be subjected to the stress. This work analyzes various tradeoffs in active and passive devices for optimum performance, low noise and EMI compatibility of a buck regulator. The regulator is designed in general purpose digital CMOS 0.8Jtm technology for voltage conversion from 5.0 Volt to 1.2 Volt for load up to 400mA, to be used for SoC applications.

For more details click here

back

Title : *Full Wave Analysis Of Shielded Single And Off-Layered Coupled Non-Radiative Dielectric(NRD) Guides For Millimeter Wave propagation*
Author(s) : *Sovanlal Mukherjee*
Roll No : *Y3104093*
Supervisor(s) : *Biswas Animesh*

Abstract

Particles being accelerated in Particle accelerators derive their energy from RF cavities excited by RF amplifiers. Superconducting (SC) cavities are used for particle acceleration because of very high Q and low losses offered by them. The SC cavity requires RF power of KW order to develop the required voltage across the cavity gaps. RF power of this order can be easily derived using solid-state devices instead of vacuum tube devices. Power amplifiers based on solid-state devices are rugged, low cost & provide high gain over a broad bandwidth but power obtained from individual solid-state devices is only a few hundreds of watts. However, for achieving RF power of the order of KW level, development of power combining/dividing components is a basic requirement. In this work cylindrical stripline based structure is proposed for power combing applications. Cylindrical strip line consists of circular arc strip placed between two cylindrical ground planes separated by multilayer dielectrics. Transmission line matrix method (TLM) is used to analyze the cylindrical stripline structure. 4 strips are placed upon the dielectric between two cylindrical ground planes. MMICs are being put between two strip sections along the structure. Power launched to the structure is carried by these 4 strip lines & amplified by MMICs in midway along the structure and collected at the other end. Because of symmetry of the structure power from all the 4 strips is combined in same phase.

For more details click here

back

Title : *EM Wave Propagation Studies In Periodically Loaded Transmission Line Based Metamaterials*
Author(s) : *Kumar Rajesh*
Roll No : *Y3104127*
Supervisor(s) : *HarishA R*

Abstract

Metamaterials are composite structures made up of naturally occurring materials. They are specifically designed to obtain electromagnetic properties which are not found commonly in nature. Recently, metamaterials with simultaneously negative permittivity and permeability, commonly referred to as Left Handed Materials (LHMs) are an hot area of research among scientific and engineering community. Several novel concepts, devices and applications have been reported in literature based upon LHMs. The basic building blocks of most of the metamaterials are periodic structures. MatLab based simulations have been performed to demonstrate dispersion relations in periodically loaded transmission lines. The concept of negative group velocity, negative phase velocity and negative group delay has been studied in detail and many simulations have been performed. A microstrip, periodically loaded with shorted stubs has been designed to obtain frequency bands showing negative group velocity. The PSpice based time domain simulations and frequency domain measurements have shown group delay of more than -5ns per unit cell. The Split Ring Resonator (SRR), which is a basic element of negative permeability for most of meta-material constructions has been modified and used inside a co-axial cable to study its transmission response. This is the first study on such rings inside coaxial structures. The FEMLAB based simulations have shown stop bands around the resonance frequency of the ring. Many configurations have been tried during simulations. These different ring configurations are under investigation. One such ring configuration is in fabrication stage.

For more details click here

back

Title : *A Truncated Substrate EM Coupled Patch Antenna*

Author(s) : *BibhuPrasad Nayak*

Roll No : *Y3104015*

Supervisor(s) : *Sachidananda M*

Abstract

Narrow impedance bandwidth and high mutual coupling is a major concern of microstrip patch antenna. The electromagnetic coupled (EMC) patch configuration in which the microstrip feed line is one layer and the patch on a thicker layer increases bandwidth. The truncated substrate patch antenna (the upper substrate is present only under the patch) studied in this thesis, further improves the performance of the EMC patch antenna by reducing the surface wave mode excitation to a significant extent. With a proper selection of dimensions it is possible to eliminate the input matching quarter wave transformer completely, because the EM coupling is equivalent to an impedance transformer. The transformation ratio is a function of the relative heights of the lower and upper substrates. In this thesis a truncated substrate EM coupled patch antenna performance is analyzed using finite difference time domain (FDTD) formulation. The performance of the antenna is studied as a function the patch width, length, height. A few patch antennas were fabricated in duroid substrate and the input impedance measurements were made using a vector network analyzer to validate the FDTD calculations. The theoretical results are in good agreement with the measurements.

For more details click here

back

Title : ***Studies On Propagation Properties Of Indoor Optical Wireless Diffuse Channels***
Author(s) : ***Smitha K***
Roll No : ***Y3104091***
Supervisor(s) : ***John Joseph***

Abstract

Infrared links provide an attractive means to achieve high-speed wireless communications over relatively short distances. As a medium for short-range, indoor communication, infrared offers several significant advantages over radio, including a virtually unlimited spectral region that is unregulated worldwide. This thesis is focused on the study of various characteristic features of indoor infrared diffuse channel. It is shown that the realistic multi path optical wireless channel can be characterized well by two parameters, viz. the optical path loss and the rms delay spread. The Ceiling bounce model is selected as the basic impulse response model in this work. In the traditional model, the condition to be satisfied is that the transmitter and receiver are co-located. To use this model for the all possible transceiver positions, complex computations are required. This thesis aims at developing a method which can be used to find the impulse response of the system for any transceiver positions with less computational burden. The main parameter of the impulse response (the rms delay spread) is found out using a statistical approach. The path loss is also calculated separately and both these parameters are used in the modified ceiling bounce model. Detailed studies are done to predict the impact of transmitter and receiver position and their separation from ceiling on rms delay spread, system bandwidth, path loss and multi path power penalty. The results establish a correlation between path loss and rms delay spread. A study of the dependence of signal to noise ratio and bit error rate on the background noise power and received signal power is also carried out. An experimental set up for the characterization of indoor infrared diffuse channels is proposed. Some of the experiments done using this set up are discussed.

For more details click here

back

Title : *Microstrip-Patch Discontinuity Characterization Using FDTD Technique*
Author(s) : *Srivastava Amit*
Roll No : *Y3104009*
Supervisor(s) : *Sachidananda M*

Abstract

Omni-directional antennas are of great utility for WLAN applications. This thesis describes a new omni-directional microstrip antenna and the characteristics of discontinuity encountered in the design of the antenna. The antenna is formed by switching the microstrip and ground plane from top to bottom of the substrate at half-wavelength intervals. The advantage in the microstrip realization is the flexibility available in terms of the control on the width of the ground plane as well as the microstrip line impedance. We can also incorporate impedance transformers, phase shift elements, active circuits etc. on the antenna element. To design such an antenna we need to accurately characterize the discontinuity encountered in flipping the microstrip and the ground plane sides at regular intervals, which will be referred to as microstrip patch discontinuity. In this thesis we have characterized one such discontinuity, and also coupling between two discontinuities. The analysis of the discontinuity is carried out using finite difference time domain (FDTD) formulation of the problem. The FDFI method simulates structure in the time domain using discrete form of the Maxwell's curl equations. The FDFI code is developed on the MATLAB platform. The discontinuity is characterized in terms of 2-port equivalent circuit parameters, and the variation of the parameters is studied as a function of the ground plane width as well as the discontinuity gap. A few discontinuities are fabricated in the duroid substrate and the scattering parameters are measured using a vector network analyzer. The theoretical FDFI results show good agreement with the measurements. In the array design it is essential to account for the mutual coupling among the radiators. This aspect is also studied. An equivalent circuit model corresponding to the antenna is presented which can be used for the array design.

For more details click here

back

Title : ***Studies On The Effect Of Rain, Fog, And Smog On Outdoor Optical Wireless Links***
Author(s) : ***Agrawal Manisha***
Roll No : ***Y3104051***
Supervisor(s) : ***John Joseph***

Abstract

An optical wireless system is an alternate wireless system for high speed data transfer to combat the highly congested RF spectrum. Outdoor optical wireless systems are becoming more popular and gaining market acceptance as a functional wireless tool, because of their advantages such as, unlimited and unregulated spectrum, low cost etc. One barrier which still exists in the wide acceptance of optical wireless communication (OWC) Systems is the effect of the atmospheric conditions viz. rain, fog, haze, smog etc. The main emphasis in this work is on the degradations induced by the atmosphere on the received optical signal. A comprehensive study of the existing outdoor optical links is done and their major features are compared. The major design challenges faced by an Outdoor wireless link are also discussed. The major atmospheric degradations considered are: attenuation due to fog, attenuation due to rain, and attenuation due to smog. Theoretical models for rain, fog and smog are studied in detail. These atmospheric conditions are simulated and their attenuation characteristics studied. Effect of various parameters like wavelength, particle size, distance, and particle size distributions on attenuation is also studied. Electromagnetic wave scattering patterns based on the particle size and the size parameter are simulated. A simulation package has been developed which can calculate the attenuation for a given link under the specified weather conditions. We find that the most severe atmospheric conditions are the heavy fog and smoke. Heavy rainfall conditions also cause severe losses.

For more details click here

back

Title : ***Electromagnetic Field Prediction And Antenna
Identification In An Indoor Wireless Environment***
Author(s) : ***Ilamparidhi I***
Roll No : ***Y3104037***
Supervisor(s) : ***Harish A R***

Abstract

With the increased deployment of the Wireless local area network (WLAN) network using 802.11 technologies, several security issues are being raised. A simple WLAN network consists of an access point (AP) generally connected to the wired network and several clients communicating with the AP. Since the signals are propagating in air, there are enough opportunities for sniffing and deciphering the information carried by them. Major security threats to such a system are to change the orientation of the antenna, type of antenna and position of the antenna so that the signal strength in the undesired regions goes up and thus compromising the integrity of the network. In this thesis, we first look at the issue of identifying the changes in the orientation of the antenna by using a network of sensors. Using theoretical techniques of ray tracing it is possible to find power distributions pattern around the antenna taking into account the environment and antenna radiation pattern. We have developed a 3D ray tracing code which uses beam propagation algorithm. Using the code, we generate several power distribution patterns for different antenna orientations for different antenna at different position. This forms the knowledge base for the situation under consideration. With this knowledge base, we developed an algorithm to find the number and the position of the sensor which can be used to predict type, orientation and position of the antenna in an indoor environment. Using this algorithm, we demonstrate that, given a power distribution pattern, it is possible to identify orientation, type and the position of the antenna for a given environment. The theoretical results have been compared with the measurements carried out in the laboratory. For the experiment, we have considered the horizontal polarized antennas for both transmit and receive. A network

For more details click here

back

Title : *Investigation into SPR Based -Optical Sensors*
Author(s) : *Siddarth V*
Roll No : *Y3104106*
Supervisor(s) : *Ghosh Anjan Kumar*

Abstract

Surface Plasmon Resonance (SPR) sensors are highly accurate in detecting refractive index changes, commercially available SPR sensors have a resolution of about 5×10^{-6} RIU (Refractive Index Unit). It is because of this accuracy and due to real time processing capabilities that SPR sensors are being used in research in bio-chemical and drug industries and laboratories. SPR sensor can also be used in the fields of food processing and medicine. But if such sensors are to be popular in a developing country such as India, they need to be cheap, robust and easy to handle. In this thesis we investigate the possibility of making low-cost sensors based on the Surface Plasmon Resonance principle. First we analyze the effect on the SPR sensor response when low-cost, non-collimated and polychromatic sources such as LED's are used instead of laser light sources. We characterize the loss in sharpness or selectivity in SPR response. Next we analyze the possibility of constructing a low-cost SPR sensor configuration. We determine the spatial filter characteristics of a SPR setup. Using this, the evolution of the envelope of the wavefront as the incident beam propagates through the SPR setup is modeled. Using this method the output intensity profiles of two SPR sensor configurations are analyzed. Based on the characteristics of the output intensity profile sensitivity, resolution and range of the SPR sensor are found in each case. We find that a SPR sensor setup with SF-7 glass prism in Kretschmann configuration having a gold coating of 50 nm, a monochromatic light source at 800 nm wavelength and array detector of 1×1024 pixels placed at a distance of 0.1 m from the prism base has sensitivity of 105.4074 mm I RIU, resolution of 2.3716×10^{-6} RIU and operating range of [1.2723, 1.3937].

For more details click here

back

Title : *Full Wave Analysis Of A Coaxial Waveguide Based Power Combining Structure using 3D Transmission Line Matrix (TLM) Method*

Author(s) : *Gupta Alok Kumar*

Roll No : *Y3104007*

Supervisor(s) : *Biswas Animesh*

Abstract

Proliferation of power electronic loads, a prerequisite for realizing energy efficiency and productivity benefits, has brought utilities to crossroads. Utilities on the one hand are promoting the use of non-linear adjustable speed drive (ASD) loads for significant energy savings to the customer and on the other hand, more frequently encounter harmonic related problems including substantially higher transformer and line losses due to harmonics, required derating of distribution equipment and severe harmonic interactions between customers or between the utility and load, reduced system stability and safe operating margins. Passive filters consisting of capacitors and inductors have long been used to reduce harmonics. Passive filters offer less expensive and simple solution to the harmonics. But passive filters suffer from the danger of resonance at one or more harmonics frequency, which further increases harmonics. Active filters overcome majority of the drawbacks of the passive filters. Pure active filters provide effective solution for a small rating nonlinear load, but are not feasible and cost effective for a large rated non-linear load due to their high rating requirement. Hybrid filters offer a cost effective and practical solution for harmonic filtering and harmonic isolation for large rated nonlinear loads. In this thesis, a new control aspect for a wide band hybrid parallel active filter is investigated in detail to solve the harmonic distortion problems on the distribution system with lower cost and higher efficiency. The basic circuit is designed using a parallel resonant LC circuit tuned at fundamental frequency and a small-rated active filter composed of high frequency inverter. The band-stop property is intended to prevent flow of fundamental frequency currents into the parallel branch. Low impedance is offered to all harmonic components within the bandwidth of the active filter with proper choice of resonant circuit parameters. This results in a great reduction of the required rating as well as the cost of the active filter. This work presents the design of control circuit and a hardware scheme for a wide band hybrid active filter. Depending on its bandwidth, the hybrid parallel active filter is capable of compensating multiple harmonic components. This is expected to result in an improved cost effectiveness of the proposed configuration vis-a-vis almost all topologies reported in literature. Special considerations are incorporated to take care of variations in system frequency, noticeable in many utility supplies. The controller is developed by using TMS320F240 DSP processor. A phase lock loop (PLL) system is completely implemented in software on this DSP and tested in a 400V/50Hz system. A voltage sensor card is also designed and used in experiment. The step wise procedure for designing of inductor is presented with an example.

For more details click here

back

Title : *On Error Exponent In Lossy Source Coding*
Author(s) : *Mayank Bakshi*
Roll No : *Y3104053*
Supervisor(s) : *Bansal Rakesh K*

Abstract

This thesis presents upper and lower bounds on the reliability function for lossy coding for two cases –memoryless sources and finite alphabet stationary irreducible Markov sources. The results presented are simpler to evaluate than the recent characterization given by Iriyama for general sources and are extensions of previous results in this direction. We also find the error exponent for lossy coding of the class of variable length codes when a reliability criteria in terms of the excess code-length exponent is also desired. We show that a trade-off between the excess code-length exponent and the excess distortion exponent is essentially trivial in nature.

For more details click here

back

Title : ***Analytical Evaluation Of Fourier-Bessel Series Expansion
And Finding A Condition For Maximum Coefficient***
Author(s) : ***Agrawal Abhishek***
Roll No : ***Y3104005***
Supervisor(s) : ***Sircar Pradip***

Abstract

Fourier Bessel series expansions are used to represent some signals into a compact form. The evaluation of Hankel transform is needed to calculate the coefficients of Fourier Bessel series expansion. In the present work, for the first time an analytical closed form expression for Fourier Bessel series coefficients for some standard signals has been derived. Also, an attempt to evaluate a condition for maximum weighted coefficient for each signals has been done. By this, multicomponent signals can also be easily separated out because now one knows the relevant coefficients to represent a signal.

For more details click here

back

Title : *Improving The Diversity And Coding Gain Of Quasi Orthogonal Space Time Block Codes*

Author(s) : *Harinarayanan E V*

Roll No : *Y3104024*

Supervisor(s) : *Vasudevan Kasturi*

Abstract

Space Time Codes (STC) are used in Multiple input multiple output (MIMO) antenna systems. They make use of diversity in space and time. There are basically two types of space time codes, namely, Space Time Block Codes (STBC) and SpaceTime Trellis Codes (STTC). Orthogonal Space Time Block Codes (OSTBC) are a subclass of STBC codes. In 2001, Jafarkhani introduced a new class of OSTBC codes called Quasi Orthogonal Space Time Block Codes (QOSTBC). However, in Jafarkhani's approach, the diversity order attained using a 4 transmit antenna system is only 2, whereas the maximum achievable diversity is 4. This thesis, introduces a technique which attains a diversity of four for a four transmit antenna system. It also involves in finding constraints on the structure of the constellation, for the proposed method to result in a diversity of four. Out of many such possible constellations, the one to maximise the coding gain is chosen through an exhaustive search. Such a constellation for a BPSK and a QPSK system is also presented.

For more details click here

back

Title : ***Multiscale 3D Edge Detection Algorithm Using Wavelet Domain Vector Hidden Markov Tree***
Author(s) : ***Vamshadhara Solium***
Roll No : ***Y3104079***
Supervisor(s) : ***Sharma Govind***

Abstract

The wavelet analysis is an efficient tool for the detection of 3d image edges. Based on the wavelet analysis, we present an unsupervised algorithm to detect 3d image edges. A Wavelet Domain Vector Hidden Markov Tree (WD-VHMT) is employed in our algorithm to model the statistical properties of multiscale and multidirectional (subband) wavelet coefficients of an image. With this model, each wavelet coefficient is viewed as an observation of its hidden state and the hidden state indicates if the wavelet coefficient belongs to an edge. The WD-VHMT model can be learned by an Expectation-Maximization algorithm. After the model is learned, we employ an extended Viterbi algorithm to uncover the hidden state sequences according to the maximum a posterior estimation.

For more details click here

back

Title : *Analysis And Annotation Of Cricket videos*
Author(s) : *Kiran Kumar O*
Roll No : *Y3104129*
Supervisor(s) : *Venkatesh K S*

Abstract

Video can be treated as a sequence of frames, shots, event sequences or stories at different levels of abstraction. Video Shot Detection and Classification is a fundamental step for efficient accessing, retrieval, browsing, highlight generation etc. Summarization of a large amount of video data is one of the popular fields of video research in very recent times. Sports videos in particular have a clear domain knowledge that depends on the particular sport, which helps mainly in shot classification. The aim of the present work is to analyze the cricket videos from the annotation point of view, and to use this analysis in shot classification to automatically classify shots into various semantic categories, and hence generate annotation cues for them. The features used in shot segmentation step are color histograms. We use in shot classification, both color histograms and mean shot energy as features. In addition to automatic shot classification, the work also deals with one of the popular applications of sports video annotation, highlights generation, by detecting the slow motion replay shots.

For more details click here

back

Title : ***Parameter Estimation Of Signal With Multiplicative Noise Using Higher Order Statistics***

Author(s) : ***Samdani Hemant Kumar***

Roll No : ***Y3104035***

Supervisor(s) : ***Sircar Pradip***

Abstract

In this thesis, a new approach for the estimation of parameter of signal with multiplicative noise is suggested based on the fourth order cumulant function of the observed signal. In practice the observed signal are contaminated with noise both multiplicative and additive. In this regard, some useful property of fourth order cumulant are studied and effectively utilized to reduce the deleterious effects of noise. In the proposed method, accurate parameter estimation is therefore achieved by using geometrical properties of the signal. A linear system of equations is formed by using the fourth order cumulant function of the observed signal. The signal parameter are then calculated by polynomial rooting vector of these prediction coefficients. The proposed method is first considered for the simple complex exponential with both multiplicative and additive noise. Further utilization of the method in the case of more complex model like complex valued amplitude and frequency modulated signal has been done. Finally the complex valued linear frequency modulation (chirp) signal model is also considered for the parameter estimation.

For more details click here

back

Title : *Processor Composition, Complex Sets And Hyperprocessing*
Author(s) : *Tayal Richa*
Roll No : *Y3104076*
Supervisor(s) : *Venkatesh KS*

Abstract

We follow a very general framework for signal and system theory in which the domain and range are taken to be mere nonempty sets with no presumed structure, and different signals are defined as different maps from the domain to the range. The signal space is the collection of all possible signals and processors are maps on the signal space. We introduce the notion of point preservance and consonance. Using these as a first attempt to study processor behaviour, we then proceed to compute the maps of compositions of processors, and study their population and synthesisability. The topological characterization of an arbitrary processor is preceded by the development of a theory of complex sets. We define a hyperprocessor and then, the topological characterization of hyperprocessors is presented. The effect of invariances on the preservance topologies of the hyperprocessors is also discussed.

For more details click here

back

Title : *Simulation Studies If OFDM Based Power Line
Communication System*
Author(s) : *Singhai Amit*
Roll No : *Y3104008*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

This thesis is about indoor powerline communication (PLC), which has emerged as a powerful candidate for home networking, because it utilizes the existing infrastructure. This thesis starts with an introduction to powerline communication. We then describe the behavior and characteristics of a typical powerline channel. The effect of noise, attenuation, multipath fading and phase errors have been discussed. In the next part of this thesis the OFDM system has been explored in details and its utilization in PLC has been discussed. Finally we present simulation results for various constellations like binary phase shift keying (BPSK), quadrature phase shift keying (QPSK) and 16-QAM (quadrature amplitude modulation) for both AWGN channels as well as powerline channels.

For more details click here

back

Title : *A Timing Recovery Algorithm For Distortion Less Channels*
Author(s) : *Solanki RiteshKumar*
Roll No : *Y3104077*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

In a digital communication system we want the frequency spectrum of the transmitted signal to be limited and ISI (inter symbol interference) to be minimized. For these two reasons pulse shaping is used. Root raised cosine pulse gives the best performance compared to other pulse shape like square pulse, sinc pulse etc. In this thesis we have used root raised cosine pulse shape and 16-QAM constellation for communication. When the clock frequency at receiver is identical to the transmitter, then it can be shown that the correct sampling instant at matched filter output does not change with time. But when there is a clock frequency mismatch, then the correct sampling instant changes with time and it needs to be tracked. Tracking of this correct sampling instant for each symbol is known as "timing recovery". For tracking of this sample we make use of the fact that the variance of this sample is minimum. By using the minimum variance method of timing recovery we have obtained performance very close to optimum performance.

For more details click here

back

Title : *Iterative Timing Recovery*
Author(s) : *Kushwaha A S*
Roll No : *Y3104001*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

Coding gains of iteratively decodable error-control codes enable reliable communication at very low signal-to-noise ratio (SNR). Hence timing recovery must be performed at an SNR lower than ever before. In most communications (decoding) scenarios, perfect timing recovery is assumed but this assumption breaks down particularly at low SNR. If the sampling is not properly done, the advantages of iterative detectors/decoders will not be observed. At these low SNRs, the conventional timing recovery techniques fail because they ignore the presence of error-control coding. Iterative timing recovery, which implements timing recovery in cooperation with iterative error-control coding, is described and implemented. Conventional timing recovery techniques using various timing error detectors are studied and implemented for uncoded 13PSK transmission. Performance of the receiver, with and without timing recovery, is compared. Iterative timing recovery is performed for turbo coded system. Iterative decoder (Based on BCJR algorithm) is used for turbo decoding. The performance of conventional and iterative timing recovery techniques is compared.

For more details click here

back

Title : *Comparative Study Of Effect Of Dispersion On Different Pulse Shapes In An Optical Fiber Link*
Author(s) : *Partha Sarathi Ghatak*
Roll No : *Y3104130*
Supervisor(s) : *Singh Yatindra Nath*

Abstract

Performance of optical channels is mainly affected by either attenuation or dispersion in this thesis, the later phenomena is considered. Dispersion is the main criteria to limit the high data rate in an optical fiber link. due to dispersion ,pulse spreading takes place which increase the bit error rate. it is obvious from the communication theory that for different pulse shapes there will also be different signal to noise this thesis deals with the study and performance comparison of different. pulse shapes in a dispersive optical link. different pulse shapes are applied to a dispersive optical link and photo detector output is passed through a low pass filter. three low pass filters are considered here ideal LPF, first order LPF, second order LPF, low pass filter output is sampled at sample and hold circuit and output sample is compared in a threshold detector. additive white gaussian noise is assumed to be present in the detector. pulse are also studied in duobinary modulation.

For more details click here

back

Title : ***Mathematical Analysis Of SOA Based 2R Regenerator***
Author(s) : ***Pradhan Santosh Kumar***
Roll No : ***Y3104132***
Supervisor(s) : ***SinghYatindraNath***

Abstract

The demand for higher bandwidth is increasing day by day. To cater this demand now fiber optic communication is employed. This communication uses optical fiber cable. These optical fibers have an enormous bandwidth { 12 THz}. In fiber optic communication, we send signals in optical form i.e. photons carry information from source to the destination. The major constraints in optical fiber communication are fiber losses, dispersion, and non-linearities. To compensate fiber losses, optical amplifiers are incorporated. These optical amplifiers amplify the signal, but unfortunately add Amplified Spontaneous Emission (ASE) noise, which limits the transmission length. And due to the dispersion phenomenon, pulse gets broadened which causes inter symbol interference (ISI). To enhance the transmission length, it is necessary to re-amplify and reshape the signal. In this thesis, mathematical analysis of semiconductor optical amplifier (SOA) based 2R regenerator is being done.

For more details click here

back

Title : ***Investigations In To Incremental Multi-Camera Self-Calibration***
Author(s) : ***Prasad A V S***
Roll No : ***Y3104132***
Supervisor(s) : ***Venkatesh K S***

Abstract

This thesis deals with calibration of a multi-camera setup and investigates the approach for incrementally calibrating the setup when the cameras rotate through an approximately known angle. Virtual immersive environments often consist of multiple cameras which have to be calibrated. Much work is done on single and stereocamera calibration where the user has to show a checker board in different positions to the camera. We have implemented a fully automatic multi-camera self-calibration technique which requires a minimum of 3 cameras. A freely moving bright spot is the only hardware required and waving the bright spot throughout the working volume is the only work required. Occlusions are handled effectively by using a filling algorithm. Projective structures are computed using rank 4 factorization and Euclidean stratification is effected by imposing geometric constraints. We have calibrated a set-up of 4 cameras within a reprojection error of 1 pixel in less than 5min. Radial distortion parameters are also estimated from the same data. Using this calibration information, we have reconstructed a 3D model of an object kept in the calibrated volume. We have implemented an algorithm for estimating the relative pose between two cameras from 5 point correspondences. We then investigate the approach to calibrate the cameras incrementally when the cameras rotate through an approximately known angle.

For more details click here

back

Title : *An Adaptive Probabilistic Routing Algorithm*
Author(s) : *Shukla Swapnil*
Roll No : *Y3104099*
Supervisor(s) : *SinghYatindraNath*

Abstract

The internet has grown and changed ever since the first connections were made in 1969. The problem of routing assignments has been one of the most intensively studied areas in the fields of data networks since then. Network routing essentially consists of two entities the Routing Protocol and the Routing Algorithm. The routing protocol provides each node in a network, a consistent view of the topology and the routing algorithm provides the intelligence to compute paths between nodes. The focus of this thesis is on Routing Algorithm. Routing algorithms can broadly be classified into Selfish and Non-Selfish Routing Algorithms, This thesis starts with discussion of the problems faced with Selfish routing algorithms and presents a Non-Selfish Routing Algorithm with the aim to solve the problems. This algorithm falls into category of multipath routing. Performance of the network is improved because the resources of multiple paths are utilized. Finally extensive simulations have been carried out for evaluation of the performance of the algorithm in different scenarios. The factors that decide the performance of a network are how frequently updates are sent and how frequently routes are computed. The effect of variation of these factors on convergence time, load on routers and the queue size have been studied.

For more details click here

back

Title : *Upper Bound On The Performance Of Subscriber Access Networks For Downstream Traffic Considerations For Broadband Applications*
Author(s) : *Prasanna T M*
Roll No : *Y3104100*
Supervisor(s) : *Singh YatindraNath*

Abstract

Increased demand for bandwidth arises from a proliferation of applications such as voice, video and data traffic as well as by the bootstrapping effect of increased consumption resulting from lower rates and optical fiber enjoys monopoly in providing long distance communication with a remarkable error rate performance. Optical communication is driven by WDM technology that employs Erbium Doped Fiber Amplifiers. WDM carves up the huge bandwidth of single mode fiber (SMF) into channels whose bandwidths are compatible with peak electronic processing speeds. This thesis deals only with the unidirectional aspect of the Dual Bus Architecture for Subscriber Access Network with passive optical splitting being employed at the Optical Network Unit (ONU). The aim is to give an upper bound on the number of WDM channels that can be transmitted and the number of subscribers that can be accommodated (by maximizing the number of power splits) for broadcast applications. The receiver sensitivity is compared for different detection schemes. Three cases arise as (i) Analog broadcast channels along with unicast transmission (also called switched services) (ii) Digital broadcast channels with switched services, and (iii) Hybrid Multichannel case. The analog broadcast is AM-VSB (Vestigial Side Band) and digital broadcast is M-QAM or QPSK modulated and they are sub-carrier multiplexed. This thesis also analyses the benefit of AM/OFDM over AM/M-QAM hybrid service in terms of bit error rate performance and proposes the use of Forward Error Correction coding to improve the error performance. The simplified gain model of EDFA as a preamplifier has been adopted to exemplify its application in optical communication, and algorithm is given for the design of Subscriber Access Network, with an example design also carried out. Thus, the Wavelength Division Multiplexing (WDM) also called, as "Data in a Rainbow" concept will cater to the eventual need of greater capacity and faster access.

For more details click here

back

Title : *A Fast And Robust Correspondence Algorithm For View Synthesis*
Author(s) : *Sriram M P*
Roll No : *Y3104048*
Supervisor(s) : *Venkatesh K S*

Abstract

The thesis deals with the view synthesis problem: to generate snapshots of a scene taken from a 'virtual' viewpoint different from the available 'reference' view points of the given views. We propose a novel method to synthesize the virtual view from two uncalibrated reference views. Our aim is to automatically generate virtual views at a high speed on standard hardware in an environment which is prone to illumination effects and noise. No assumption about the foreground and background objects are made. We address the main bottleneck in automatic generation of virtual views, the 'correspondence' problem between the two reference views, by combining a local method such as Block Matching and a global method like Dynamic Programming. A new cost function is proposed for global search for correspondence and its performance is compared with the earlier reported definitions of cost functions. A new approach based on resolution is followed to localize the effects of occlusion. An information theoretic measure is introduced to study the performance of the algorithm. We apply our algorithm to stereo compression, foreground-background segmentation and obtaining realistic zoom. Experiments with real-world images demonstrate its robustness against illumination effects and significant occlusions present in the stereo pairs.

For more details click here

back

Title : *Foreground Extraction And Object Tracking*
Author(s) : *Dibyendu Palai*
Roll No : *Y3104021*
Supervisor(s) : *Venkatesh K S*

Abstract

Real-time segmentation of moving regions in image sequences is a fundamental step in many vision systems such as automated visual surveillance. Objects that temporally occlude near-static parts of the scene (called the background) are extracted as the foreground by background subtraction algorithms. This process consists of different stages: pre-processing, color space selection, feature extraction, model based learning and segmentation. Our proposed contributions are in the preprocessing and feature extraction stages. We propose a novel pre-processing technique for background subtraction that comprises representing the image in multiple scales. We also propose that the colinearity statistic can be used as the feature to work with. We show that this combination gives the best results. Then we focus on background subtraction for Pan-Tilt Cameras. Here we propose a suitable technique for mosaicing the background model. Next we develop a target tracking system (DynaTracker). DynaTracker is a pan-tilt device based active camera system for maintaining continuous track of the moving target, while keeping the same within a pre-specified region (typically, the center) of the image. The significant features of this work are the use of the mean-shift algorithm for visual tracking and the derivation of the error dynamics for a proportional-integral control action.

For more details click here

back

Title : *Study Of Multiwavelet And Its Appliation To Image Processing*
Author(s) : *Jawed Qumar*
Roll No : *Y3104038*
Supervisor(s) : *Gupta Sumana*

Abstract

In recent times development of different methods for denoising images corrupted with signal dependent and signal independent additive noise and to obtain image compression, has been a subject of considerable interest. Wavelet transforms have been used for denoising as well as for compression [Joint Photographic Experts Group (JPEG)] purposes. To achieve best performance in image denoising and compression, wavelet transforms require filters that have a number of desirable properties, such as orthogonality and symmetry. However, the design possibilities for wavelet filters are limited because they cannot simultaneously possess all these desirable properties. The relatively new field of multiwavelets is a promising approach in removing some of the limitations of wavelets. Multiwavelets offer more design options and hence can combine all desirable transform features. The performance of the different multi wavelet used for denoising and compression is evaluated in terms of root mean square error (RMSE). A wide range of images are selected and tested in order to determine typical performance on an arbitrary image. In case of signal dependent noise such as speckle noise and film grain noise, the logarithmic of the inputs are processed in transform domain. In multiwavelet transform domain depending on the size of image the required level of decomposition is chosen. The noise variances are estimated at first and used in computing donoho threshold. The transform coefficients are then pruned to reduce the noise as well as compress the image. The proposed method are compared with existing (scalar wavelet) algorithm for all standard images including synthetic images. The performances are compared on the basis of computed RMSE obtained for a given bit budget and noise variance in case of image compression and image denoising respectively.

For more details click here

back

Title : *Face Detection Using Morphological Associative memories*
Author(s) : *Giridhar Tammana*
Roll No : *Y3104031*
Supervisor(s) : *Sharma Govind*

Abstract

Given a single image, the goal of face detection is to identify all image regions which contain a face regardless of its three-dimensional position, orientation, and lighting conditions. Such a problem is challenging because faces are non-rigid and have a high degree of variability in size, shape, color, and texture. Numerous techniques have been developed to detect faces in a single image. In this thesis a new technique for face detection based on recently proposed Morphological Associative Memories (MAMs) is proposed. Morphological Associative Memories are a neural networks architecture based on the shift of the basic algebraic framework. They possess some robustness to specific noise models (erosive and dilative noise). MAMs are created from example face patterns which are taken from face database in which each face is of size 19 x 19, this size limits the minimum size of that can be detected. MAMs recall a pattern when it is presented with a pattern, the similarity between input and recalled pattern will be higher if input pattern is a face pattern. This similarity measure is used in classifying face and non-face images. To alleviate computation load a heuristic rule is proposed, which filters out most of the non-face regions of the images. The proposed system is capable of detecting upright faces. The main advantage of this technique comes from the fact that the creation of MAMs is not recurrent and converges in single step.

For more details click here

back

Title : *Fully Optical Decoder Using Optically Controlled Optical Switch*
Author(s) : *Shumail Saeed*
Roll No : *Y3104087*
Supervisor(s) : *Singh Yatindra Nath*

Abstract

In this thesis a fully optical decoder is designed using all optical switches. As we have electronic decoder in which the level of output depends on the input combination where inputs are expressed in binary system, similarly here in optics, high level means light is present at that port and low level means no light is present. In this design, optically controlled optical switches are used, these switches are studied and simulated in this thesis. These switches work on the principle of disturbance of waveguide structure due to invocation of non linearity in the medium. Essentially, an optical waveguide is a structure of higher refractive index surrounded by lower refractive index providing two dimensional confinement of the radiation to form a light guiding channel in three dimension. By embedding non linear optical material in the waveguide possibility of controlling light through waveguide by control light beam exist. Non linear optical materials are those that change their optical properties upon passing intense light through them. In optical waveguides, dimensions are very small so high optical flux density is achievable such that material operates in non linear region. The thesis presents the various geometries in which non linear material can be arranged in waveguide and which can act as light controlled switch.

For more details click here

back

Title : *A Timing Recovery Algorithm For Linearly Modulated Digital Signals Transmitted Through Distortionless Channels*
Author(s) : *Tanweer Alam*
Roll No : *Y3104103*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

In this thesis, algorithms have been presented for implementation of digital communication system for distortionless channel using linear modulation. The distortionless channel model is valid in many practical situations like wireless line of sight communications, ethernet etc. The advantage of digital communication over analog communication is that it can be implemented in softwares. Software based implementation provides flexibility and is also much reliable than a hardware implementation. Software based implementation has become more feasible in today's scenario because of availability of high speed DSP processors. The root raised cosine spectrum is used in many communications standards like the V.34 voiceband modems and has been proposed for the 3Gpp standards for wireless communication. The V.34 voiceband modem is used for transmitting data rates upto 33.6 Kbps over telephone networks having a bandwidth of only 3.3 KHz. The V.34 standards are commonly used in fax machines. In this thesis we have also dealt with the important issue of timing recovery. We have developed the minimum variance method of timing recovery which is suitable for linearly modulated signals. In order to test the effectiveness of this method, we have introduced a clock frequency error of 25ppm between the transmitter and the receiver. Simulation results using 16-PSK modulation shows that the performance of this method is close to that of the ideal situation where there is no clock frequency mismatch.

For more details click here

back

Title : *Interleavers In Turbo Codes : Some New Results*
Author(s) : *Arya Mazumdar*
Roll No : *Y3104012*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

The performance of any linear code depends greatly on the minimum distance of the code. The attribute of interleavers which determines the minimum distance of the turbo coding system, due to an input weight two sequence, is called spread. A high value of spread ensures that the minimum weight due to a weight two sequence is high. For a given block-length, we have determined the number of interleavers with spread two. Using this, the probability that a randomly chosen interleaver has spread two is found out. It is shown that as block-length increases, this probability increases but very quickly saturates to the limiting value $1 - e^{-2}$. Subsequently, we have determined a lower bound on the probability of an interleaver having spread at least $\$$. It is shown that this lower bound saturates to the value $e^{-2^{\$}}$ as the block-length increases. This analysis leads to the conclusion that turbo codes with random interleavers are likely to have a overall low minimum distance. The overall minimum distance of turbo codes, due to any input, depends on another property of interleaver called the summary distance. We propose a new approach to design interleavers, from 3-regular Hamiltonian graphs, such that the minimum distance of the code is high. These interleavers can be generated using a few parameters, that can be selected in such a way that the girth of the interleaver graph become large, inducing a high summary distance of the resulting interleavers. The size of the search space for these parameters is also derived.

For more details click here

back

Title : *A Method For Tonic Selection For Indian Music Singers*
Author(s) : *Gaikwad Chandrakant J*
Roll No : *Y3104028*
Supervisor(s) : *Sircar Pradip*

Abstract

A method for tonic(sa) selection is discussed. Singers were asked to select three tonics of their choice. Then they were asked to sing aaroh and avaroh with the selected tonic in akaar(aalap) i.e. without pronouncing any syllables, only using the sustained jaajrowel sound. Notes in the aaroh and avaroh with these three different tonics were analyzed for their timbre(quality). In this experiment several audio clips drawn from commercial recordings of professional singers (e.g. Lata Mangeshkar, Md. Rafi, etc.) are used for illustration of criterion, used for the tonic selection. Spectral domain techniques and autocorrelation based pitch detection algorithm is used to analyze the musical notes. A tristimulus method suggested by Pollard and Jansson(1982) for the specification of musical timbre is used to represent the timbre of the notes sung by the singer. Timbre (quality) of the notes is compared using tristimulus diagrams. Tristimulus diagrams are drawn for all the notes in the aaroh and avaroh. Position of these notes in the tristimulus diagram determines their timbre(quality). Using classical timbre theory and analysis of Indian music singers voices, voice range and tonic is R.

For more details click here

back

Title : *Multisensor Image Registration And Fusion*
Author(s) : *Shahid Mohammad*
Roll No : *Y3104054*
Supervisor(s) : *Mazhari Baquer& Gupta Sumana*

Abstract

Fusion is basically referred to extraction of the important information from input images and constructing an output image. Although image fusion forms a part of the large arena of data fusion, it has its unique characteristics due to the complicated nature of image understanding. The thesis is primarily concerned with the development of techniques that are specific to image fusion. Due to sensor displacement, images are misaligned (unregistered). Contour and statistical based approaches are exploited for image registration. Multispectral, multisensor surveillance and medical images are considered. We have considered some of the current state of the art image fusion techniques for pixel-level fusion[^]with an emphasis on the multiresolution image merging. Based on DWT and DTCWT, we propose two new image fusion techniques. They are referred to across band fusion and perceptual contrast fusion methods respectively. Proposed schemes are robust under noisy conditions. Novel masks are developed to exploit the directional information of Dual Tree Complex Wavelet transformation. Registration and fusion performance is quantitatively evaluated using fusion quality measures. We have also proposed an FPGA based model for real time implementation of the fusion algorithms.

For more details click here

back

Title : *A New Energy Based Interpolation Method For Speech Coding*
Author(s) : *Pawar Vijay*
Roll No : *Y3104059*
Supervisor(s) : *Ray G C*

Abstract

Speech coding algorithms have different dimensions of performance. Among them, speech quality and average bit rate are the most important performance aspects. The purpose of this research is to improve the speech quality within the constraint of the low bit rate. Most of the low bit rate speech coders employ linear predictive coding (LPC) that models the short-term spectral information as an all-pole filter. The LP filter coefficients are obtained by standard linear prediction analysis, from blocks of input speech samples, called speech frames. As the frame size is reduced, reconstructed speech quality improves but at the expense of increase in bit rate. Linear interpolation of LP coefficients between two consecutive frames improves the speech quality without increasing bit rate. In transition speech segments such as onsets, a large variation in energy and spectral characteristics can occur in a short time interval. Therefore, there is large change in the LP coefficients in consecutive frames and linear interpolation performance deteriorates. We are proposing a new energy based interpolation scheme for LP coefficients in which interpolation weights change according to speech frame energy. This new method performs better than existing energy based interpolation scheme in objective as well as subjective tests and also outperforms LSF interpolation scheme in subjective test. We also implemented this new interpolation scheme in LPC-10 like speech coder and found that speech quality improves with the new interpolation scheme.

For more details click here

back

Title : *Differential Detection For Differential Orthogonal Space-Time Modulation With APSK Signals*
Author(s) : *Katkam Srikanth*
Roll No : *Y3104128*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

Differential space time modulation has been recently proposed for multiple antenna systems, when channel information is not available at receiver. A decision feedback based Amplitude Phase Shift Keying (APSK) modulation/demodulation has also been proposed in the literature, to improve the throughput of the system. It is well known that the performance of differential schemes is worse when compared to their non-differential counterparts. To improve the performance of the above system, we have proposed a modification (with theoretical proof) in the decoding technique of the Decision Feedback Differential Decoding for Differential Orthogonal Space Time modulation method with APSK signals. Next we have studied the effect of replacing the Recursive Least Square (RLS) algorithm used in the decision feedback differential detection, with the simpler Least Mean Square (LMS) algorithm. The performance of both the systems are evaluated for different orders of the adaptive algorithm and under different channel conditions, i.e., slow fading channel (where the fading coefficients of the channel are constant for at least 2 blocks of data transmission) and fast fading channel (where the fading coefficients are varying for each block of the data transmission). In all the above discussed systems, the decoder is designed on the assumption that the channel is flat fading. To enable the system to work in a frequency selective fading channel, a new layer with Orthogonal Frequency Division Multiplexing (OFDM) modulation has been added and the performance of the same is evaluated.

For more details click here

back

Title : *Inter Person Voice Conversion Using Factor Analysis*
Author(s) : *Raghuram A*
Roll No : *Y3104068*
Supervisor(s) : *Ray G C*

Abstract

Voice Conversion is defined as modifying the speech signal of one speaker (source speaker) so that it sounds as if it had been pronounced by a different speaker (target speaker). In this thesis, we present a method for voice conversion by representing the joint probabilistic acoustic space of the two speakers with a Mixture of Factor Analyzers (MFAs). This can also be interpreted as a reduced dimension mixture of Gaussians. Most of the existing voice conversion systems are trained on aligned LSF vectors. However, there are many applications of voice conversion systems where the amount of training data from the source speaker and the target speaker is different, amount of source data is large, but it is desired to estimate the transformation with a small amount of target data. The extra unaligned source data is incorporated into the training phase to estimate the parameters of the MFA and hence improve performance. Objective experiments demonstrate that the performance of the proposed system using factor analyzers is comparable to the performance obtained using existing systems using Gaussian mixture models, with significant gains in both time and memory. The addition of unaligned data in the training phase leads to a much superior performance in conversion. Subjective tests imply that a small increment in the dimension of the factor analyzers does not make a difference perceptually to the listener when the increments are small.

For more details click here

back

Title : *LDPC Codes : Bounds On The Rate For FSMCs And Some Results On Minimal Stopping Sets*
Author(s) : *Pulkit Grover*
Roll No : *Y3104066*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

Since their re-discovery in mid-90's, Low-Density Parity-Check (LDPC) codes have been shown to be capacity approaching for a large class of memoryless channels. Recently their performance has been analysed over certain Finite State Markov Channels (FSMCs), and has been found to be encouraging. In this dissertation, we present upper bounds on the rate of LDPC codes for reliable communication over FSMCs. We consider the class of FSMCs in which the channel behaves as a Binary Symmetric Channel (BSC) in each state. A simple upper bound for all non-inverting FSMCs is first derived. A tighter bound is then presented for the case of Gilbert-Elliott channels. Tighter bounds are also derived for FSMCs which behave as a BSC in each state. However, the latter bounds hold only almost surely for a randomly constructed sequence of LDPC codes. Finally, we extend these bounds to arbitrary symmetric FSMCs. To establish the utility of random construction of LDPC codes, we prove the concentration theorem for Belief Propagation (BP) decoding over Markov channels. The derivation of these bounds is a generalization of bounds given by Gallager for BSCs. Since these bounds are derived for optimal Maximum-Likelihood decoding, they also hold for BP decoding. These bounds prove that if a sequence of codes has a constant average number of 1's in corresponding parity check matrices, the sequence cannot achieve capacity of any FSMC. Furthermore, using the derivations of bounds on the rate, we also derive lower bounds on density of parity check matrices for given performance over FSMCs. We also introduce the concept of minimal stopping sets in the decoding of LDPC codes over Binary Erasure Channel (BEC). The significance of minimal stopping sets is explained, and bounds on their number are derived for LDPC codes with $\epsilon > 0$.

For more details click here

back

Title : *Local Tomography Using Multiscale Radial Sampling And Interpolation*
Author(s) : *Reddy R Mahesh Kumar*
Roll No : *Y3104067*
Supervisor(s) : *Ray G C*

Abstract

In this work, Region of Interest (ROI) tomography using wavelet transform has been studied and using this theory, a new sampling pattern for collecting projections is proposed which reduces the Region of exposure significantly. In conventional filtered backprojection method, even to reconstruct a small region of interest, global projection data i.e., projections pertaining to the region outside the ROI are also needed due to the nonlocal ramp filter. This increases the region of exposure to the harmful X-ray radiation which is undesirable. In * Wavelet localization approach the ROI is exposed at all angles but the full object is exposed only at a fewer angles which results in the reduction of angular samples and thus reduces the region of exposure of the object. Here the key factor is the localization of the radon transform using wavelets. In this work, it is shown that a simple linear interpolation of the reduced sinogram gives the reconstructed ROI whose quality is as good as the one obtained using wavelet localization. Also a new Multiscale radial sampling scheme is proposed in which the radial samples outside the ROI are reduced and these reduced samples are interpolated to get the full samples of the sinogram. An error analysis is done and it is proved that the reduction of samples outside the ROI doesnot introduce much error in reconstructing the ROI.

For more details click here

back

Title : *Power Efficient Video Transmission On CDMA Based Wireless Networks*
Author(s) : *Jain Pooja*
Roll No : *Y3104060*
Supervisor(s) : *Chaturvedi Ajit Kumar & Gupta Sumana*

Abstract

We have considered the problem of minimizing sum of total power consumption of various users transmitting video on CDMA uplink channel, while satisfying the distortion constraint. Power consumption of video source coder, channel coder and transmitter has been considered. Distortion due to lossy source coder compression and residual errors has been taken into account. An iterative algorithm is presented to accomplish the objective. The analysis is relevant for the uplink channel as portable devices are battery powered. Their limited battery power must be used efficiently. Unfaded and Rayleigh distributed multipath fading channel have been considered. Effect of exploitation of multipath and spatial diversity offered by the fading channel on the operating point and sum of total power consumption has been studied. Effects of variation in number of users (MAI), distances of users, chip rates have been investigated. Computational complexity of the iterative algorithm has been determined. Redundancy and the knowledge of operating parameters at any given time on the uplink channel has been exploited to reduce the computational complexity of the algorithm. This facilitates real time applications.

For more details click here

back

Title : *Environment Mapping Using Monocular Image Sequences*
Author(s) : *Arshad Jamal*
Roll No : *Y3104011*
Supervisor(s) : *Venkatesh K S*

Abstract

Environment mapping from a video sequence is considered to be one of the most important problems in computer vision. Its successful solution has numerous possibilities in applications like surveillance, virtual reality, autonomous navigation, multimedia communications, medical prognosis, etc. One of the most powerful techniques for solving this problem is known as structure from motion (SFM). Briefly, the SFM problem is about recovering the absolute or relative depth of static and moving objects using the Optical Flow obtained from the image sequence acquired from single or multiple video cameras. The most challenging problem is when only a monocular video is present and we require a dense estimate of the depth. Successful solution of this problem requires a detailed understanding of the geometry of the 3D world and its 2D projections on the image planes. Besides, as the images are quite noisy, it is often difficult to accurately estimate the optical flow, which in turn makes the depth estimation inaccurate. The overall aim of this thesis is to generate the depth map using optical flow and then create an environment map by integrating these depth maps obtained at regular intervals by acquiring monocular image sequences from a mobile camera. Two different strategies have been proposed for the environment mapping. In the first one, a two-sided map is generated by panning the camera in left and right directions. This method, because of some limitations of implementation relating to the panning speed of the onboard camera, is more suitable for outdoor mapping as it gives only a sparse map for indoor environment. However, we also present a second approach in which, the camera is kept constantly directed either in left or right direction, and the captured set of images is used to compute the dense depth map. We have used a Kalman filter to denoise the depth map.

For more details click here

back

Title : *Feature Assisted Fast Motion Estimation, Error Concealment And Roi Identification In Video Codecs*
Author(s) : *Jawahar Waknis*
Roll No : *Y3104108*
Supervisor(s) : *Gupta Sumana*

Abstract

Block motion estimation is arguably the most significant and computationally demanding component in Video Coding. The exhaustive full search gives optimum performance but is computationally intensive and hence impractical. Previous search algorithms speed up the process by limiting the search locations, however, the tradeoff is the degradation in the quality. All of these algorithms start their search from the center of the search window. The thesis work uses Gradient and Edge images as features to place the initial search point near to the global minimum. The work here achieves near-to exhaustive search performance in terms of MSE and better performance for edge -blocks in considerably less number of computations. The ease of extraction of the features, computational feasibility and the fact that it works as a simple extension to existing search algorithms are the main advantages in application of the algorithm. A compressed video bitstream is sensitive to errors. Severe degradation may result in the performance of reconstructed video. A way of combatting this and improving the performance of reconstructed video is error concealment. Before transmission the data is interleaved at a MB level. The result is a sequence of data whose adjacent elements are from spatially disjoint locations in the original video. This helps conceal the video and hence better the perceptual quality of video. Lastly, an algorithm for automated extraction of region of interest(ROI) is suggested. An application of this in MPEG-4 FGS using selective enhancement has also been suggested and tested.

For more details click here

back

Title : *Study Of Dual- Phase Continous Phase Modulation For Direct Sequence Spread Spectrum*
Author(s) : *Mishra Jaya*
Roll No : *Y3104039*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

Direct sequence spread spectrum (DSSS) communications using continuous phase modulation (CPM) has been studied. Continuous phase modulation (CPM) has been used, as it ensures phase continuity, constant envelope and bandwidth efficiency. The spreading is done by adding an extra phase term to the information phase. The spreading phase is formed from the spreading code and is independent of the information phase. The separation of information and spreading phase allows despreading to be done before information detection, which implies that the use of the simple receiver structure consisting of a despreader and a detector is possible. The spreading phase has been shaped by the time domain raised cosine pulse whereas the information phase is in the minimum shift keying format. A serial minimum shift keying (SMSK) type spread spectrum receiver has been used for information detection. The resulting DSSS CPM has been studied for different types of receivers, frequency shaping pulses, processing gain, flat fading, multiple access communications, partial and full response system. We also study the effect of pulses on performance of CPM. A linear combination of some known pulses have been studied and the best linear combination with respect to bit error rate (BER) has been obtained. The study has been extended to multiple access interference (MAI) for DSSS using CPM.

For more details click here

back

Title : *New Techniques For Audio-Visual Speech Recognition*
Author(s) : *Kumar A T Rajesh*
Roll No : *Y3104002*
Supervisor(s) : *Ray G C*

Abstract

This thesis aims at, developing new techniques for isolated digit recognition using the additional modality of visual data obtained from lip-tracking. This is a multi-sensor fusion problem. Cepstral coefficients are extracted from speech data and used in Hidden Markov Models for audio-only recognition. For the lip-appearance variation modeling, Active Appearance Modeling (AAM) technique is used. Two AAM-based lip-tracking techniques have been implemented, the Residual-based procedure for Combined AAMs, and the Inverse Compositional Image Alignment procedure for Independent AAMs. The sequential AAM parameters so obtained are fed into a new Segmental-Dynamic modeling (SDM) technique that has been proposed by us for lipreading. An Expectation-Maximization (EM) style algorithm has been developed for learning the SDM parameters. The next technique, termed combined Hidden Markov – Segmental Dynamic (c-HMSD) model by us, has been proposed for fusing the fast audio with the slow video. The corresponding EM training algorithm has also been developed. Next, for performing Online lip-Tracking and Recognition (OTR), we pose the problem as a Multi-Hypothesis, Multiple-Model tracking problem. A Jump-Markov System (JMS) with combined-AAM parameters as the hidden continuous states, the dynamic regimes as the hidden discrete states and the lip video sequence as the observations is the result. For inference in this model, we make use of the machinery of Particle Filters (PF). We show, how using the dynamics learnt in the SDM step, the JMS can be set-up. We propose a technique by which recognition can be carried out simultaneously with the filtering (tracking) procedure. Next, an approach for fusing the speech modality into the online stage has been proposed. Here we use the c-HMSD model and perform PF for recognition (filtering). Then we turn to the recently proposed Hidden Dynamic Model (HDM) of the Vocal Tract Resonance (VTR) variables. We show how its structure can be expanded by introducing switching dynamics and name it the Jump Markov Hidden Dynamic System (JMHS) for word-models. For inference in this system, we show how the principle of variance reduction can be made use of via the Rao-Blackwellized Particle Filter (RBPF). RBPF is a Sequential Monte Carlo (SMC) technique with a variance reduction step (in the form of Extended Kalman Filtering in our case).

For more details click here

back

Title : ***Design And Development Of Custom Power Devices With Sliding Mode Control***
Author(s) : ***Rao Rammohan Errabelli***
Roll No : ***Y3104072***
Supervisor(s) : ***Das Shyama Prasad***

Abstract

Cycle of power switches in the converters. Hence the state trajectories move back and forth around an average surface in the state space. This leads to ripple in state variables and system exhibits nonlinear behavior. Sliding mode controller can take advantage of this behavior do the same and can give a performance better than the conventional controllers. Judiciously selected sliding surface combines useful properties of circuit modes and can even possess new properties not present in any of the modes. Advantages of sliding mode control are • Stability for large load and supply variations as state trajectories is maintained on average sliding surface. • Robustness to external disturbances and system modeling errors. • Simple implementation and better performance compared to classical control techniques. Keywords: Custom Power Devices, DSTATCOM, DVR, UPQC, Sliding Mode Control.

For more details click here

back

Title : ***Study Of Bifurcation And Chaos In Current- Mode Controlled CUK Converter***
Author(s) : ***Jayalakshmi Kedarisetti***
Roll No : ***Y3104045***
Supervisor(s) : ***Joshi Avinash& Ghosh Arindam***

Abstract

A DC-DC converter is a switched piece-wise linear circuit. Due to the periodic switching, it has nonlinear behavior even when all its circuit elements are linear. Hence, these converters exhibit a wide range of bifurcation and chaos behavior under certain conditions. In the present work, the bifurcation and chaos in current-mode controlled Cuk converter have been studied. By normalizing the variables, the bifurcation phenomenon under the variation of a range of circuit parameters has been investigated. The main advantage of the normalization is the reduction in the number of parameters. The different routes to chaos and areas of stability of Cuk converter have been studied. The chaotic behavior of a Cuk converter has been studied both through digital simulation and laboratory experiment. The chaotic behavior in both cases match closely. The study of bifurcation and chaos help us to understand the changes in the behavior of power electronic circuits when some parameters vary. A complete knowledge about the domains of bifurcation and chaos in the parameter space is important for the power electronic engineers because they must choose the parameter values in order to obtain the desirable behavior.

For more details click here

back

Title : *Static Synchronous Series Compensator (SSSC) Based Damping Controller For Damping Out Low Frequency Oscillations In A Power System*

Author(s) : *Kanjula Kiran*

Roll No : *Y3104043*

Supervisor(s) : *Das Shyama Prasad*

Abstract

As an interconnected power system is subjected to a large load with rapid change, system frequency may be severely disturbed and become oscillatory. To stabilize the low frequency oscillations, the dynamic power flow control of static synchronous series compensator (SSSC) located in series with transmission lines is required. With the system power flow through the transmission line taken as the control variable, the power flow control by an SSSC in a transmission system creates a sophisticated method of frequency stabilization. This thesis presents a systematic approach for designing a static synchronous series compensator (SSSC) based damping controller using phase compensation method for damping out low frequency oscillations in a power system. The selection of the operating point for designing damping controller for robust performance to variations in system loading and system parameters has also been attempted. Detailed investigations have been carried out considering two alternative SSSC based damping controllers. The investigation reveals that for the damping controller based on SSSC parameter $C < V$ (Phase angle of inverter output voltage) provides superior performance to variations in system loading and system parameters compared to damping controller based on SSSC parameter 'w' (Inverter amplitude modulation index). The proposed method of designing SSSC based damping controller is also applied to a part of Indian transmission system. Key words: SSSC, damping controller, three-level inverter, Indian transmission system.

For more details click here

back

Title : ***Integration Of GIS/GPS In Electric Power Distribution Automation***
Author(s) : ***Monajigari Rajender***
Roll No : ***Y3104049***
Supervisor(s) : ***Singh Sri Niwas***

Abstract

In the present era of restructuring and modernization of electric power utilities, the application of GIS/GPS technology in the power industry is growing and covering several technical and management activities. The electric power distribution system has not been developed according to the planned program resulting in uneconomical utilization of funds, commercial loss and poor service to the consumers. The present work proposes integration of GIS/GPS with load flow algorithm of distribution automation to analyze the power flows and losses in the distribution network. The maps of distribution lines and road network are drawn using Leica GIS-5 instrument and drawings are exported to Arc View GIS 8.3 environment. This present work also highlights the application of GIS in IIT Kanpur (India) electricity distribution network with a special emphasis on GIS integration with distribution automation. Custom menus are well presented and the options in the menu give better understanding of the power distribution network of IIT Kanpur. Customization is done using Arc View script language, AVENUE, which is a high level object oriented programming. Output of the load flow algorithm displayed in very user friendly manner using with Visual Basic Module. The present work emphasizes the need of GIS-GPS integration to improve the power distribution system.

For more details click here

back

Title : *Simulation And Pc-Based Implementation Of A Vector Controlled Synchronous Motor Drive*
Author(s) : *Sukla R Pavan Kumar*
Roll No : *Y3104078*
Supervisor(s) : *Das Shyama Prasad*

Abstract

Vector control ensures good dynamic torque and speed response comparable to that of a separately excited dc motor drive. In the present thesis, the mathematical modeling and simulation of a vector controlled Synchronous Motor (SM) have been carried out. Hardware implementation of the Vector controlled drive is also done in the laboratory. An inverter, which is Current Regulated Pulse Width Modulated (CRPWM), is designed and fabricated. Hysteresis controller is used for current regulation. An algorithm based on vector control principle is developed for generating the reference phase currents of SM. The reference currents are compared with actual current values in the hysteresis controller and the output is used to drive the inverter. The field current is kept constant. An incremental encoder with 2500 pulses per revolution is used to estimate the rotor position accurately in the presence of multiple direction reversals. The drive system was tested for different test conditions and results were found to be satisfactory. **Keywords:** Synchronous Motor, Vector Control, CRPWM, hysteresis controller, PC-based implementation, incremental encoder.

For more details click here

back

Title : *A Utility Friendly Three-Level High Performance Induction Motor Drive System*
Author(s) : *Kiran G*
Roll No : *Y3104026*
Supervisor(s) : *Das Shyama Prasad*

Abstract

In the present thesis, the torque and the flux of a three-level induction motor are directly and independently controlled by using "Direct Torque and Flux Control (DTFC)" method. A three-level Synchronous Link Converter (SLC) is used as the front-end converter for drawing unity power factor sinusoidal current from utility. Hence the drive is utility friendly and capable of four quadrant operation. High performance induction motor drives require accurate independent torque and flux control over a wide range of speed range. DTFC is less complex and gives better control characteristics. The main difference between DTFC and traditional AC drive method controls is that with DTFC there is no separate voltage and frequency-controlled PWM modulator. The DTFC method gives attractive performance in terms of fast torque response, simple control scheme without coordinate transformation, and robustness against the motor parameter variation. It has been developed on the space vector approach, where the torque and flux of an induction motor can be controlled directly and independently. In the DTFC, the motor torque and flux are calculated from the primary variables and they are controlled directly and independently by selecting optimum inverter switch modes. The conventional DTFC suffers from flux demagnetization at low speed due to increased stator resistance drop. A modified control scheme has been developed to avoid this problem for better response at low speed condition. The real time algorithm of the drive system has been implemented with a PC, which uses PCL-208 data acquisition card for data transfer. **Keywords:** Direct Torque and Flux Control (DTFC), Synchronous Link Converter (SLC), Three-level inverter, Induction Motor, Look up table, Space vector modulation.

For more details click here

back

Title : *Signal Propagation In Neuron And Its Dynamical Behavior*
Author(s) : *Roy Sudipa*
Roll No : *Y3104096*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

The neurons work together to process the information in nervous system that in turn controls the animal behaviors. This is an attempt to understand the dynamics of one of the basic components of central nervous system i.e., neuron. Exploring the dynamical characteristics of neuron is very helpful in uncovering the mechanism behind brain functions. Along with this, revealing the parallel processing in brain requires knowledge of coupling and synchronization among different neurons. In this thesis work, the dynamical features and effect of coupling strengths on synchronization in network of neurons are studied. Bifurcation analysis are carried out to find out the variation in excitability considering stimulus intensity as the bifurcation parameter. Besides the dynamics of point neuron, the signal propagation in the neuron structure is also investigated. The neuron structure consists of amalgamation of dendrites, soma, axon and synapse each exhibiting different dynamics. The study of signal propagation in complete neuron structure is helpful to depict the dynamics of biophysical activities. The effect of random opening and closing of ion gates and ephaptic interaction are taken care of by adding white Gaussian noise in the analysis. A different method to evaluate signal propagation is proposed which is based on calculation of Fourier coefficients from the generated wave.

For more details click here

back

Title : *Intelligent Controller Design For Configurable Control Systems*
Author(s) : *Gopal Krushna Das*
Roll No : *Y3104032*
Supervisor(s) : *Behera Laxmidhar*

Abstract

Fuzzy Logic Controllers (FLCs) using Genetic Algorithm have been designed for four different dynamical systems. The parameters of fuzzy logic controller have been determined optimally by using genetic algorithm with multi objective cost function. 1. Poor water level control of U tube steam generator (UTSG) in nuclear powerplant may lead to frequent nuclear shutdown. UTSG of pressurized water reactor (PWR) has a time varying dynamics. FLC has been designed for this system and its performance is compared with LQR controller. It is found that its performance is as comparable with LQR controller. 2. Control of a U tube steam generator is possible if a proper mathematical model can be derived. A U tube steam generator has been modeled for analyzing its behavior. The PD, PI and fuzzy logic controllers have been implemented for controlling the water level. 3. FLC controller has been implemented on a single link manipulator and its performance has been tested with linearized and PD controllers. It is found that FLC performs better than PD Controller and is well compared with linearized control schemes. 4. FLC has been used to balance a reaction wheel pendulum, which is an underactuated system.

For more details click here

back

Title : *Space Vector Modulation Of Dynamic Voltage Restorer To Improve Power Quality*
Author(s) : *Bhaumik B Sherdiwala*
Roll No : *Y3104089*
Supervisor(s) : *Ghosh Arindam& Joshi Avinash*

Abstract

Various types of voltage disturbances occur in a power distribution system. These disturbances may be due to voltage sag/swell, unbalance, distortion, momentary interruption, flicker etc. These disturbances may be unacceptable to most customers. Office automation, process automation, medical and communication equipment used in everyday life are sensitive to such voltage disturbances. If these disturbances are not properly mitigated, they can be the cause of equipment breakdown or mal-operation resulting in equipment damage or production loss. Dynamic Voltage Restorer (DVR) is a compensating type custom power device that protects sensitive loads from all kinds of supply side disturbances. The DVR is realized using a solid-state DC to AC switching power converter (inverter) that injects voltages of required magnitude, phase and frequency in series with the distribution feeder such that the load voltages become balanced sinusoidal. Voltage source inverters (VSI) are used to inject voltages effectively and efficiently. In the present work, DVR operation for voltage sag mitigation has been discussed. Three different VSI topologies viz., two-level three-leg VSI, two-level four-leg VSI and three-level diode clamped VSI have been used to realize the DVR separately. Space Vector Modulation (SVM) technique has been used for all the three VSIs. Important issues for SVM, such as definition of voltage space vectors, identification of nearest vectors, calculation of switching time and switching sequences have been addressed. Simulation results for the DVR operation during voltage sag have been presented and performance evaluation of DVR using different VSIs have been examined. Key Words: - Dynamic Voltage Restorer, Space Vector Modulation.

For more details click here

back

Title : *Design And Simulation Of A Harmonic Compensator In Power Systems Using Hybrid Parallel Active Filter*
Author(s) : *Kingshuk Kr Das*
Roll No : *Y3104046*
Supervisor(s) : *Sensarma ParthaSarathi*

Abstract

The design of the track-foundation-soil system of a railway track depends on many factors like the thickness of the granular layer (formation thickness), strength and stiffness of the subgrade soil, strength of the granular materials used etc. The thickness and the strength of the granular layer play key roles in the design of railway track from the point of civil engineering. In the present study, a new design approach is proposed for the design of granular layer thickness. It takes in to consideration the shear strength parameters of the foundation soil, foundation coefficient and other important variables and is based on a rotational failure of the subgrade soil about a point just below the end of the sleeper. In this approach, first of all, a required factor of safety is decided based on several considerations and then it is used to evaluate the thickness of the granular layer. A detailed parametric study has been carried out to bring out the effect of various parameters of soil and railway track. Results show that the proposed method for the design of granular layer thickness of a railway track is well suited for the c-O soil. It is observed that resilient Young's modulus of the granular materials, foundation coefficient and resilient Young's modulus of subgrade soil have appreciable influence on the granular layer thickness. A comparison of the proposed design method with two other methods shows that the method leads to a more economical design.

For more details click here

back

Title : *Design And Tuning Of Power System System Stabilizer For Kaiga Nuclear Power Plant*
Author(s) : *Panda Sakti Prasad*
Roll No : *Y3104081*
Supervisor(s) : *Singh Sri Niwas*

Abstract

With the increase in the complexity of power system, mostly in the generation, control and transmission levels, stable operation of the system under various conditions is of main concern. Power system is highly non-linear and unpredictable in nature. So stability studies of the system as a whole is very challenging. Proper modeling of dynamics of all the components with sound knowledge of all the constraints is necessary for a detailed study of power system. With reasonable assumptions and simplifications the study can be made easier. In many cases, instability and eventual loss of synchronism are initiated by some spurious disturbance in the system resulting in oscillatory behaviour that, if not damped, may eventually build up. This is very much a function of the operating condition of the power system, such as strength of the system, generator power output, and Automatic Voltage Regulator (AVR) settings. Oscillations, even if undamped at low frequencies, are undesirable because they limit power transfers on transmission lines, in some cases, may take the generator out of synchronism and induce stress in the mechanical shaft. Power System Stabilizer (PSS) aids in damping these small oscillations via modulation of the generator exciter. The art and science of PSS application has developed considerably over the last few decades. In this thesis the small signal instability problem associated with Kaiga Nuclear Power Plant (NPP) is addressed. The causes for the oscillation are determined and PSS is tuned to damp out these oscillations. An intelligent Fuzzy Logic PSS is also designed, which can be used in place of the existing PSS for proper operation of the system. Other standard methods are also studied and developed for application purposes.

For more details click here

back

Title : *Vector Control Of A Permanent Magnet Synchronous Motor*
Author(s) : *Sharma Ravindra Kumar*
Roll No : *Y3104075*
Supervisor(s) : *Behera Laxmidhar*

Abstract

The thesis is concerned with vector control of permanent magnet synchronous motor (PMSM). Recent research has indicated that PMSM could become a serious competitor to the induction motor (IM) for high performance servo applications. Mathematical model of a PMSM is developed with the help of Park and Clarke transformations. The concept of vector control is applied to PMSM to obtain linear dynamics similar to that of a DC motor. Consists of two control loops namely, current loop and speed loop. The objective of the control scheme is to achieve very fast response. The performance of PMSM drive system under different speed reference input is evaluated on the basis of simulation and experimental results. All the experiments have been done on PMSM with the help of ADMC-401 motor control DSP and an inverter circuit at BARC Bombay. Bang bang and fuzzy logic controllers have been implemented on a separately excited DC motor. Similarly bang bang, sliding mode control, state feedback linearization and fuzzy logic controllers have been implemented on an inverted pendulum system. These control schemes are studied to know the state of the art in nonlinear control. PMSMs are helpful for very high speed position tracking of radar signals. This work is intended for the use in a project of national importance.

For more details click here

back

Title : *Simulations And Experiments In Robotic Systems: A Simple Robotic ARM And An Eight DOF Biped Humanoid Robot*
Author(s) : *Dip Goswami*
Roll No : *Y3104022*
Supervisor(s) : *Behera Laxmidhar& Dutta Ashish(ME)*

Abstract

Nonlinear Dynamic model of an Eight DOF biped humanoid has been studied. PDController, with feedback linearization, has been designed for stable dynamic walking of an eight DOF biped. Neural network based controllers using decentralized scheme has also been designed for the same purpose. A comparative study of the performances of the above controllers has been done. Four different control algorithms have been studied and implemented on a single DOF robot arm. These control algorithms are PD, PID, LQR and neural network based control. These experiments confirm that neural network based controller perform better for high speed trajectory tracking when the system parameters are uncertain. A single DOF leg and foot has been designed. A force control technique has been successfully implemented to bring the above mentioned single DOF leg from any initial position to vertical position. Experiments in biped walk have been carried out on an eight DOF biped robot, using a standard PMAC motion controller. The results prove that the robot can walk straight by dynamically balancing its ZMP.

For more details click here

back

Title : *Optimal Reactive Power Planning And Pricing Analysis In A Competitive Electricity Market*
Author(s) : *Moger Tukarama*
Roll No : *Y3104104*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

A methodology for reactive power planning and pricing analysis is presented. Attention is given to the reactive power marginal prices in a competitive electricity market. The methodology has been implemented using a modified optimal power flow. The planning problem involves optimal placement and sizing of capacitor at load buses to improve the system voltage profiles and reduce losses in a network so that operating and investment costs are minimum. A simple bus-wise cost benefit analysis (CBA) is presented which involves solving a modified OPF problem iteratively. The CBA incorporates detailed hourly loading conditions at a bus and achieves a fairly accurate estimate of the benefits from capacitor placement. A reactive power marginal price is studied in details under different system operating conditions to observe how these conditions influence reactive power marginal prices. The IEEE-14 and IEEE-I 18 bus systems have been used for the application of methodology. Results demonstrate that the active and reactive power marginal prices give economic signals that could impel even more the participation of agents of competitive reactive power markets.

For more details click here

back

Title : *Full Bridge Zero-Voltage-Switching Converter For Wide Load Range Applications*
Author(s) : *Kumar D Durga Praveen*
Roll No : *Y3104022*
Supervisor(s) : *Sensarma ParthaSarathi*

Abstract

Magnet power supplies in the accelerator works need a DC- DC power supply with the stringent requirements of low EMI and high resolution in the output current. The drive for achieving higher efficiency and low power density forces one to operate the power supplies at a higher switching frequency. Switching losses in the semiconductor devices at higher frequencies poses a limit to the operating frequency of the power supply. Hence soft switching is needed to lower/eliminate these losses. This project aims to develop a power supply under Resonant Transition converters category, for the present application with soft switching through load variation. Full bridge converter with phase modulation technique is used to control the current through the electro magnet. Turn-on losses of the switching device are eliminated by turning it on when the voltage across it is zero. Turn-off losses are minimized by using the snubber capacitance across the switches. In the present topology an auxiliary circuit is added to the full bridge to assist the ZVS for lagging pair of switches. The novelty of this topology lies in the arrangement to disconnect the pole for load currents greater than certain limit. This limit depends on the leakage inductance of the intermediary high frequency transformer. The trade off between leakage inductance assisted ZVS and the pole assisted ZVS is done by optimizing the conduction losses of the full bridge.

For more details click here

back

Title : *Fault identification And Location Electrical Distribution Networks Using Ann And Wavelet Transform*
Author(s) : *Prabodh Dewangan*
Roll No : *Y3104062*
Supervisor(s) : *Srivastava S C*

Abstract

To meet the ever rising demand of electrical energy, most of the countries, including India, are going for large scale expansion of their power generation system, which is largely based on fossil fuels. The contribution of power plants in the emission of Green House Gases (GHGs) has been found to be significant. Thirty nine countries across the globe, under a United Nations Framework Convention on Climate Change (UNFCCC), held in Kyoto in December 1997, decided to reduce their GHG emissions by an average of 5.2% of their base level emissions in the year 1990, during the first commitment period of 2008-2012. India has ratified the Kyoto Protocol and is categorized as a non Annex-I country, which does not have any emission caps at present. Various tools were proposed to assist these emission capped countries in achieving their emission targets, including Clean Development Mechanism (CDM). Since not much literature is available to identify and quantify the impact of CDM projects on the Indian power sector, this thesis presents a detailed study on this subject. The present work quantifies various parameters associated with the generation expansion planning to identify the CDM projects using GHG emission reduction, total cost and Marginal Abatement Cost (MAC) as decision parameters. The utility, financial and environmental implications of the identified CDM options on the integrated Indian power system has been studied and analyzed. Sensitivity analyses of expansion costs and GHG emissions with respect to change in commitment year of CDM options have been presented. An Integrated Resource Planning Analyses (IRPA) package and CPLEX optimization software have been used for this purpose. According to this study, Solar and BIGCC (Biomass Integrated Gasification Combined Cycle) technologies have been identified as candidate CDM options. However, an analysis of utility, cost and environmental implications of these candidate CDM technologies reveal that the BIGCC is a more promising technology under Clean Development Mechanism. VI

For more details click here

back

Title : ***Identification Of Projects Under Clean Development Mechanism And Their Impact On Generation Planning Of Indian Power System***
Author(s) : ***Sankara Srikanth***
Roll No : ***Y3104083***
Supervisor(s) : ***Srivastava S C***

Abstract

To meet the ever rising demand of electrical energy, most of the countries, including India, are going for large scale expansion of their power generation system, which is largely based on fossil fuels. The contribution of power plants in the emission of Green House Gases (GHGs) has been found to be significant. Thirty nine countries across the globe, under a United Nations Framework Convention on Climate Change (UNFCCC), held in Kyoto in December 1997, decided to reduce their GHG emissions by an average of 5.2% of their base level emissions in the year 1990, during the first commitment period of 2008-2012. India has ratified the Kyoto Protocol and is categorized as a non Annex-I country, which does not have any emission caps at present. Various tools were proposed to assist these emission capped countries in achieving their emission targets, including Clean Development Mechanism (CDM). Since not much literature is available to identify and quantify the impact of CDM projects on the Indian power sector, this thesis presents a detailed study on this subject. The present work quantifies various parameters associated with the generation expansion planning to identify the CDM projects using GHG emission reduction, total cost and Marginal Abatement Cost (MAC) as decision parameters. The utility, financial and environmental implications of the identified CDM options on the integrated Indian power system has been studied and analyzed. Sensitivity analyses of expansion costs and GHG emissions with respect to change in commitment year of CDM options have been presented. An Integrated Resource Planning Analyses (IRPA) package and CPLEX optimization software have been used for this purpose. According to this study, Solar and BIGCC (Biomass Integrated Gasification Combined Cycle) technologies have been identified as candidate CDM options. However, an analysis of utility, cost and environmental implications of these candidate CDM technologies reveal that the BIGCC is a more promising technology under Clean Development Mechanism. VI

For more details click here

back

Title : Simulation And Performance Evaluation Of 3-Phase High Power Unified Power Quality Conditioner For Power Distribution Systems

Author(s) : Hema Rani P

Roll No : Y3104034

Supervisor(s) : Das Shyama Prasad

Abstract

Quality of power has become an important issue in distribution systems. There has been a continuous evolution in the topologies and types of active filters to improve the quality of power. The basic issues in power quality are two fold. One is to maintain the utility voltage constant irrespective of any kind of voltage variation, while the second one is to supply the necessary reactive and harmonic power of the load locally so that it is not drawn from the supply. Excessive reactive power and harmonics flow through lines causing losses. Series active filters are used to maintain the utility voltage constant while shunt active filters supply the harmonic and reactive components of the load to make the source current at unity power factor with the source voltage. The effectiveness of active filters at high power level has increased with the introduction of multilevel inverters. Unified Power Quality Conditioner (UPQC), which is a combination of shunt and series active filter, simultaneously compensates for deviation in utility voltages like sag, swell, flickers etc. and make the source current nearly sinusoidal by compensating, for reactive and harmonic components in the load. Multilevel UPQC is an option which can be used for power quality issues in distribution level as the concept of multilevel allows the use of less rated semiconductor devices. For low distribution voltage levels, a multilevel UPQC can be connected to the system even without transformers. The present thesis deals with the simulation and performance evaluation of three level unified power quality conditioner as applicable in high power distribution systems. A three level UPQC for three phase four wire system and three phase three wire system is designed and its performance for various compensation objectives are studied. Two methods of current compensation are used, one based on generalized instantaneous theory and the second one using capacitor voltage feedback. Simulation studies for various static and dynamic conditions are carried out, The three level UPQC is found to be working effectively for its designed objectives.

For more details click here

back

Title : *Design Simulation And Development Of An Uninterruptible Switched-Mode Power Supply For Personal Computers*
Author(s) : *Gadde Srikanth*
Roll No : *Y3104027*
Supervisor(s) : *Das Shyama Prasad*

Abstract

This thesis introduces the concept of an uninterruptible switched-mode powersupply which performs the combined functions of an uninterruptible power supply and aswitched-mode power supply, using only one DC-DC power conversion stage, toovercome the shortcomings of traditional SMPS and UPS combination. The key elementof the proposed power supply is a DC-DC Converter with input from battery. The DC-DC Converter uses full bridge topology with high frequency operation to provide goodperformance and reduced size. The power supply is one of the most crucial componentsfor personal computers. The traditional way to protect computers against power failure isto add an uninterruptible power supply preceding the input of switched-mode powersupply. This combination is highly inefficient due to multiple power conversion stagesowing to separate design of SMPS and UPS. This project aims at bridging this gap bydesign, simulation & hardware implementation of a simple, efficient and compact powersupply for personal computers which integrates the external UPS into the computerswitching power supply to form an uninterruptible switched-mode power supply. Thisdesign offers substantial improvement in efficiency, size and cost over the conventionalcascade of UPS and SMPS due to single power conversion stage, high frequencyswitching and removal of design redundancy. The operation, design, simulation andexperimental implementation of the converter are presented.

For more details click here

back

Title : *Switching Control Strategies For A Reaction Wheel Pendulum*
Author(s) : *Kamarajugadda N Srinivas*
Roll No : *Y3104042*
Supervisor(s) : *Behera Laxmidhar*

Abstract

Control of a reaction wheel pendulum, a prototype of an under-actuated system, is easily done using switching control strategies [15] which combines swing-up control and balancing control schemes. In this thesis, three novel swing-up control strategies for a reaction wheel pendulum have been proposed. The first swing-up control strategy coined as sinusoidal swing-up control, which treats the oscillations of the pendulum as perturbations from the bottom equilibrium point. The second swing-up control is trajectory tracking based swing-up control. The third swing-up control is based on interconnection and damping assignment-passivity based control (IDA-PBC). IDA-PBC preserves the structure of the system and gives more physical insight about any mechanical system. Any balancing controller can be coupled with the proposed swing-up control strategies to stabilize the pendulum at the top unstable equilibrium position. The control task of balancing the pendulum in top upright position is completed by switching from swing up scheme to the balancing scheme at the point where the pendulum is very near to the top equilibrium point. To accomplish this task, balancing control strategies have also been discussed. Proposed switching control strategies have been implemented in real time in switching mode on a Mechatronics Control Kit. The three proposed swing-up control schemes provide fast responses as compared to existing energy based schemes. For control research and education, an experimental platform has been constructed to control a single link manipulator.

For more details click here

back

Title : *Dynamical Aspects And Learning In Biological Neuron Models*
Author(s) : *Yadav Abhishek*
Roll No : *Y3104006*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

Neuronal dynamics and learning are closely related. This thesis is an attempt to explore the close relationship between these two phenomena. Researchers have experimentally observed that chaos and strange attractors are helpful in learning various patterns in brain. Study of chaotic behavior of biophysical neuron models and their learning capabilities is an important step towards analyzing the overall functioning of brain. Analysis of the nonlinear dynamics and chaotic behavior of individual neurons as well as their interconnections has been made in order to investigate their learning capabilities. Two new neuron models for artificial neural networks are proposed. It is found that the inclusion of more of biological phenomena in an artificial neural network significantly improves its learning capability. The first model is based on an aggregation function which mimics the relationship between injected current and interspike interval for integrate-and-fire neurons. The second model is a modification of existing spiking neuron model in which probabilistic spiking and nonlinear dendritic interactions are considered. It is observed that even a single neuron of these models is capable of performing classification and function approximation tasks very efficiently.

For more details click here

back

Title : *Load Compensation Of Distribution System Using Dstatcom Based On Five-Level Diode Clamped Multilevel Inverter*
Author(s) : *Naidu Navin Mohan*
Roll No : *Y3104056*
Supervisor(s) : *Ghosh Arindam& Joshi Avinash*

Abstract

There has been rise in power electronics loads which are major source of harmonic generation and unbalance in currents, thereby affecting all the loads connected to a distribution system. DSTATCOM is a shunt compensator used for harmonic filtering, power factor correction and load balancing in a power distribution system. Traditionally, the conventional two level inverter structures have been used to realize the DSTATCOM. However, for high voltage distribution networks, a transformer is necessary to meet the desired voltage profile, as the available power semiconductor devices are not of such higher ratings. The transformers make this device bulky. To avoid the use of transformers, multilevel inverters with their high voltage, high current rating can be used. Diode-clamped multilevel inverter is one of the multilevel inverter topologies. In this thesis, a five-level diode clamped multilevel inverter structure has been chosen to construct a DSTATCOM. The diode-clamped inverter structure is operated in current control mode. A hysteresis current control technique is derived, which uses all the five output voltage levels of the diode clamped inverter to track the desired current. The dc-link of the inverter constitutes of dc capacitors. The dc-link voltage is regulated around a fixed reference value using a PI controller. Diode-clamped structure has the inherent property that its dc-link capacitors become unbalanced due to over utilization of some of the inner capacitors in generating the different output voltage levels. A chopper-circuit has been used to overcome this unbalance problem. The choppers are able to maintain the voltages across the dc capacitors within a specified band. The distribution system under consideration contains both unbalanced and nonlinear loads. The system study has been performed separately on the distribution system having ideal and non-ideal supply i.e., stiff and non-stiff voltage sources. A filter structure for bypassing high frequency components has been discussed and simulated.

For more details click here

back

Title : ***Optimal Reactive Power Planning And Pricing Analysis In A Competitive Electricity Market***
Author(s) : ***Moger Tukarama***
Roll No : ***Y3104104***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

A methodology for reactive power planning and pricing analysis is presented. Attention is given to the reactive power marginal prices in a competitive electricity market. The methodology has been implemented using a modified optimal power flow. The planning problem involves optimal placement and sizing of capacitor at load buses to improve the system voltage profiles and reduce losses in a network so that operating and investment costs are minimum. A simple bus-wise cost benefit analysis (CBA) is presented which involves solving a modified OPF problem iteratively. The CBA incorporates detailed hourly loading conditions at a bus and achieves a fairly accurate estimate of the benefits from capacitor placement. A reactive power marginal price is studied in details under different system operating conditions to observe how these conditions influence reactive power marginal prices. The IEEE-14 and IEEE-I 18 bus systems have been used for the application of methodology. Results demonstrate that the active and reactive power marginal prices give economic signals that could impel even more the participation of agents of competitive reactive power markets.vii

For more details click here

back