

M.TECH. THESIS ABSTRACT 2007

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Microelectronics, VLSI & Display Technology

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RF Microwaves and Photonics

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Signal Processing, Communication & Networks

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Title : *A Novel Approach To The Frequency Control Of CMOS Ring Oscillators With High Noise Rejection Capability*
Author(s) : *Dixit Pushkar*
Roll No : *Y2157300*
Supervisor(s) : *Dutta Alope*

Abstract

This work presents a new frequency control scheme for CMOS ring oscillators. Existing topologies of ring oscillators, namely the current-starved and differential oscillators, are first explored and their merits and demerits are presented. The problems inherent in these topologies, vis-a-vis not having rail-to-rail swing and non-linear frequency control characteristics, which necessitated a new scheme, are highlighted through simulations done using Tanner Spice. Subsequently, we presented our scheme of frequency control. The mechanism for frequency control is through a change in the threshold voltages of the devices of the oscillator, caused by a change in their body bias. This idea came from the Linear Time Variant (LTV) model for the phase response. We investigated three schemes: one with body biasing NMOS only, the other with body biasing PMOS only, and finally biasing the bodies of both NMOS and PMOS through symmetric bias voltages, having an offset equal to the power supply voltage.

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Title : *Study Of Annealing Effects On P3HT:PCBM Bulk Hetero Junction Organic Solar Cells*
Author(s) : *Pagare Vinod*
Roll No : *Y5104071*
Supervisor(s) : *Iyer SSundarKumar*

Abstract

Solar energy is the most promising choice to fulfill growing energy demand of the current civilization. Environment friendly and low cost production of organic photovoltaic has the potential to replace other renewable and non-renewable energy sources. In the past few decades, there has been a tremendous growth in research efforts in polymer photovoltaics. Polymer/fullerene bulk heterojunction solar cells have shown significant and confirmed improvement in performance and efficiency. However, the present efficiencies are still not high enough to bring the technology into production. For that to happen, lot more research work is needed. This thesis is an attempt toward that direction. This work relates to bulk heterojunction organic solar cells. More specifically, it relates to the fabrication method of bulk heterojunction organic solar cells employing conjugated polymer poly 3-hexylthiophene (P3HT) as a donor, and derivatives of C₆₀[6, 6]-phenyl C₆₁-butyric acid methyl ester (PCBM) as acceptor.

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Title : *Imidazolin-5-One Molecules Based Organic Solar Cells*
Author(s) : *Jain Vibhor*
Roll No : *Y2157416*
Supervisor(s) : *Iyer S Sundar Kumar*

Abstract

The exponential increase in global energy demand over the past few decades has not only put a lot of pressure on the limited supply of fossil fuel sources of energy, but also seems to be having a detrimental effect on the delicate natural balance that sustains life on earth. Thus the need for renewable, non-polluting sources of energy is of utmost importance in the present day scenario. Directly tapping the abundant energy from sunlight seems to be the most practical solution for generating clean and inexpensive electrical power. Organic solar cells fabricated by ecologically friendly processes and materials have the potential to provide low cost and environment friendly alternative to the existing expensive sources of energy. The goal of this project is to develop organic solar cells based on some of the novel molecules from the imidazolin-5-one family synthesized at IIT Kanpur.

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Title : *An Analytical Gate Tunneling Current Model For MOSFETs Having Ultrathin Gate Oxides*
Author(s) : *Mondal Imon*
Roll No : *Y5104023*
Supervisor(s) : *Dutta Aloke*

Abstract

In this work, we present a completely analytical model for the gate tunneling current in present generation MOSFETs, having ultrathin gate oxides and high substrate doping concentrations. The model has been developed from first principles, and does not use any empirical fitting and/or correction parameters. It takes into account the quantization of the electron energy levels within the inversion layer of a MOSFET, which behaves similar to a potential well, and develops the model of the electron wavefunction within the potential well formed near the semiconductor insulator interface. While doing so, a compact expression for the ground state energy level within the quantum well is also postulated, by taking the positional variation of the electric field within the semiconductor into account. During the development of the wavefunction, some important simplifications regarding the well structure have been made, which have been rigorously justified.

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Title : A Dynamic Logic Family Using Only N Or P-Type Enhancement Mode MOSFET
Author(s) : Agarwal Ashish Kumar
Roll No : Y5104012
Supervisor(s) : Mazhari Baquer

Abstract

This thesis describes a new Single Transistor Type Dynamic Logic (STTDL). With this logic design style, complex digital circuits can be designed with either only N-type or P-type transistors. Gated diode based voltage boosting technique is used to compensate the degradation of voltage due to threshold drop across MOSFET. Also, the concept of delayed clock is used to overcome the problem of cascading of logic blocks. The proposed logic shows significant performance advantage in terms of area, delay and static leakage over the conventional Domino logic. Simulations and layout show 25% to 40% improvement in terms of area and 25% improvement in terms of speed. Moreover, because of low gate leakage of PMOS, the P-type STTDL shows significant reduction in static leakage in submicron technologies. Results are presented for basic logic circuits like NAND, NOR, Half Adder and 4-bit carry lookahead adder to validate the proposed design.

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Title : *A Novel Algorithm For Data Hiding In Images And Its Hardware Implementation*
Author(s) : *Gupta Akash*
Roll No : *Y2157035*
Supervisor(s) : *Qureshi Shafi*

Abstract

Data hiding is the process by which a message signal, or signature, is covertly embedded within a host data set to form a composite signal [11]. Data hiding has numerous applications and a proper dedicated hardware for data hiding would enhance its speed and usability. Presently no efficient hardware implementation of data hiding algorithm has been published to the best of our knowledge. The present work describes a new data hiding algorithm. The proposed algorithm is specifically designed to make the hardware faster, less complex and less expensive. JPEG is the most common and practical form of attack (or compression) faced by images during transmission through communication links. Hence most of the data hiding algorithms (including the proposed) are designed so as to survive JPEG attacks [9]. These Hiding algorithms hide data in the host just after the Quantization step of JPEG.

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Title : ***Fabrication And Characterization Of Pentacene Based Organic Thin Film Transistor (OTFT) With PMMA Dielectric***
Author(s) : ***Kumar Arvind***
Roll No : ***Y5104010***
Supervisor(s) : ***Mazhari Baquer***

Abstract

An all-organic active matrix organic light emitting diode display (AMOLED) offers the prospect of low cost implementation of high performance flat panel displays on flexible substrates. An important step towards this goal is realization of organic TFT with mobility comparable or better than that of amorphous silicon transistors. This work describes fabrication and characterization of top contact, bottom gate Organic Thin Film Transistor (OTFT) with vacuum deposited Pentacene as semiconductor and spin coated Poly Methyl Methacrylate (PMMA) dielectric on Indium Tin Oxide (ITO) coated glass substrate. Transistors with different thicknesses of PMMA were fabricated and the best field effect mobility of $0.613 \text{ cm}^2 \text{V}^{-1} \text{s}^{-1}$ was obtained for a dielectric thickness of 4000 \AA at PMMA concentration of 50 mg cm^{-3} and spin speed of 3800 rpm for 60s. Among the problems with the devices, gate leakage is the most serious one. Because of its high value, estimate of true on/off ratio

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Title : ***Current Balance In Organic Light Emitting Diode***
Author(s) : ***Dewett Radesh***
Roll No : ***Y5104046***
Supervisor(s) : ***Mazhari Baquer***

Abstract

To obtain high efficiency in organic light-emitting diodes (OLED), it is important to ensure that recombination of electrons and holes occur close to the organic-organic interface and away from quenching sites near electrodes. A high recombination efficiency requires a proper balancing of electron and hole injected currents. In this work, 1-D numerical simulation is used to understand factors that affect recombination efficiency (or current balance) in bilayer OLED. Results are presented which describe the impact of various device parameters including field dependent carrier mobility, energy offsets at the organic interface, injection barrier height at the metal-organic interface and applied voltage on recombination efficiency. It is shown that recombination close to the organic-organic interface in electron transport layer (ETL) requires that electron current dominates over the hole current injected in ETL. This condition can occur if hole mobility is much smaller than electron mobility

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Title : ***Fibre Optic Remote Linkage Optrode Development For Characterization Of Trace Level Species In Solution***
Author(s) : ***Gautam Nutan***
Roll No : ***Y5104036***
Supervisor(s) : ***John Joseph***

Abstract

Optical fibres have a vast range of applications ranging from long haul telecommunication to sensing applications. Optical fibers are increasingly being used for sensing applications because of their inherent advantages over conventional sensors. Fiber optic probes are used in a variety of sensing applications. Fibre optic probes, also known as Optrodes, are made of a bundle of fibres. They are used to carry out spectroscopic studies of samples in difficult and non-accessible hostile environments. The objective of this thesis was to design, fabricate and characterize fibre optic probes for their utilization in the analysis of solutions in remote environment. A number of fibre optic probes have been used in this study with varied fiber parameters. The optrode essentially included one light carrying fiber to carry light from source to target and a few collecting fibres to take the emitted light back from the target, bundled together to form the probing end.

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Title : *Band Pass Filter Realization Using Degenerate Dual- Modes Of A New Type Of Patch Resonator For Significant Size Reduction*
Author(s) : *Zinka Srinivasa Rao*
Roll No : *Y5104061*
Supervisor(s) : *Biswas Animesh*

Abstract

A new type of dual mode patch resonator has been proposed, and bandpass filters have been designed by perturbing its degenerate modes using two slots which are orthogonal to each other. Also it has been showed that both the degenerate modes can be varied independently by adjusting one slot length at a time. Geometrical size as well as radiation loss has been reduced further by using inductively loaded cross-slotted patch resonator. A bandpass filter operating at 2.91GHz with a fractional bandwidth of 4.69% has been designed after miniaturization. Also a transmission zero can be made to appear in either side of stop band in the vicinity of passband. A filter like this can be used in implementing diplexers where filter response characteristics required are asymmetrical in general. Thus using this kind of filters will reduce the complexity of the design in terms of order as well as size.

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Title : ***FMCW Radar Based Level Measurement System***
Author(s) : ***Bhushan Bharat***
Roll No : ***Y5104016***
Supervisor(s) : ***Sachidananda M***

Abstract

The application of FMCW radar technique for short distance or level measurement has been analyzed and a design for measurement system based on this technique has been presented in this thesis. The system has been designed for operation in X-band (11GHz) for measurements up to 30 m. Such a system has the advantages of being non-contacting and immune to varying parameters of the material (whose level is required to be measured) as well as the environment such as varying density, temperature and pressure etc. The principle of operation and salient features of FMCW radar have been discussed briefly in the beginning of the thesis. Two novel concepts, namely 'Amplifier and Mixer Combination' and 'Delay Locked Loop' have also been analyzed. A transceiver based on amplifier and mixer combination obviates the requirement of either having separate antennas for transmission and reception or the use of circulator/coupler to separate the transmit and receive paths.

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Title : ***Antenna Orientation Identification***
Author(s) : ***Kumar Rajesh***
Roll No : ***Y5104051***
Supervisor(s) : ***Harish A R***

Abstract

Indoor wireless systems are used in a large variety of office, factory and residential environment. Thus guidelines for radio port (or Access point) placement are needed to ensure satisfactory performance at the lowest cost. These guidelines must be derived from a large body of site-specific propagation data. However, collecting a statistically significant database through measurements is a daunting task. Alternatively, this database can be generated by using propagation models, validated by measurements. In this thesis, we describe a 3D and 2D ray tracing algorithm which accounts for all (transmitted as well as reflected) rays reaching the receiver location after an arbitrary number of reflections. We include the effects of the angle of incidence, the material dielectric constant and the antenna patterns. The predicted results from 2D and 3D simulations are then compared against measurements carried out in the laboratory to establish the accuracy of this approach.

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Title : ***Design And Development Of A Trackside Rail Vehicle Identification System For The Indian Railways***
Author(s) : ***Dhole Akash***
Roll No : ***Y5104003***
Supervisor(s) : ***John Joseph***

Abstract

Railways are in the process of implementing a sensor based automatic trackside monitoring system. Automatic identification of rail vehicles will link this sensor data to the rail vehicle to which it pertains. RFID efficiently does this task with an added advantage of tags having enough memory to store the maintenance history of the rail vehicle. RFID tags are placed on the rail vehicles, and reader with antennae is placed on trackside. The sensors will pick up data and the reader will identify the vehicles to which this data pertains, by reading the tags ID of the tags placed on the vehicles. The repair/overhaul site will also have a set of Reader and antennae to read the detailed tag data which may be used by the technicians to know the history of past repairs. On completion of repairs, the tag data can be updated, with details of these, by writing into the tag. The high speed at which the tags move across the reader antenna makes this application different from standard RFID applications.

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Title : *Measurement Of Complex Permittivity Of Conducting Fabrics*
Author(s) : *Parashar Anoop*
Roll No : *Y5104006*
Supervisor(s) : *Sachidananda M*

Abstract

The problem of finding complex permittivity of the conducting fabrics has been addressed in this thesis, using transmission/reflection rectangular waveguide technique. This method uses partially-filled waveguide for the measurement of the material properties than conventional waveguide method. The measurement device VNA is first calibrated and scattering parameters are measured for the empty waveguide cell. This data is used as reference for other samples. The change in s-parameters is measured by placing the fabric in the empty waveguide. The FDTD based simulation software and Mode-matching based theoretical analysis is used to extract the complex permittivity of the fabrics from experimentally measured s-parameters. This analysis determines the loss tangent of the fabrics and gives the information which fabric sample is effective for EMI shielding. The results show that this method is very simple, free from errors occurs in conventional waveguide due to air gaps.

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Title : ***Indoor Position Sensing Using RFID***
Author(s) : ***Chattopadhyay Arunabh***
Roll No : ***Y5104009***
Supervisor(s) : ***Harish A R***

Abstract

The problem of Indoor Position Location Tracking has been addressed in this thesis, using Passive UHF RFID tags. The test area is first calibrated by placing some reference tags at known positions and orientations. This data obtained by measuring the detection powers to excite the reference tags is later used to train an algorithm, which is in turn used to predict unknown tag positions. Two different techniques have been evaluated using the given reference data, namely 'Nearest Neighbor Algorithm' and 'Artificial Neural Networks'. The results obtained have been discussed. Their performances have been compared. Some other properties of these techniques have also been analyzed.

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Title : *Design Of A Grating Assisted Lateral Directional Coupler By Impurity Induced Quantum Well Intermixing Of In GaAs/GaAs*
Author(s) : *Barve Ajit Vijay*
Roll No : *Y5104002*
Supervisor(s) : *Das Utpal*

Abstract

A novel waveguide grating assisted coupler, suitable for a CWDM system, based on quantum well intermixing process in InGaAs/GaAs has been designed and a complete numerical simulation has been performed. The proposed device processing is similar to those used in nominal microelectronics processing and does not require any regrowth for the fabrication of the gratings, as opposed to demonstrated vertical couplers on semiconductors. The device has been modeled from the first principle of refractive index change due to F implantation and anneal. The refractive index of the quantum well intermixed multi-quantum wells has been calculated from the energy band structure in conduction and valence bands, including the effect of strain. Variation of the quantum well energies with the interdiffusion has been studied by solving Schrödinger wave equation numerically.

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Title : *Video In painting And Object Separation*
Author(s) : *Raghavendra K*
Roll No : *Y5104025*
Supervisor(s) : *Venkates K S*

Abstract

A computer vision technique is proposed to remove a moving foreground object in a video sequence for digital post-processing. Recently various special effects have been employed in video production. Our contribution introduces one of the digital special effect techniques, moving object removal, background completion and moving foreground objects separation. To segment foreground objects in a video sequence, we used a pyramidal version of the background subtraction method. For segmentation, Gaussian mixture models are learned on the video sequence. We propose a novel post-processing technique for completion of a static background that comprises extending of image inpainting to video inpainting while maintaining temporal consistency. We also propose a novel motion inpainting technique for the completion of dynamic backgrounds. This process is a smooth extrapolation of local motion flow to the undefined area in a manner that preserves temporal consistency.

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Title : *Low Feedback Joint scheduling And Beam Forming Schemes For Multiuser MIMO Systems With Limited Feedback*
Author(s) : *Bajpayee Prashant*
Roll No : *Y2157274*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

Multiple-input multiple-output (MIMO) communication techniques have been an important area of focus for the next-generation wireless systems because of their potential for high capacity, increased diversity, and interference suppression. Limited feedback and multi-user MIMO systems are two different novel approaches to effectively utilize high capacity available in MIMO and combine it with the benefits of space-division multiple access (SDMA). Feedback in a communication system can enable the transmitter to exploit channel conditions and avoid interference. In situations where the feedback rate is limited, important issues are how to quantize the information needed at the transmitter and how much improvement in associated performance can be obtained as a function of the amount of feedback available. Whereas, simultaneous transmission to multiple users is capable of achieving very high throughput.

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Title : *Turbo-Equalization For Coded Data Transmission Over ISI Channels*
Author(s) : *Durbhakula Sandeep*
Roll No : *Y5104054*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

In this thesis, turbo equalization approach to coded data transmission over ISI channels is discussed, with an emphasis on the basic ideas and some of the practical details. Turbo-equalization is an iterative equalization and decoding technique, which can achieve equally impressive performance gains for communication systems that send digital data over channels which introduce intersymbol interference (ISI). A rate-1/2 convolutional code is considered and the channel is modeled as a tapped delay-line. The optimum turbo receiver consists of a channel maximum a posteriori (MAP) detector and a MAP decoder for the encoder convolutional code. Each MAP detector is implemented as a forward/backward algorithm operating on observations and soft inputs from the constituent MAP algorithm to produce a posteriori probabilities (APPs). The forward/backward algorithm is implemented efficiently in calculating the branch metrics and hence the extrinsic information.

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Title : *Heuristic For Adaptive Routing And Optimal Placement Of Wavelength Converters In Optical Networks*
Author(s) : *Singh Rakesh Pratap*
Roll No : *Y2157316*
Supervisor(s) : *Singh Yatindra Nath*

Abstract

With advent of WDM technology we are able to harness the benefit of fiber's potential with existing electronics. Problem of routing in WDM Networks became more complex due to wavelength continuity constraint and thus gave rise to two separate problems of routing and wavelength assignment. To solve routing subproblem many static routing algorithms were proposed. In this thesis we have explored the area of adaptive routing in WDM Networks. With the progress of technology, the development of wavelength converters, provided freedom from wavelength continuity constraint, essentially under its presence WDM Networks behaves as simple Circuit-Switched Network. To efficiently use the wavelength converters various kind of architecture e.g., sparse and shared were explored. In second part of this thesis we have proposed a sparse optimal wavelength converter placement heuristic for a optical network.

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Title : *Restoration Of Missing Information In Video Sequences*
Author(s) : *Madishetti Srikanth*
Roll No : *Y5104059*
Supervisor(s) : *Gupta Sumana*

Abstract

Restoration of missing information in video sequences that may arise due to transmission errors or due to aging of the video films is an important research problem. In video transmission frames lost are often restored by retransmitting the data. This incurs delay in the system. Instead of retransmission of the missing frames they can be restored using the information from the available frames thereby reducing the delay in transmission. The work presented in this thesis primarily focuses on, This thesis focuses on 1. Reconstruction of the missing frames at the output of MPEG decoder using a novel interpolation technique; 2. Detection and Removal of Persistent Scratches in Old Video films. The interpolation technique utilizes a novel background subtraction method in which the background is modeled based on RGB values and only the foreground region is interpolated using a variable patch size interpolation approach.

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Title : *Registration And Mosaicing Of Aerial Image Sequence From AUAV*
Author(s) : *Niranjana Shobhit*
Roll No : *Y2157369*
Supervisor(s) : *Gupta Sumana*

Abstract

Unmanned Aerial(UAV) Vehicles have provided researchers with a platform to extend research in computer vision to various applications. UAVs, in generic missions, carry imaging payloads, provide valuable aerial imagery. However, stitching up of aerial images to larger mosaics is a requirement, before they are put to use for different applications. In this work we have addressed the issue of image registration and mosaicing, for aerial images captured from a UAV. Image registration is the process of establishing correspondences between two or more images, taken at different times, from different viewpoints under different lighting conditions and/or by different sensors and aligning them with a reference co-ordinate system that is coherent with the three dimensional structure of the scene. Once feature correspondences have been established and the geometric alignment has been performed, the images are combined to provide a representation of the scene that is both geometrically and photometrically.

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Title : *Shift Based Speaker Normalization Using Center Of Gravity*
Author(s) : *Rani R Sandhya*
Roll No : *Y5104055*
Supervisor(s) : *Umesh Srinivasan*

Abstract

The variability in acoustic signals from different speakers uttering the same sound has an adverse effect on the performance of a speaker-independent (SI) speech recogniser. It has been widely accepted that vocal tract length is the major source of performance degradation, which can vary as much as 25% between speakers. These variations in vocal tract length are normally tackled by a procedure known as Vocal Tract Length Normalisation (VTLN). The variations due to vocal tract length are usually modelled as a linear scaling relation between spectra of speakers enunciating the same sound. Recently, it has also been shown that the non-linear scaling relationship is more appropriate which can be expressed as a fixed translation factor in mel domain. Speaker normalisation is realised by finding the linear scaling factor or the corresponding shifting factor in VTLN. In practice, since we do not have a reference speaker, a maximum likelihood based grid search is employed to find the scaling

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Title : *Enhanced Spatial And Temporal Error Concealment Methods*
Author(s) : *Chandrakanth Gorantla*
Roll No : *Y5104022*
Supervisor(s) : *Sharma Govind*

Abstract

Video/Image transmission over error-prone networks can suffer from packet erasures. This may cause the loss of blocks of data. Error resilience techniques are employed in the encoder side to decrease the error rate. At the decoder side, error correction techniques are employed. But these techniques may not recover lost data in case of erasure errors. An alternative method is to perform error concealment procedures on the received picture. Error concealment methods intend to conceal the effects of data block loss by restoring the lost information. This thesis consists of Enhanced temporal and spatial error concealment methods which yield better performance compared to existing techniques. The proposed Spatial error concealment method conceals the lost block of data by adaptively selecting the best edge direction to apply the corresponding smoothness measure to recover the lost Discrete Transform Coefficients (DCT).

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Title : *Error Concealment Techniques For Block-Based Video Coding*
Author(s) : *Mudithanapalli Ashok*
Roll No : *Y5104014*
Supervisor(s) : *Sharma Govind*

Abstract

Video coding has attracted much attention in the recent past, especially due to the large amount of digital video content available today. Video transmission and storage requirements result in efficient compression techniques with many different standards, such as MPEG-2, MPEG-4, H.263, and H.264. The transmission of these compressed videos over a data network is always subject to corruption due to errors such as bit errors or lost and ill-timed packets. However, in many cases, such as real time video transmission, retransmission request (ARQ) is not practical. Therefore receivers must be capable of recovering from corrupted data. Errors can be mitigated using forward error correction in the encoder or error concealment techniques in the decoder. This thesis focuses on the error concealment techniques in the decoder, in the context of networks where channel errors can result in the loss of entire macroblocks when MPEG video is transmitted.

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Title : *Object Detection By 2-D Continuous Wavelet Transform*
Author(s) : *Reddy Vijaya Kumar*
Roll No : *Y5104070*
Supervisor(s) : *Sircar Pradip*

Abstract

Two Dimensional (2-D) Continuous Wavelet Analysis has been the least focussed topic so far in the field of Image Processing using Wavelets. It has been overshadowed by the 2-D Discrete Dyadic Wavelet Transform (DWT) due to its compactness and excellent performance in Coding, Data Compression, Image reconstruction etc. However, 2-D DWT has a lot of restrictions on the scale and position parameters and does not detect all the features of an image unless properly tuned. The 2-D Continuous Wavelet Transform (CWT), on the other hand, is more flexible and provides complete control over the scale and position parameters but its use so far has been very limited in Image Processing due to its redundancy. It is proved that sharp edges can be extracted at lower scales of 2-D CWT. In this thesis, an algorithm is developed to extract the focussed objects in an image/video using 2-D CWT. The first step in this algorithm is extracting the edges of focussed objects using 2-D CWT.

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Title : ***Scale And Affine Invariant(SAI) Descriptors For Matching Color Images***
Author(s) : ***Reddy V Apoorva***
Roll No : ***Y5104068***
Supervisor(s) : ***Venkatesh K S***

Abstract

Image matching has a vital role in many of the present day computer vision applications such as tracking, image indexing and retrieval etc.,. The problem in image matching is finding the features and descriptors which are invariant to the transformations that the image is subjected to. The descriptors should be of low dimension for real time applications. Thus they should be chosen such that a tradeoff is achieved between accuracy and speed. This thesis deals with a novel method of matching color images under Scaling and affine transformations. We derive an equation which shows the invariance property of both affine and scaling transformation. Using this property we construct a three dimensional descriptor, which we called scale and affine invariant (SAI) descriptor. We have used the three color channels separately in order to get sufficient equations to solve for the affine parameters. From this we obtained an invariance property for affine transformation.

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Title : *Study Of Code Polynomial Influence On Turbo Codes Using EXIT Chart*
Author(s) : *Jalan Sandeep*
Roll No : *Y2157334*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

The bit error rate(BER) chart of iterative decoding scheme comprise of three main regions. These regions are categorized on the basis of values that BER takes with different iteration for particular SNR value. Among these the second region is called as turbo cliff region which shows a persistent BER reduction over many iterations. Mutual information transfer characteristics of soft in/soft out decoders are proposed as a tool to better understand the convergence behavior of iterative decoding schemes in this region. The exchange of extrinsic information is visualized as a decoding trajectory in the extrinsic information transfer chart (EXIT chart). This allows the prediction of turbo cliff position and bit error rate after a particular number of iterations. In our work we have proposed the use of EXIT chart to observe the influence of code memory and code polynomials on the convergence behavior for parallel concatenated codes.

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Title : *Design Of Low Bit Rate Color Video Coder And Color Palette In Two Dimensional Color Space*
Author(s) : *Mishra Abhineet*
Roll No : *Y5104001*
Supervisor(s) : *Gupta Sumana*

Abstract

The thesis work is primarily concerned with the design of low bit rate color videoencoder and color palette. Color video coding and color palette design methodsproposed so-far use 3D YUV and RGB representation of color respectively. In thisthesis, we propose a new method for video coding and color palette design & pixelmapping using 2D representation of color signal. Some of the main issues in colorvideo and image processing are bandwidth limitation and computational complexity.By using the proposed 2D representation of color for video coding and palette designsigni cant reduction in bitrate and computational time is achieved . A methodbased on spiral mapping of color signal from 3 dimensional YUV color space to 2dimensional YC color space is used. The proposed codec uses both DCT and DWTin order to exploit the interframe and intraframe redundancies respectively. Thisapproach has been adopted in view of the fact that the mixed transforms performbetter than single transform methods

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Title : *QoS Scheduling Architecture For IEEE 802.16: A Novel Approach*
Author(s) : *Patel Rajdeep*
Roll No : *Y5104048*
Supervisor(s) : *SinghYatindraNath*

Abstract

The IEEE 802.16 WirelessMAN standard (also known by the name of its vendor interoperability organization, WiMAX), which has been emerged as Broadband Wireless Access (BWA) solution, is promising to meet all the demands of high speed internet access and multimedia application along with the fulfillment of the Quality of Service (QoS) requirements and becoming the most popular way for wireless communication. It has several advantages over the wired DSL and cable wired communication e.g., easy and fast deployment, less labor required, covers larger area and rural areas too where these wired DSL and cable can not be deployed. The IEEE 802.16 standard is supposed to fulfill the QoS requirements for different services or applications, however it does not define the MAC scheduling for achieving QoS. It defines the Uplink Scheduling of Unsolicited Service Flow (USF) Service flow, but it left the scheduling of other flows like "Realtime polling Service (RTPS), NonRealtime polling Service (NRTPS).

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Title : ***Layered Video Codec Implementation Using 3D-SPIHT
In Java***
Author(s) : ***Hasbe Sunil***
Roll No : ***Y5104065***
Supervisor(s) : ***SinghYatindra Nath***

Abstract

Applications for real-time video transmission in heterogeneous network and computing environments, like the Internet, need to be highly scalable and adaptive in terms of bandwidth and processing requirements. Layered video encodings in combination with layered transmission schemes can be thought as a solution to network and terminal equipment heterogeneity. The thesis work is primarily concerned with the design of layered video encoder with advanced features of scalability such as SNR, spatial and temporal scalability. Two layered video encoding techniques have been presented to achieve these scalabilities. Both of the techniques use 1-D discrete wavelet transform to exploit temporal redundancy and then 2-D discrete wavelet transform to exploit spatial redundancy. The 3D-SPIHT (set partitioning in hierarchical trees) algorithm is used in two different ways to encode the transformed coefficients in a group of frames. First technique supports only SNR scalability while the second technique supports

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Title : ***Novel Symbol Timing Estimation Techniques For MIMO Systems***
Author(s) : ***Rajawat Ketan***
Roll No : ***Y2157177***
Supervisor(s) : ***Chaturvedi Ajit Kumar***

Abstract

The problem of symbol timing estimation in multi-antenna wireless communications systems is considered. We propose novel solutions to the problem for both Data Aided (DA) and Non Data Aided (NDA) cases. The proposed DA estimator utilizes pulse shape information and achieves better performance with lower computational complexity than the existing receivers. Further, we design new training sequences that facilitate performance closer to the Cramer Rao Bound. For the Non-Data Aided (NDA) case, the proposed timing estimators achieve better performance by utilizing the information about the Space-Time code used. Since the proposed NDA methods require large number of multiplications, an approximate low complexity version is also derived. Finally, we theorize the impact of timing errors as a signal to noise ratio penalty.

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Title : ***Simulation Of Modified Congestion Control Algorithm
For TCP In NS-2***
Author(s) : ***Kumar I V N Sarat***
Roll No : ***Y5104056***
Supervisor(s) : ***SinghYatindra Nath***

Abstract

In this thesis Modified Congestion Control Algorithm is simulated in network simulator(ns-2.30), making few changes to the originally specified version. This algorithm comes under the category of proactive congestion control algorithms, which respond to congestion before it happens. Proactive congestion control algorithms need to find a way to calculate the available bandwidth to avoid congestion. TCP Reno congestion control algorithm loses packets to know the available bandwidth which is not an efficient way of doing so. We call our algorithm as Modified Reno algorithm. Modified Reno algorithm uses receiver based packet pair technique to find the available bandwidth. It assumes Fair queueing at all routers. Modified Reno algorithm basically sits on top of the TCP Reno algorithm, switching to Reno algorithm whenever there is a timeout. The receiver calculates the available bandwidth for the flow and sends this information periodically to the sender.

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Title : *Reliability And Availability Analysis In p-cycle Based Networks*
Author(s) : *Reddy Y Harsha Vardhana*
Roll No : *Y5104074*
Supervisor(s) : *Singh Yatindra Nath*

Abstract

Achieving both high capacity, efficiency and fast restoration speed is a critical issue of WDM network design. Protection methods have been developed using pre-configured Cycle(p-Cycle) to provide spare capacity in the mesh network. p-Cycle offers an approach to protection of optical transport network which is as fast as ring based network and with mesh like capacity efficiency. Here we have done the reliability analysis for p-cycle based networks for single link failure. The p-cycles are found using Spare Capacity Allocation Algorithm. They are allocated using two approaches namely Sequential Allocation (SA) and Optimum p-cycle Allocation (OPA). The reliability comparison of these two approaches without Removal of Loop Back and with Removal of Loop Back is done. The availability analysis is also done for the same cases.

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Title : ***Advance Techniques In P-Cycle Network Design***
Author(s) : ***Chinthalapudi Srinivas***
Roll No : ***Y5104060***
Supervisor(s) : ***Singh Yatindra Nath***

Abstract

p-cycles are one of the most promising techniques of span protection for optical networks. This is due to the fact that p-cycles can provide mesh like efficiency and ring like speed. However, the restoration paths provided by p-cycles are usually many hops long, as longer p-cycles provide better efficiency. In many cases the best p-cycles are the ones who cover all the nodes of the network. In this scenario there must be some nodes which are common between working path and restoration path provided by p-cycle. This gives rise to loop back of the path at the common nodes. If these loop backs can be removed, restoration can be provided with significantly lesser amount of capacity in the event of failure, and significant amount of capacity will be saved. This saving also depends upon the allocation of paths of the failed span to the p-cycles which are protecting the span.

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Title : ***Perceptual Watermarking Of Digital Video Using The Variable Temporal Length 3D-DCT***
Author(s) : ***Agrawal Vivek Kumar***
Roll No : ***Y5104072***
Supervisor(s) : ***Gupta Sumana***

Abstract

The huge success of internet allows the transmission, wide distribution, and access of electronic data in an effortless manner. Content providers are faced with the challenge to protect their electronic data. Recently this problem has generated a flurry of research activity in the area of digital watermarking of electronic content for copyright protection. The challenge here is to introduce the digital watermark such that the perceived quality of the electronic content remains unaltered as well as robust to different types of attacks. In this thesis, we propose a robust perceptual digital video watermarking procedure to embed a watermark image in digital video frames using the variable-temporal length 3-D DCT technique. A variable-length 3-D DCT is chosen for exploiting the redundancy of the video sequences in temporal domain properly. The variable window length is obtained by applying a scene-change detection to a sequence of 8×8 blocks in successive frames.

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Title : *An Efficient Requantization Algorithm For Video Transcoding*
Author(s) : *Reddy G Venu Gopal*
Roll No : *Y5104021*
Supervisor(s) : *Sharma Govind*

Abstract

In many applications it is sometimes needed to reduce the bit-rate of pre-encoded video for saving the disk space or for sending the video to the device with limited bandwidth and/or display size. Since the original uncompressed video is not available, it is needed to recompress the already compressed video. In the existing literature, it is revealed that the direct transcoding by requantization, generally results in lower quality videos when compared to the one compressed from the original uncompressed video with the same parameters. This discrepancy is due to the requantization error, and the existing algorithms for more efficient requantization were focused on finding the requantization step sizes for reducing this error. This thesis is primarily concerned in designing an efficient requantization algorithm for transcoding pre-encoded video sequences with computational complexity as a constraint.

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Title : *Restoration Of Color Faded Video/Photographs And Removal Of Line Scratches In Motion Films*
Author(s) : *Mandsorwale Aniruddha*
Roll No : *Y5104005*
Supervisor(s) : *Gupta Sumana*

Abstract

A large number of important events of the past that are of historic, political and cultural significance have been recorded in media which are susceptible to degradation. The quality of media stored in such films get reduced after repeated usage. As for example, film rolls because of their physical nature deteriorate as a result of their continuous projection for display purposes. Thus it is extremely important to preserve and restore these video archives. Typical artifacts in degraded video include Line Scratches and Color fading. Line Scratches are visible as bright or dark intensity lines oriented more or less vertically over much of the image. Color fading causes alteration of the original colors of the image and thereby degrading its visual quality. In order to preserve the degraded videos, defects must be removed so that picture quality can be restored. Traditional techniques for scratches deals with only static scratches and does not deal well with moving and secondary scratches.

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Title : *Detection Of Asynchronous DS-CDMA A Using The Viterbi Algorithm And Linear Detectors*
Author(s) : *Sethia Prakash*
Roll No : *Y5104044*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

Direct-Sequence Code-Division Multiple Access (DS-CDMA) is a popular wireless technology. In DS-CDMA communications, all of the users signal overlap in time and frequency and cause mutual interference. The conventional DS-CDMA detector follows a single-user detection strategy in which each user is detected separately without regard for the other users. A better strategy is multi-user detection, where information about multiple users is used to improve detection of each individual user. Multiuser detectors may be classified on the basis of their operation, such as linear, successive interference cancellation, etc., these multiuser detectors have a trade off between their complexity and performance. Bit-error rate is generally the desired parameter for performance analysis. In DS-CDMA, the performance can be improved by having spreading sequences that have low value of cross-correlation for all possible values of delay (τ).

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Title : ***Adaptive Modulation And Beam Forming For OFDM Systems Using Limited Feed Back***
Author(s) : ***Deb Debasish***
Roll No : ***Y5104019***
Supervisor(s) : ***Chaturvedi Ajit Kumar***

Abstract

It is known that the performance of multiple-input multiple-output orthogonal frequency division multiplexing (MIMO-OFDM) systems can be improved by adapt-ing transmission parameters e.g., constellation size, power and transmit beamforming vector to the channel condition. However to achieve this, the transmitter should have some knowledge of the channel states. Channel states can be communicated to the transmitter via a limited feedback path from the receiver. Thus designing a strategy for limited feedback for a given power budget is of paramount importance. In the case of OFDM systems the correlation between adjacent subcarriers can be exploited to reduce the required amount of feedback. In this thesis, we exploit the correlation between the subcarriers to design a feedback strategy for OFDM systems with adaptive transmission parameters. This has led to a reduction in the number of feedback bits required. Further, compared to non-adaptive systems.

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Title : *A New Heuristic Approach To Minimize Spare Capacity Needed To Setup P-Cycles In Optical Networks*
Author(s) : *Rastogi Richa*
Roll No : *Y5104052*
Supervisor(s) : *Singh YatindraNath*

Abstract

As the optical networks continue to grow, the network survivability has become an important issue to be focused upon. The active protection and restoration schemes are used to get a real time recovery for all the network traffic. In this thesis, only the protection against span failures in an all-optical WDM networks is considered. Achieving both the high capacity efficiency and fast restoration speed is a critical issue for WDM network design. The protection method using Pre-configured Cycles (P-cycles) in the spare capacity of the mesh network has been considered. P-cycles offer an approach for the protection of optical transport network which is as fast as ring based network and also has the mesh like capacity efficient characteristics. Presently, most of the research efforts are directed towards reducing the cost of p-cycle setup by minimizing the redundancy. We have dealt with the node properties and the cost factor to achieve a heuristic approach to design a more capacity efficient network.

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Title : *A Low Complexity Timing Acquisition Algorithm For TH-UWB Signals*
Author(s) : *Patel Chetankumar K*
Roll No : *Y5104017*
Supervisor(s) : *Chaturvedi Ajit Kumar*

Abstract

Rapid timing acquisition with low complexity constitutes a major challenge in realizing the potential of Ultra Wideband (UWB) technology for indoor wireless communications. The problem of timing acquisition in UWB is difficult due to the signal characteristics unique to UWB signals like narrow pulses and low duty cycle signaling. Accuracy and complexity are the two main performance metrics for the timing acquisition problem. This thesis proposes a low complexity timing acquisition algorithm for Time Hopping UWB systems (TH-UWB) operating in a dense multipath environment. The proposed algorithm exploits the clustering of multipaths along with the TH code pattern to find out the timing information from the received signal. The proposed algorithm has been compared with the existing timing acquisition methods and at high SNRs it has been found to provide good performance.

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Title : ***A Prototype Development Of Reliable Sensor Network Based Structural Health Monitoring System For Railway Bridges***
Author(s) : ***Kumar Raj***
Roll No : ***Y5104047***
Supervisor(s) : ***Chebrolu Kameswari & Raman Bhaskaran (CSE)***

Abstract

The Indian Railways consists of about 1,27,000 bridges, of which 40% are over 100 years old. It is critical to have a system to monitor the structural health of these bridges for maintenance and safety of the public. Present systems used for such monitoring are mainly wired systems. These systems are generally bulky and require expertise in manpower. Also it takes days to deploy these systems on the bridge. In this thesis work we develop an automated wireless sensor network (WSN) based system, which makes use of sensor nodes and MEMS accelerometers for railway bridge monitoring. We call this system as BriMon. The system is easily deployable and requires minimum maintenance. The system though primarily designed for long term monitoring of remotely located bridges, can be used for short term monitoring too. The system has been developed by making use of off the shelf hardware. We have adopted an application driven approach in developing the protocols and components of the system.

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Title : *Linear Transformation Approach To VTLN Using Dynamic Frequency Warping*
Author(s) : *Kumar D Dinesh*
Roll No : *Y5104018*
Supervisor(s) : *Umesh Srinivasan*

Abstract

Speaker variability is considered as a major source of performance degradation in speaker-independent speech recognition systems. One of the main source of variability is the difference in vocal tract length. It is tackled by normalizing the speaker differences in speech signals and is commonly referred to as vocal tract length normalization (VTLN). These variations are commonly modeled as a pure scaling relation between spectra of speakers enunciating the same sound. In the thesis, we present a novel linear transformation approach that can transform features to the desired warping factor of interest given the existing features at hand using the idea of dynamic frequency warping (DFW). The advantage of this approach is that, we can obtain a transformation matrix for any arbitrary warping even when we do not know the functional form or mapping of the warping function.

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Title : *Turbo Multi-User Detection For Coded DS-CDMA*
Author(s) : *Parihar Siddharth Singh*
Roll No : *Y5104058*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

Direct-Sequence Code Division Multiple Access (DS-CDMA) has been adopted in second and third generation mobile standards. It possess several attractive features as Dynamic channel sharing, asynchronous transmission, robustness against fading to name a few. In the conventional DS-CDMA systems spreading is done at the transmitting end whose effect is to distinguish different users at the receiving end. But in actual the spreading operation results in redundancy without any coding gain. On the other hand the FEC encoders also provide redundancy but with a coding gain which is a desirable feature. This suggest towards the fact that by devoting the entire Bandwidth expansion to coding we can achieve improvement in performance. Several users share a common medium in DS-CDMA system which results in Multiple Access Interference better known as MAI. Multiuser detection is a promising technique for protection against MAI.

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Title : *Correspondence Based Video Deinterlacing*
Author(s) : *Reddy T Bharat Kumar*
Roll No : *Y5104067*
Supervisor(s) : *Venkatesh K S*

Abstract

The thesis deals with the deinterlacing problem: The deinterlacing of interlaced image fields to obtain non-interlaced image frames. In the 1990s when HDTV standards were introduced, the options, 1280x720p (720 lines progressively displayed) and 1920x1080i (540 odd lines drawn, then 540 even lines drawn) were included. Some broadcast networks use 1280x720p and some use 1920x1080i. Since the interlaced video frames are composed of 2 fields that are captured over different intervals in time, interlaced video frames will exhibit motion artifacts when both fields are combined and displayed at the same moment. Any object that is moving will appear in different positions on the two fields, and simply displaying them overlaid will result in very objectionable artifacts termed the 'comb-effect' on the moving vertical edges. To minimize the artifacts caused by interlaced video display, a procedure called 'deinterlacing' can be applied.

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Title : ***Routing And Time Synchronization Protocols For Low Duty Cycle Operation Of A Sensor Network Based Bridge Monitoring System***
Author(s) : ***Valiveti Phani Kumar***
Roll No : ***Y5104042***
Supervisor(s) : ***Chebrolu Kameswari & Raman Bhaskaran (CSE)***

Abstract

Railways form a crucial part of transport infrastructure in many parts of the world. A large fraction of bridges used by railways may be considerably old and may be in use for decades. For instance, Indian Railways has about 127,000 bridges of which 51,000 are about 100 years old. For smooth functioning of the system, safety of travel over these bridges must be assured. For this, a structural health monitoring system is required, that is capable of indicating any deterioration of physical condition of the bridges, thereby calling for maintenance. Existing techniques are mostly wired solutions, requiring technical personnel to be present at the bridge site during the inspections. In this work, we present BriMon, a Wireless Sensor Network based structural health monitoring system that has the essential features like ease of deployability, long life with minimum maintenance, and remote monitoring. It also satisfies the constraints imposed by structural engineers on data collection and analysis.

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Title : *Complementary Codes For Multicarrier Modulation Schemes*
Author(s) : *Padmavathi P*
Roll No : *Y5104038*
Supervisor(s) : *Vasudevan Kasturi*

Abstract

Multicarrier modulation often also denoted as orthogonal frequency division multiplexing (OFDM) has been introduced in various applications. One of the main reasons to use OFDM is to increase the robustness against frequency selective fading or narrow band interference. Though OFDM is a useful tool in handling multipath propagation in an efficient way OFDM suffers due to its high peak-to-average power (PAPR). Different methods have been proposed in literature to reduce the high PAPR of OFDM symbol. Each method has its own merits and constraints. These solutions are broadly classified into three types viz. signal distortion techniques, signal scrambling techniques and coding techniques. Clipping, peak windowing and peak cancellation are examples of signal distortion techniques and PAPR reduction using selective mapping and partial transmit sequences are examples of signal scrambling techniques. An OFDM code, in which the codewords are complementary sequences was introduced by Richard van Nee.

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Title : *Estimation Of Two Dimensional Direction Of Arrival*
Author(s) : *Choudhery Satyendra Kumar*
Roll No : *Y2157346*
Supervisor(s) : *Sircar Pradip*

Abstract

Source localization is one of the most challenging problems in Smart Antenna Communication. Estimation of angle of arrival of signal from a multiple narrow band source requires antenna array geometry which may have various configurations. As a special case, we can take antenna array geometry as L shaped which has certain advantages over the other possible configurations in coverage area and implementation. The present work comprises of two parts. Firstly, we propose a computationally efficient algorithm for estimating two-dimensional Direction-of-Arrival (DOA) by taking array geometry as 2L shaped. Then we propose a new definition for the azimuth angle and we again estimate the DOA taking 1L shaped array geometry using the above mentioned algorithm. Finally, we compare it with results obtained by applying Cramer-Rao bound approach. Simulation results are included to demonstrate the performance of proposed technique.

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Title : *2-D Continuous Wavelet Transform And Its Applications In Image Analysis*
Author(s) : *Kumar S Kiran*
Roll No : *Y4104075*
Supervisor(s) : *Sircar Pradip*

Abstract

Two Dimensional (2-D) Continuous Wavelet Analysis has been the least focussed topic so far in the field of Image Processing using Wavelets. It has been overshadowed by the 2-D Discrete Dyadic Wavelet Transform (DWT) due to its compactness and excellent performance in Coding, Data Compression, Image reconstruction etc. However, 2-D DWT has a lot of restrictions on the scale and position parameters and does not detect all the features of an image unless properly tuned. The 2-D Continuous Wavelet Transform (CWT), on the other hand, is more flexible and provides complete control over the scale and position parameters but its use so far has been very limited in Image Processing due to its redundancy. In this thesis we explored the 2-D Continuous Wavelet Transform in detail and studied how it can be applied efficiently in Image Analysis. We implemented the different methods of obtaining 2-D Continuous Wavelet Transform of an Image.

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Title : ***DSP Based Scalar And Indirect Field Oriented Control Of VSI Fed Induction Motor***
Author(s) : ***Kumar Modepalli***
Roll No : ***Y5104031***
Supervisor(s) : ***Sensarma ParthaSarathi & Behera Laxmidhar***

Abstract

In the past, Induction motors (IMs), were considered as constant speed drives. Even then, Induction motor being smaller, rugged and cheaper and they are considered as the work horses of the Industries. But with the advent of growth and technological advancement in power electronic devices such as Power MOSFETS, IGBTs, IPMs e.t.c, Induction motors are being used as variable speed drives. Among the variable speed schemes developed for Induction motor, Indirect Field Oriented Control or Vector Control is most preferred because of its good dynamic response. In the present work Indirect Field Oriented Control fed by the VSI is implemented with the TMS320F240 DSP controller as control platform. For the implementation of the field oriented control the Speed feedback is obtained through an Incremental encoder. The TMS320F240 DSP controller has an in built QEP module to interface with the encoders and in the present work the QEP module is configured to obtain the speed information from the encoder.

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Title : *Design And Development Of Unity Power Factor Power Converter ,Data Acquisition And Debugging Facilities For A Stand-Alone Digital Platform*
Author(s) : *Naidu Vechalapu Kasu*
Roll No : *Y5104069*
Supervisor(s) : *Sensarma Partha Sarathi & Behera Laxmidhar*

Abstract

This thesis introduces the design, simulation and development of unity power factor Power Converter and Data acquisition and Debugging facilities for the stand-alone digital platform. These two are the basic parts of the developing stand-alone digital platform which can be used for Power Electronic applications. The power supply is very crucial for the stand-alone digital platform to work properly. One way of designing a power supply is converting AC to DC either through thyristors or diodes and then obtaining different voltage levels using switch mode buck converters. These diode rectifiers, thyristor controlled converters, and switched mode converters introduce harmonics in the input current. Also this scheme has very low power factor. So one aim of this thesis is to maintain input power factor to unity. One of the auxiliaries of the stand-alone digital platform is data acquisition and debugging facility. The proper design of data acquisition and debugging card is necessary

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Title : *Online Rotor Time Constant Estimation Of A Speed Sensor-Less Indirect Rotor Flux Oriented Vector Controlled Induction Motor Drive System*
Author(s) : *Mukherjee Subhra Sankha*
Roll No : *Y5104063*
Supervisor(s) : *Das Shyama Prasad*

Abstract

Among various control strategies of an induction motor drive, vector control is popular because it creates two independent channels for flux and torque control. A speed encoder is undesirable in a vector-controlled drive because it adds to cost and creates reliability problems, besides the need for shaft extension and mounting arrangement. It is possible to estimate the speed signal from the machine terminal voltages and currents. So the sensorless speed control scheme has been very popular in recent industrial applications. Moreover, rotor flux oriented indirect vector control requires the exact knowledge of at least rotor time constant as this directly affects the slip speed command used in the indirect vector controller. If rotor time constant changes from the nominal value used in the controller, due to change in operating conditions, then rotor flux position cannot be determined accurately and proper decoupling between flux and torque is not possible.

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Title : ***Design And Development Of FPGA Based VSI And Analysis Of Active Damping Control Schemes For Active Front-End***
Author(s) : ***Reddy M Jyotheeswar***
Roll No : ***Y5104024***
Supervisor(s) : ***Sensarma Partha Sarathi***

Abstract

Electric utilities and end users of electric power are becoming increasingly aware of the quality of power now-a-days. The power quality problem refers to any problem that manifests itself in the deviations from the normal values of voltage, current and frequency. Any deviation from the ideal condition indicates deterioration in the quality of power distributed and hence the economic value goes down. The quality of power supplied has direct economical impact on consumers. Now-a-days utilities are making it mandatory for loads to operate at near unity power factor. Conventional Rectifiers which use diodes and thyristors draw highly distorted current and have a poor power factor. So use of new topologies of rectifiers like Active Front-end which are utility friendly is gaining importance. AFE rectifier consists of a VSI coupled to grid through a ripple filter. It can operate at unity power factor or any other desired value of power factor depending on the reference current.

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Title : ***Design And Implementation Of A250 VA Single-Phase Soft-Switched Inverter For Airborne Application***
Author(s) : ***Bogi Seshagiri Rao***
Roll No : ***Y5104057***
Supervisor(s) : ***Das Shyama Prasad***

Abstract

Soft switching is preferred over hard switching as the latter has various problems. Soft-switched dc-ac converters are attractive for power supply in air-borne applications due to their distinct advantages such as high efficiency, high frequency operation, compact structure, low EMI, etc. compared to hard-switched inverters. The present thesis deals with design and implementation of a 250 VA, 400 Hz single phase soft-switching inverter for airborne application. A soft-switching inverter topology with zero voltage switching (ZVS) for resistive and reactive loads is proposed. The topology consists of a total of eight switches and two resonant inductors and a capacitor. The soft switching operation of inverter is explained in terms of modes for both positive and negative link current. The ZVS of the inverter switches is achieved by a quasi-resonant dc link. For experimental results a laboratory prototype has been fabricated using power MOSFET's and digital logic circuit based control.

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Title : ***Vision Based Mobile Robot Navigation***
Author(s) : ***Uggirala Balaji***
Roll No : ***Y5104091***
Supervisor(s) : ***Behera Laxmidhar***

Abstract

This thesis deals with Vision based Mobile Robot Navigation. It involves real-time tracking of objects using computer vision algorithm and navigation of the robot towards the target. The scheme used for this purpose consists of two modules, namely, a vision module and a motion module. The vision module detects the object of interest from the video stream captured through on-board camera and passes the target image coordinates to the motion module. The Motion module uses the target coordinates to compute the displacement and angle of rotation needed by the robot to reach the target. During this process, the motion module carries out various tasks like searching target, avoiding obstacles and reaching the target. These tasks are given different priorities to ensure proper coordination among them for effective navigation. In this work, a hybrid CAMShift algorithm is proposed for object tracking where the original CAMShift algorithm is combined with a mean-matching algorithm.

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Title : ***Modeling And simulation Of A Matrix Converter Using PWM And SVM***
Author(s) : ***Naidu Kumpatla VVP***
Roll No : ***Y5104025***
Supervisor(s) : ***Joshi Avinash***

Abstract

The combination of a rectifier, dc-link capacitor and an inverter is being widely used for ac to ac conversions. But the use of dc-link capacitor in the intermediate stage is resulting in large volume (about 30 % of total converter size), high cost and operating temperature constraints. An ac to ac conversion without dc-link capacitor is offered by MATRIX CONVERTERS which are being developed in the recent years. Matrix converters are mostly suitable for military, navy, space applications etc. where space is an important criteria and the temperature varies over a wide range. In the present thesis, analysis of dc to single phase, dc to three phase, single phase to single phase, single phase to three phase, three phase to phase, three phase to single phase and three phase to two phase matrix converter topologies with their analytical formulation is presented. Detailed investigation of three phase to three phase matrix converter with PWM (Venturini control method) and space vector modulation (SVM).

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Title : ***A DSP Hardware And Software Platform With RS232 And CAN Communication Capabilities A And HMI For Power Applications***
Author(s) : ***Murthy Batchu S R C***
Roll No : ***Y5104053***
Supervisor(s) : ***Sensarma ParthaSarathi & Potluri Ramprasad***

Abstract

There is rising interest in using digital controllers in power electronic applications. In this thesis, development of digital controller platform using TMS320D2812 processor is presented. The digital controller platform is developed with all the required components for power electronic applications like analog to digital converter, digital to analog converter etc using the “ eZdsp TMS320D2812 starter kit”. The RS232 , CAN communication capabilities and human machine interface have also been developed for the digital controller.

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Title : ***Analysis And Comparative Study Of Control Methods For Matrix Converter Fed Synchronous Motor Drive***
Author(s) : ***Tiwari Lalit Mohan***
Roll No : ***Y5104029***
Supervisor(s) : ***Das Shyama Prasad***

Abstract

Matrix Converter is a direct ac-to-ac converter without any intermediate dclink. It has inherent four quadrant capability with controllable power factor. Since matrix converter does not have a dc link, it does not use an electrolytic capacitor in the dc link and hence can be applied where the ambient temperature is high. This thesis aims to analyze the operation of matrix converter. Two popular control schemes are analyzed and simulated. The advantages and disadvantages of the control schemes are highlighted. Subsequently, a matrix converter-fed vector controlled synchronous motor is simulated. Vector control of synchronous motor gives improved speed and torque response. **Keywords:** Matrix converter, Modulation function, Synchronous Motor, Venturini's Algorithm, Space Vector Modulation, Stator flux orientation Vector control, Digital Simulation.

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Title : *Strategic Bidding And Risk Assessment In Electricity Market Using Genetic Algorithm*
Author(s) : *Jain Arvind Kumar*
Roll No : *Y5104011*
Supervisor(s) : *Srivastava SC*

Abstract

In electricity markets, several participants bid against each other and compete to win a share of the market. In order to maximize profit, each supplier must bid strategically looking at the expected bid of the rivals. Congestion in the transmission system gives rise to the market power as well as influences the market clearing price, making the power market inefficient. In such a situation, optimal bidding strategy of power producers can increase their own profit. Each supplier tries to minimize financial risk in the market, which requires proper methodology for its assessment and preventive steps to minimize the risk. This thesis has suggested an optimal bidding formulation considering single and double sided bidding, AC sensitivity factors to simulate impact of transmission congestion for pure and probabilistic strategies. Value at Risk (VaR) has been used for the risk assessment under different confidence levels and bidding scenario.

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Title : *Neuro-FuzzyBasedAutomaticGenerationControlIn
Deregulated Power System*
Author(s) : *Kollepara Sudheer*
Roll No : *Y5104064*
Supervisor(s) : *SinghSri Niwas & Potluri Ramprasad*

Abstract

The main requirement in parallel operation of interconnected power systems is to maintain the system frequency at nominal value and the power interchange between different areas at their scheduled values. This control problem is called as automatic generation control (AGC). In frequency regulation market, different types of transactions, such as Poolco based, bilateral and multilateral transactions can take place. In most of the work on AGC, the System Operator has utilized an integral controller to implement the Poolco based transactions. The limitations of the conventional controls viz., Proportional, Integral and Derivative (PID) are slow and lack of efficiency in handling system non-linearities. The field of intelligent control viz., Fuzzy logic, ANN and Hybrid Fuzzy Neural Network were developed for solving such problems. In this thesis, firstly an integral controller has been used to implement the transactions and then a fuzzy logic based integral tuning has been designed.

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Title : ***Design And Simulation Of A Single-Phase Multilevel Inverter For A Photovoltaic System***
Author(s) : ***Kadavelugu Arun Kumar***
Roll No : ***Y5104007***
Supervisor(s) : ***Joshi Avinash***

Abstract

The continuous increase in power demand has been met by the conventional energy sources like coal, petroleum, gas, etc. to a great extent. But they are depleting at a rapid rate and also responsible for several harmful effects like pollution and global warming. Therefore, in the recent decades, much focus has been put for developing renewable energy sources. Photovoltaic (PV) energy is one of the most widely used renewable energy source, which stands out as a viable source of clean and limitless energy, which is available locally. Particularly, low power (< 5 kW) single-phase grid-connected PV systems are becoming important due to deregulation in the electricity market. These systems are designed to inject real power to the grid at unity power factor (UPF), while maintaining the harmonic content of the output current below the limits imposed by IEEE 1547/ IEC 61727 standards. PV sources have peculiar characteristics, which allow extracting maximum power from them only under particular voltage conditions.

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Title : *Design ,Simulation And Realization Of A Multiband Shunt Hybrid Active Filter With Sensorless Control*
Author(s) : *Kumar S Surendra*
Roll No : *Y5104066*
Supervisor(s) : *Sensarma Partha Sarathi*

Abstract

The application of non-linear loads such as diode and thyristor rectifiers, switched mode power supplies, uninterruptable power supplies, adjustable speed drives, etc. is proliferating in the present trend. These loads create harmonic pollution in the powersystem, which has some detrimental effects on the other loads connected to the same system. This led to standards like IEEE 519-1992 on the maximum harmonic current drawn by the industrial and domestic loads. Passive filters have been mostly used to eliminate the harmonics in utilities due to their low cost and high efficiency.

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Title : ***Design And Implementation Of The Front-End Converter Control For A Three Level Inverter Fed Induction Motor Drive System***
Author(s) : ***Tiwari Ashutosh***
Roll No : ***Y2157106***
Supervisor(s) : ***Das Shyama Prasad***

Abstract

High power traction drive employing an induction motor requires both ac to dc conversion and dc to ac conversion. The front-end ac to dc conversion is traditionally achieved by a diode rectifier. In this project a three level synchronous link converter (SLC) has been used as the front-end converter having four quadrant capability. Both hysteresis current control and space vector control have been applied to the front-end converter separately, for input current control. The input current remains in phase with the input voltage. The experimental controller has been realized with a PC based control employing LabView programming. Subsequently, the front-end converter is used to feed a three level inverter feeding an induction motor drive. The three level inverter is operated with sine-triangle PWM. The integrated operation of the converter-inverter system is found to be satisfactory.

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Title : *Coordination Of Power System Stabilizer And Static VAR Compensator Parameter Using Particle Swarm Optimization*
Author(s) : *Sangeetha B*
Roll No : *Y5104015*
Supervisor(s) : *Srivastava S C*

Abstract

Power system stabilizers (PSS) have been widely used, as supplementary controller to the generator exciter, for improving the power system damping. The Flexible AC Transmission systems (FACTS) controllers, like Static Var compensator (SVC), has been primarily used either for providing reactive power support or controlling the line real and reactive power flows, and also maintaining the bus voltage to desired value. Besides their primary task, FACTS controllers can also be used for improving power system damping, when provided with additional supplementary controllers. Conventionally, the PSS and FACTS supplementary controller parameters are determined at a given operating point, around which the nonlinear power system is linearized. Most of the work on the design of stabilizing controllers has considered single machine infinite bus representation, which may result in unsatisfactory performance of the controllers in actual multi-machine system representation.

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Title : ***Efficient Color Palette Design Using Variants Of Counter Propagation Neural Network***
Author(s) : ***Bose N Subhash Chandra***
Roll No : ***Y5104062***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

Color quantization (CQ) is an image processing task popularly used to convert true color images to palletized images with minimal perceptual distortions. The two main issues associated with CQ are sensitivity to initialization and difficulty in determining the number of prototypes/templates. The first issue, sensitivity to initialization relates to the problem of underutilization, where some prototypes will never become a winner due to bad initialization and has no contribution to the learning outcome. The second issue, difficulty in determining the number of prototypes relates to adaptive clustering, where the number of clusters in the input data is not known a priori. CQ is susceptible to the mentioned issues resulting in contouring artifacts and imposes limitation for an effective palette design. FOCPN gives an extra advantage over competitive learning for CQ i.e., cluster prototype fine tuning is possible in FOCPN to adapt the local population.

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Title : *Fuzzy Logic Based Low Bit-Rate Video Coder: RegionOf Interest Based Approach*
Author(s) : *Kandula Prabhanjan*
Roll No : *Y5104043*
Supervisor(s) : *Kalra Prem Kumar*

Abstract

In this thesis, an intelligent coder is designed based on image segmentation, to compress videos of typical applications like video conferencing and videophony systems by locating the facial region within the video. At first, Fuzzy Overlapping Block Motion Compensation (FOBMC) is implemented to obtain good estimate of the P-frames which in turn reduces the entropy of prediction error. An algorithm is developed based on image segmentation using fuzzy C-means clustering in HSV color domain to segment the image meaningfully and to automatically detect the facial object among the obtained segments. A video coder is implemented to compress videos of videophony and video conferencing system by treating face as Region of Interest (ROI). Rest of the image is compressed to a great extent while maintaining the acceptable quality in facial region to obtain overall compression high, such that coded data requires very low bandwidth upto 64Kbps.

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Title : ***Image Compression And Interpolation Using Back-propagation Neural Networks***
Author(s) : ***Kumar Ashiwani***
Roll No : ***Y5104013***
Supervisor(s) : ***Kalra Prem Kumar***

Abstract

The neural network has been proved for its ability to approximate non-linear data. This is an attempt to understand the behavior of neural network while dealing with large amount of data as in case of the images. In this thesis work, the multilayer neural network based backpropagation algorithm has been investigated for color image compression application. Other variants of backpropagation algorithms also have been explored. Higher order multiplicative neural network, which has higher approximation capability than conventional multilayer neural network, also used for image compression. Interpolation is technique to change low resolution image into high resolution image. Neural network approach for interpolation using backpropagation and discrete wavelet transform has been explored and further extended with the use of higher order multiplicative neuron and discrete wavelet transform.

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Title : ***Improved Methods For Early Diagnosis Of Stator And Rotor Faults Of Induction Machines***
Author(s) : ***Basak Debasmita***
Roll No : ***Y5104020***
Supervisor(s) : ***Das Shyama Prasad & Tiwari Arvind***

Abstract

Electrical machines are the heart and nerve of the industries. Failure of a very critical machines may result in complete shut down of a plant or can even cause an unexpected disaster, e.g. the failure of the cooling system in a nuclear power plant. A sudden failure can lead to a considerable downtime resulting in irrecoverable losses. Since more than 80% of industrial machine are induction machines, the thesis work is concentrated on induction machines. A fault, if detected at its very early stage of occurrence, can save the machine as well the entire system depending on the machine, from a catastrophic failure and hence can be the life savior of the entire system. The objective of the current thesis is to critically investigate and prescribe novel, simple and efficient online diagnostic methods at a very early stage for the two major faults in induction machines namely stator and rotor faults. Initially the sequence component method is employed to diagnose the stator turn faults.

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Title : ***Investigation Of Air Gap Clearance Required For Electric Traction***
Author(s) : ***Madallapalli Nagaraju***
Roll No : ***Y5104032***
Supervisor(s) : ***Arora Ravindra***

Abstract

While converting the existing rail network to electric traction network, provision of specified minimum air gap clearance under old bridges and tunnels has always posed problems. The air gap clearance required depends upon the breakdown characteristic of air gap between the HV electrode and the ground electrode configurations under different atmospheric conditions and the prevalent overvoltages in the network. The presently specified electrical clearance of air gap followed by Indian railways is very high. It has forced the Indian railways in the construction of new bridges when the traction overhead lines have to pass under existing bridges. This has resulted Indian Railways in the construction of new bridges when the existing bridges still had their remaining life left. Laboratory investigations were carried out to calculate the breakdown voltage of air for horizontal bundled configuration of the contact wires for different type of voltages

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