

M.TECH.THESIS ABSTRAC 1993

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Title : ***A Software Package For Discrete Event Simulation***
Author(s) : ***Kotaiah T***
Roll No : ***9110450***
Supervisor(s) : ***Raina Ajay K& Mahanta Anil***

Abstract

The primary objective of this thesis is to develop algorithms to represent the DES in a form that can be used to store them in a computer and give the user facilities to perform various operations (as specified in computer 1 and 2). Through these facilities were developed elsewhere in the world, the algorithms for these are not available to us. Once, the DES are stored in the computer memory, there is no facility to view the STATE TRANSITION DIAGRAMS of these at present. Thus, this thesis work was undertaken to study various ways in which the DES can be represented graphically and to develop algorithms for this purpose. When a DES is represented Graphically (state transition diagrams), it becomes very easy to simulate and study various DES. At present a facility to construct and view (graphically), for a DES of 100 states (maximum) is provided. With the development of this software, a Control engineer can find it convenient to simulate and study various Discrete Event Systems. The algorithms developed are described in chapter 3 and some of the results specified in chapter 4.

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Title : *Study Of Low Frequency Noise And Avalanche Degradation In Bipolar Transistors*
Author(s) : *Natu Mahesh Shyam*
Roll No : *null*
Supervisor(s) : *Mohapatra Yashowanta Narayan & Sharan R*

Abstract

The aim of the present work is to correlate the avalanche degradation (AD) and the low-frequency noise in the bipolar junction transistors (BJTs). This has been done earlier as evident from the published literature in specially fabricated BJTs the transistor type 2N2222 (Si, n-p-n) has been as a suitable prototype. It has been conjectured that the AD is due to the change at the Si/SiO₂ interface in the base region. The surface current I_{st} , which has been extracted from the measurement of the base current and the collector current is found to be a suitable probe for characterization of these changes. The surface current can be expressed as $I_{st} = I_{BEV} \exp(-qV_{BEV}/kT)$ where BEV is the base emitter bias and kT is the thermal voltage. It was found that the parameters I_{st} and S_{tn} can be used for the absence of the control gate to some extent. Avalanche stressing of 2N2222 was found to result in a significant rise in I_{st} and S_{tn} both. The noise power spectral density (PSD) was monitored as a function of frequencies and collector current. It was found that the $1/f$ noise PSD referred to the input increased in proportion with I_{st}^2 due. A correlation between the collector current dependencies of the $1/f$ noise and I_{st} was also observed. Numerical calculations of the surface current were carried out and a result. The following possibility for explaining the rise in I_{st} and S_{tn} were explored: Increase in the surface potential due to capture of hot holes by oxide traps or generation of positive traps at the interface or in the oxide? Host carrier induced generation of predominantly electron traps at the interface? A significant increase in the total charge stored at the interface owing to generation of a large number of interface states. Some sample of BC148 that were also valiantly stressed in the same manner did not show any rise in S_{tn} and the degradation was found to be occurring at a much slower pace (No noise measurements were carried out). This result indicates that the AD mechanisms and the rates differ from one transistor type to another.

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Title : *Real Time Direction Of Arrival Estimation*
Author(s) : *Karthikeyan S*
Roll No : *9110443*
Supervisor(s) : *Raina Ajay K*

Abstract

The Multiple Signal Identification and Classification (MUSIC) algorithm which involves any of the matrix iterative procedure for the computation of eigenvectors of the complex Hermitian matrix (auto correlation matrix of the process) is bound to have the limitations posed by the particular matrix iterative procedure, both in terms of computation time and complexity. In navy the prior information about friendly targets signatures and temperature & noise profile of the sea area under consideration are essential data to be acquired prior to employing any of the DOA (direction of arrival) estimation scheme for identification of enemy targets. Under these circumstances, for fast real time application, alternative methods of computation of noise eigenvectors are considered. Direct computation of noise eigenvector from the autocorrelation sequence without involving any iterative procedure is evaluated. Introducing centrosymmetric sensor array geometry, and logical correlation concept, a method of converting complex matrix problem into real matrix is also discussed. Also during operation there is always a likelihood of failure of planted sonobuoys. So the effect of element failure on standard high resolution algorithms such as Beam forming, Capon's method, linear prediction and MUSIC are evaluated and compared for their performances.

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Title : *A Quasi Two-Dimensional Approach To Modeling Of Short-Channel Mosfets*

Author(s) : *Hariharan S*

Roll No : *9120406*

Supervisor(s) : *Dutta Alope*

Abstract

In this work, quasi two - dimensional analytical and iterative models for the strong -inversion region current and the substrate current for short - channel MOSFETs are developed. Several second order effects, such as surface mobility degradation with respect to the gate potential, carrier velocity saturation near the pinch - off region of the channel, channel length modulation, drain - induced barrier lowering (DIBL), and drain/source series resistance are taken into account. Our work also considers the variation of the surface potential as a function of the gate bias in strong – inversion beyond threshold, and the variation of the lateral field as a function of depth into the bulk. These two modifications incorporated in the model yielding a very interesting result, that of the drain conductance curve becoming continuous with respect to the drain - to - source voltage at the onset of saturation point. This is a significant contribution of this work. In previous works, the discontinuity was attributed to the modeling of drain/source series resistance as lumped elements. Two - dimensional plots for the lateral electric field in the pinch - off region are made for both the models, and a comparison between them is given. The substrate current is obtained by numerically integrating the electric field in the pinch -off region without introducing any extra fitting parameter. The threshold voltage is modeled using the quasi two - dimensional analysis (QTDA) taking into account the mobile charges in the channel, which makes this model more accurate than previous models which neglected these. Also, analytical and iterative models are developed for the subthreshold current, of which the former becomes more accurate than the latter as the gate voltage is raised towards thresholds, since it takes the drift component of the current into account alongwith the dominant diffusion component. Experimental data is collected using the commercially available dual complementary MOSFET chip CD4007UBE. The parameters are extracted and the experimental results are compared with the simulated data, which showed a good match.

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Title : ***Design And Implementation Of A Laser Driver And A Receiver Amplifier For High Speed Digital Fibre Optic Communication Links***

Author(s) : ***Kumar Madhu Ranjan***

Roll No : ***9120407***

Supervisor(s) : ***Dutta Alope&ChatterjeeP K***

Abstract

The high speed digital fibre optic communication system based on the direct intensity modulation of the semiconductor laser is strongly dependent on the laser light output characteristic, which changes with the operating temperature and the laser ageing. Therefore, a control scheme is in order to monitor and compensate for the changes in the output power levels of the laser. In the present work, an attempt has been made to implement an automatic control scheme for stabilizing the optical power in the logic levels "1" and "0" of a binary PCM system. The laser driver implemented in this work is intended to supply small risetime current pulses to modulate the laser at the rate of a few hundred Mbps and provide simultaneous feedback control of both modulation and bias currents to the laser in order to regulate the power in the two logic levels, by monitoring the variations in the threshold current and the power slope efficiency of the laser. To realize a complete fibre transmission link, a PIN photodiode and a receiver amplifier consisting of a low-noise preamplifier and a post amplifier have been implemented to detect and amplify the received optical signals. The low-noise preamplifier in transimpedance configuration has been designed using BJTs so as to have a sufficiently large bandwidth to accommodate the system data rate. The laser driver and the receiver amplifier circuits have been tested with a graded index multimode fibre as the transmission medium in the existing laboratory environment. The laser driver circuit has been found to stabilize the laser output power to within 1 dB from its nominal value for a data rate range of 10 to 80 Mbps. The receiver circuit has been tested to have an average sensitivity of about -25 dBm in the given data rate range

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Title : *On Dc Constrained Codes For Fiber Optic Applications*
Author(s) : *Chandra T Ramesh*
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Supervisor(s) : *Chatterjee P K*

Abstract

Line codes which incorporate error control capability for hishspeed fiber optic links, have been studied in this work. Balanced codes, which contain equally many 1's and 0's suitable for transmission where de free pulse formats and low complexity en coder -decoder implementation are required, have been studied. A class of block cost codes derived by partitioning linear block codes are discussed. Balanced codes without error correction, derived from linear block codes are presented. Balanced codes with error correction derived by partitioning a set of balanced words are described. Encoding and decoding techniques for such codes are developed. An improvement over the one - dimensional codes, to provide burst error correction is presented. The error cor rection capability of such array codes is discussed and the encoding and decoding algorithms are presented. A comparison of he directly coded 8B10B block code with that obtained by combining two smaller length block codes is discussed. The features li ke run length, running digital sum etc. for these codes are tabulated. The concept of guided scrambling and it use in line coding is also studied.

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Title : *A Comparative Evaluation Of T800 Transputer And ADSP 2100 Digital Signal Processor For Use In Surveillance Radar Signal Processing (Moving Target Detection)*
Author(s) : *Babu S Ravi*
Roll No : *9110444*
Supervisor(s) : *Siddiqui M U*

Abstract

Traditionally, radar signal processors have been developed using LSI and MSI devices. Recently, due to the advent of programmable digital signal processors and Transputers, radar engineers have been motivated to bring in programmability features in radar systems so that the same basic computer remains usable for a family of radars. In this thesis a comparative evaluation of ADSP 2100 digital signal processor and T800 Transputer for surveillance radar signal processing (Moving Target Detector) has been made. The possibility of using ADSP 2100 for realizing radar signal processors based on Residue Number System (RNS) has also been investigated. The programs are written in assembly language for ADSP 2100 and in Occam, the native language for Transputers. It is concluded that ADSP 2100 offers high sampling rate and hence may be preferred over Transputers. However, to realize radar signal processing (clutter cancellation, doppler processing and detection) and radar data processing (centroiding and tracking) on the same bed and also for complete programmable radar systems, Transputers might turn out to be better candidates of their unique features for use in multi - processing environment. It is further concluded that the present hardware configuration of ADSP 2100 is not sufficient to meet the critical requirements of RNS for high dynamic range applications

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Title : *Design Of 2-D Adaptive Volterra Filter For Image Processing*
Author(s) : *Singh Vijaya Nand*
Roll No : *null*
Supervisor(s) : *Gupta Sumana*

Abstract

This work is a study of a particular class of adaptive nonlinear digital filter used in image processing. The aspects of matrix representation of 2D-volterra filter readily amenable to decomposition techniques, highly efficient design and realization techniques keeping in view the symmetry properties of volterra kernels has been reviewed. The LMS adaptation algorithm has been used to design an adaptive volterra filter for image processing applications wherein the local statistical characteristics of the image is varying in nature. Different noise models and various images have been used to prove the versatility of the adaptive volterra filters. Finally an adaptive two-component filter is designed and the performance comparison of adaptive volterra filter is made based on MSE and PSNR criteria

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Title : *A New Lcl Resonant Converter With PWM Control*
Author(s) : *Raju G S N*
Roll No : *9110414*
Supervisor(s) : *Doradla S R*

Abstract

Many of the limitations of two element resonant topologies can be overcome by adding the third reactive element. However, the number of possible circuit topologies increase because of three elements. The selection of a proper topology for a given application is a difficult task. In this thesis a new LCL type of resonant converter using a capacitor output filter and providing load independent operation above the resonant frequency is presented. Pulsewidth modulation is employed to control the output voltage. The possible modes of converter operation under pulsewidth modulation are analyzed using state - space approach. The steady state solutions are presented for each mode. Further, closed form solutions are worked out under steady state conditions using energy balance and average current. An extensive simulation has been carried out using SPICE - software package to study the transient and steady state behaviour of the resonant converter. There is complete agreement between simulation and analytical results. A 200 W prototype converter is designed and fabricated. The performance of the converter is experimentally studied with dc and pulsed loads. The experimental study reveals that the output voltage remains constant over a wide range of load resistance. The performance of the resonant converter is found satisfactory with the pulsed load as well. The experimental study is in complete agreement with the analytical and simulation results

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Title : ***Application Of Continuous Phase Modulation Techniques In Coherent Subcarrier Multiplexing***
Author(s) : ***Reddy N Madhava***
Roll No : ***9110428***
Supervisor(s) : ***Chatterjee P K&Sircar Pradip***

Abstract

A multichannel coherent continuous phase modulation (CPM) system using subcarrier multiplexing technique is proposed here. A total of 20 CPM channels at 100 m bits/second each can be transmitted on one optical carrier using microwave subcarriers in a multi octave configuration. Crosstalk due to adjacent channels is assumed to be negligible with a suitable channel spacing. Under CPM schemes analysis is presented for binary CPFSK, multi - h and M - ary CPFSK with modulation indices of practical interest. A complete description of the M - ary CPFSK (M = 2, 4, 8 and 16) system performance, including carrier - to noise ratio, intermodulation distortion and receiver sensitivity is given. A similar analysis is extended for M - ary CPFSK 40/80 channel system in a multioctave and single - octave configuration also. Significant improvements are obtained by increasing the number of levels, M from 2 to 4, and quaternary CPFSK system is shown to be the better case.

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Title : *Complex Am Signal Model For Non-Stationary Signals*
Author(s) : *Syali Mohan Jeet Singh*
Roll No : *9110419*
Supervisor(s) : *Sircar Pradip*

Abstract

In this thesis, a new model is suggested for modeling signal data from a deterministic or stochastic process. The signal data is modeled as sum of several complex amplitude modulated signals. In this regard, the concept of accumulated autocorrelation function is used. The accumulated autocorrelation functions are fitted into an autoregressive model based on burg algorithm and the model coefficients determined. These coefficients are used to find the power spectral density of the accumulated autocorrelation functions. The carrier and modulating frequencies so obtained are used to determine the other parameters of the constituent complex amplitude modulated signals. The model is first fitted on a synthesized data. To test the robustness of the model in presence of noise, simulation is done with data embedded in white gaussian noise. The model is the fitted on speech and electro - cardiogram data with varying degree of success.

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Title : *Fourth-Order Cumulant-Based Method For Parameter Estimation Of Complex Exponential Signals*
Author(s) : *Dutta Mukesh K*
Roll No : *9110425*
Supervisor(s) : *Sircar Pradip*

Abstract

In this thesis, a new approach for the estimation of parameters of exponentially damped sinusoids is suggested based on the fourth – order cumulate functions of the observed signal. In practice, the observed signals are contaminated with noise. In this regard, some of the useful properties of fourth - order cumulate are studied and effectively utilized to reduce the deleterious effects of noise, in the proposed method. Accurate parameter estimation is therefore achieved by using the geometrical properties of the signal. A linear system of difference equations is formed by using the fourth - order cumulate functions for the observed signal instead of the signal data - values itself, which is used to compute the prediction coefficients. The signal parameters are then calculated by polynomial rooting of a vector of these prediction coefficients. The proposed method is first considered for the noise free data case. The utilization of the method in the case of finite length signal data – values in the presence of additive Gaussian noise is then addressed. The simulation example with two exponentially damped sinusoids, embedded in white Gaussian with two demonstrates the effectiveness of the proposed method

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Title : *Analysis of ECG signal using wavelet transform*
Author(s) : *Mohammad Farid*
Roll No : *9110413*
Supervisor(s) : *Sircar Pradip*

Abstract

In this thesis, the ECG signal was decomposed and reconstructed using the cubic spline and Haar basis wavelets. The performance of decomposition and reconstruction was analysed. An interesting outcome of this analysis was the noise reduction characteristic of wavelets. The QRS wave complex and the P and T waves were also separated using wavelets. An attempt was made to investigate the non-stationarity of decomposed signals.

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Title : *Signal Analysis With Best Basis Wavelet Packets*
Author(s) : *Pati Prakash Kumar*
Roll No : *9110431*
Supervisor(s) : *Gupta Sumana*

Abstract

In the thesis, an attempt has been made to find out a best orthonormal basis out of a family of orthonormal bases (the wavelet library)for a given signal. The family is generated from a single basis function and the method of selecting the best one introduce a cost function (entropy is used) which determines the amount of similarity between the waveforms in the orthonormal basis and the original signal. The best basis thus obtained provides very good similarity and needs minimum number of waveforms to perfectly the signal. Compression thus achieved is studied for different libraries, generated from different basis functions. A generalized decomposition and reconstruction algorithm is developed and Mallats decomposition and reconstruction algorithm is developed and Mallats decomposition and reconstruction algorithm is studied to be a particular case of it. Reconstruction errors for different basis functions is studied for performance analysis.

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Title : *Study Of Ac-Dc Converted-Fed Battery Charging Circuits*
Author(s) : *Bairathi Rakesh*
Roll No : *9110434*
Supervisor(s) : *Doradla S R*

Abstract

The performance study of three - phase, phase - controlled converters for battery charging circuits is carried out for both constant load current and pulsating load current conditions. It includes fully controlled, and controlled symmetrical and asymmetrical converters. A generalized computer programme is developed to obtain input source and output load performance characteristics of phase - controlled converters for given circuit parameters. The characteristics curves wL/R versus firing angle α are obtained for different values of normalized battery voltage. These curves enable the selection of minimum inductance to ensure continuous conduction. Additional inductance is, however, required to be added to the load circuit if the output current ripple is to be restricted within certain limits. Experimental oscillograms are also obtained for half controlled converters. The performance of single - phase PWM ac - dc bridge converter using three PWM control schemes namely EPWM, SPWM and SEPWM is also studied. A working model of single - phase ac -dc bridge converter using MOSFETs is fabricated and tested with these PWM control techniques. The SEPWM combines the good features of EPWM and SPWM. It has, however, the drawback that the battery charging circuit needs to be initially started with SPWM. The transfer characteristics of SEPWM shows that it appears to be attractive for power supply applications.

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Title : *A variable rate vector quantization scheme For image data compression*
Author(s) : *Patil Milind M*
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Supervisor(s) : *Siddiqui M U*

Abstract

Most images consist of regions, which vary from fairly homogeneous to fairly active. Variable block-size Vector Quantization (VQ) takes advantage of this to code regions, which are homogeneous with large dimension vector at a lower rate, while coding active regions with lower dimension vectors at a higher rate. The image is segmented to yield variable size block that are homogeneous and those, which are not. Of importance in variable block-size VQ are, therefore, the segmentation criterion and representation of thesegmentation. In contrast to the usual practice of taking variance as the activity indicator for a region, the use of edge as the activity indicator is investigated. The presence of edge in a region is taken as an indication that the block is active. This segmentation criterion alleviates the problem of poor representation of edges that exists for fixed block-size vector quantized images. The segmentation method used is a quadtree process because of an efficient representation that exists for it. To keep the computational complexity; low, Approximation Elimination Search Algorithm (AESA), a fast algorithm for encoding, is used. This algorithm leads to a savings of a factor ranging from 5 to 15 in computational complexity. The rates obtained vary from 0.25bpp to 0.50bpp (bite per pixel) with Peak Signal to Noise Ratios (PSNR) from 22db respectively for 256 gray level images

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Title : *A Connectionist Architecture For Continuous Speech Recognition*
Author(s) : *Khurana Sandeep*
Roll No : *9120411*
Supervisor(s) : *Ray G C*

Abstract

A neural network architecture which combines a self organizing feature map and a single layer perceptron with time delayed connections is proposed. The network accepts unsegmented speech signal during recognition and involves word model build up from phonotopic maps, hence making it suitable for continuous speech recognition. The system is word based and can make good phonetic distinctions. As a recognition task, the speaker dependent recognition of six monosyllable words in varying phonetic context from continuous speech was chosen. Out of six words, three were of same vowel base; big, dig, gig (base /i/) and three of different vowel base; keep (base /ii/) bar (base /aa/) and hope (base /oo/). Computer simulations of the network and the learning algorithm provide best recognition scores of 100% for words of different vowel base and 66.6% for words of same vowel base. The advantage of the proposed network lies in its being word oriented and being able to make good phonetic discriminations with only two layers of processing elements.

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Title : *Design And Implementation Of A 140 Mbps MBIC Coder-Decoder
And A Bit Synchronizer*
Author(s) : *Ravi Chandran K*
Roll No : *9120409*
Supervisor(s) : *Chatterjee P K&Dutta Alope*

Abstract

An mB1C coder - decoder circuit is designed and implemented for use in high - speed fiber optic digital communication systems. MB1C is a line coding technique, normally used at frequencies beyond 100Mbps, to overcome the effects of the base line wander, while introducing BSI (Bit sequence independence) conditions. BSI conditions include the requirements that the timing information should be extractable from any received bit sequence and in - service error monitoring should be possible at the decoder. To extract the timing information, a bit synchronizer is used. By nonlinear processing of the input NRZ (non - return to zero) data, a discrete spectral component is regenerated at the data rate. A 'delay and Ex - OR' type of nonlinearity has been used to generate this discrete spectral component. The output of the nonlinear circuit is then filtered through a PLL and the desired clock is regenerated for use in the decision circuit of the receiver. The coder - decoder and the bit synchronizer circuits are tested and found to work satisfactorily till 100 Mbps, beyond which interference and attenuation of signals set in. suggestion of the improvement of the data rate are given at the end of the thesis.

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Title : *Multiresolution Analysis Using Orthogonal Polynomial Approximation*
Author(s) : *Kumar Rupendra*
Roll No : *9210433*
Supervisor(s) : *Sircar Pradip*

Abstract

In this thesis, a new technique of multiresolution analysis using orthogonal polynomial approximation is described. The analysis technique is applied for the ECG signal, and the results are compared with the same obtained by the wavelet transform based on cubic spline.

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Title : *Processing Non-Uniformly Sampled Data Using B-Splines*
Author(s) : *Paul Abraham Santosh*
Roll No : *9210401*
Supervisor(s) : *Sharma Govind*

Abstract

The present work examines the use of B - splines for the processing of non - uniformly sampled data. A spline approximation is obtained by interpolating the data. The B - spline characterization is used for processing. We derive an algorithm for the convolution of two splines which is used for linear time invariant operations on the interpolant. Further, a method for spline characterization of the impulse response of systems is obtained. An error bound for spline interpolation on samples taken from bandlimited signals has been derived.

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Title : *Analysis Of Two-Layer Electromagnetically Coupled Rectangular Microstrip Antenna Using Moment Method*
Author(s) : *Tyagi Rajeev Kumar*
Roll No : *9020407*
Supervisor(s) : *Sachidananda M*

Abstract

A two - layer electromagnetic ally coupled rectangular patch antenna that is coupled to a micro strip line by an intervening ground plane is analyzed. Coupled integral equations are formulated by using green's functions for dielectric slabs so that the analysis includes all coupling effects and the radiation and surface wave effects of the substrates. The spectral domain approach is utilized for finding the green's functions. The spectral domain approach is suitable for structures which are unbound ed in one or two dimensions. A galeckin moment method solution f the coupled integral equations is obtained. Design curves are obtained for the antenna. Resonant frequency and antenna's dimension are found for a perfect match. The antenna and the a perture in the ground plane are found to appear as a series load along an open circuited transmission line

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Title : ***Architecture Of A VLIW Processor For Linear Array And Its Performance Evaluation***
Author(s) : ***Krishnan K Navaneetha***
Roll No : ***91104277***
Supervisor(s) : ***MahantaAnil***

Abstract

Systolic arrays offer cost-effective solution to many real-time signal processing application and scientific computation, requiring high computational speed. They achieve high throughput by efficiently exploiting both pipelining and parallelism concepts. For high-speed pipelined computation, the processing elements- the building blocks of the array- should have high interprocessor communication bandwidth. To support efficient parallel computation, each PE should be capable of archiving high computational throughput. This thesis reports architecture of a very large instruction word processor (VLIW processor) designed to meet these requirements. Each processor is a horizontally microcoded (128 bits) floating-point processor having its own program sequencer, address generator, floating-point units, register-file and local memory along with a crossbar interconnection and interprocessor communication channels. Using the simulator a few algorithms have been tested. Simulation studies have shown that the architecture is able to efficiently support both pipelined and parallel modes of computation.

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Title : *A Class Of Systolic Arrays Using DSP Microprocessors*
Author(s) : *Sharma R K*
Roll No : *9110436*
Supervisor(s) : *Mahanta Anil*

Abstract

The thesis reports the design and performance evaluation of a linear systolic array. Each processing element (PE) of the array is a programmable 16 - bit DSP microprocessor (ADSP 2100) having separate program and data memories, and capable of achieving a peak throughput of 12.5 MOPS. The PEs communicate with their immediate neighbours through two high bandwidth communication channels having a maximum data transfer rate of 12.5 million words per sec. Using the instruction set of the processor, systolic algorithms for some common signal processing operations like convolution and matrix multiplication have been developed for the array. Programs for each PE have been individually tested using the simulator of the processor. Analysis of these algorithms have shown that the array can achieve high efficiency in certain mode of computation

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Title : *Parallel Implementation Of Feature Extraction Algorithms Using Transputer Network*
Author(s) : *Ram Sita*
Roll No : *9110445*
Supervisor(s) : *Mahanta Anil*

Abstract

The aim of this thesis is parallel implementation of feature extraction algorithms for object recognition using a network of transputers (Type T-800). Object recognition is highly computationally intensive task, requiring different level of complexity in image processing operation. The concurrent processing capability and flexibility of transputer make them ideal for this work. A network of four transputers which communicate the data in parallel and does the computation in parallel was chosen. The parallel algorithms were designed using portioning approach. The execution time for sequential and parallel implementation were noted for different sizes of image for calculating speedup factor and efficiency. The system does not support image of size more than 64x64. Therefore the communication overhead is comparatively more. Due to this, the efficiency of about 60% was achieved. The test image was first edge detected using sobel operator and thresholding technique. Care was taken to remove convolution edge effect. As the edge detected output is not one pixel wide which is required for feature extraction so the edge detected output image was resampled and line drawn to form a one pixel wide contour. The features such as area, perimeter and shape factor were computed using the most efficient sequential algorithms. In this sequential approach the entire image need not be scanned and stored. Only two rows of the image has to be scanned and the features are calculated. Then further scanning of next row is done and features are updated sequentially. Thus only two rows of image is required to be stored. This approach requires less disk space for storage

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Title : *Characterization Of Two New Types Of Fin Line Discontinuities*
Author(s) : *Gupta Alok Kumar*
Roll No : *9120402*
Supervisor(s) : *Biswas Animesh*

Abstract

Two new types of fin line discontinuities (one each in unilateral and insulated fin lines) have been proposed and characterized in this thesis. The discontinuity proposed in unilateral fin line is a rectangular conducting strip, placed in the air dielectric interface of the substrate which otherwise does not have any metalization. For insulated fin line, the discontinuity consists of two rectangular conducting strips placed closed enough but again on two different otherwise metalization free' air dielectric interfaces. Eigenvalue matrix formulation for finding out the resonant length of the fin line cavity containing the discontinuity, has been done using modal analysis approach in case of unilateral fin line. And spectral domain immittance approach in case of insulated fin line. The transverse resonance technique has been applied then to extract the equivalent circuit parameters of the discontinuity in both the cases. Appropriate basis functions for field in the slot and the current on the strip have been chosen, which satisfy the edge conditions. Measurement of transmission coefficient of a sample discontinuity in unilateral fin line have been done and compared with the theoretical results. The two results have been shown matching well, which proves the validity of the choice of basis functions. A low pass filter in unilateral fin line has also been realized by cascading three conducting strips with different widths separated by uniform fin line sections of different lengths. Theoretical results of insertion loss of the filter have been calculated and compared with the measured results

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Title : *Studied On Dielectric Resonator And Design Of A Bandpass Filter In Mic Environment*
Author(s) : *Jain Akhilesh*
Roll No : *9120401*
Supervisor(s) : *Biswas Animesh*

Abstract

An improved technique based on effective dielectric constant method is used to calculate resonant frequencies of a cylindrical dielectric resonator in its lower order modes. These frequencies are also computed using relatively recent technique named finite - difference time domain (FD - TD) method. Using a simple lumped element model for TE_{01δ} mode, external quality factor between a dielectric resonator and a microstrip line, and direct coupling coefficient between two dielectric resonators are calculated and verified with experimental data available in the literature. Above analyses are incorporated in the development of a program DRCAD for calculation of all the physical parameters required for designing dielectric resonator bandpass filter in MIC environment. The accuracy of the designed data is verified experimentally by fabricating a bandpass filter and demonstrated in this thesis

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Title : *Assessment Of PSS And SVS Stabilizer For Large Disturbances*
Author(s) : *Narayan Mritunjay Kumar*
Roll No : *9110424*
Supervisor(s) : *Prabhu S S& Varma Rajiv K*

Abstract

Power System Stabilizers (PSS) and Static Var System (SVS) stabilizers are designed to improve small signal stability of power systems. These stabilizers have to operate satisfactory in the presence of large disturbances too. This thesis undertakes to assess performance of PSS and SVS stabilizers for large disturbances. The system chosen for study comprised of a single machine infinite bus system with two double circuit transmission lines and an SVS at the midpoint of the lines. For this system a co-ordinated PSS and SVS stabilizers design based on robustness consideration has been proposed in an earlier work. A non-linear model of power system suitable for large disturbance study is developed. The power system response for large disturbances vis-à-vis small disturbances has been critically analyzed. It has been observed that PSS and SVS stabilizer do not improve the first swing transient stability. However, they are effective in damping the subsequent swings. We have observed that a higher ceiling on PSS and SVS stabilizer output, though ineffective during first swing, helps in damping subsequent swing and therefore, should be preferred to a small ceiling. The study uses a simple model for the generator as well as a more detailed model, which takes into the first swing. It, however helps, but to a small extent, in damping the subsequent oscillations

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Title : ***Inductive Reasoning Based Selection Of Power System Stabilizer***
Author(s) : ***SahV K***
Roll No : ***9110452***
Supervisor(s) : ***Kalra Prem Kumar & Srivastava S C***

Abstract

This thesis presents a novel methodology to select the near optimal parameters of the power system stabilizer (PSS). The PSS is used in the control system of synchronous machine to enhance the damping of system. The approach used here, to select the parameters of PSS is based on inductive reasoning, which enables the selection of this PSS online, their design being carried out offline. The methodology provides the decision tree which has the capability of classifying unseen set of operating points, since the selection of PSS parameters is a function of operating condition. Hence decision tree based on inductive reasoning principle provides the tool for fast and reliable selection of PSS parameter even for which it has not been trained. For the purpose of generating a knowledge base a linear model of power system for dynamic stability is developed. The power system chosen for the study comprises of a single machine infinite bus system. A parametric study has been carried out to have an overview of stability at various operating points keeping in view that these operating points and the corresponding parameters of PSS form the knowledge base of the inductive methodology

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Title : *Spectral Methods For PLA Decomposition And Fault Detection*
Author(s) : *Biswal Krutibas*
Roll No : *9110417*
Supervisor(s) : *Hasan Mohammad Mozaffarul*

Abstract

A theory has been developed to calculate the Hadamard - Walsh transform from a list of cubes specification of incompletely specified Boolean functions. An efficient algorithm to generate disjoint cubes from non - disjoint ones of a cover has been developed. The transformation algorithm makes use of properties of list of disjoint cubes and allows the determination of the spectral coefficients in an independent way. Decomposition of Boolean function at the functional level is a difficult problem since it requires a global approach. We discuss linear decompositions of Boolean functions implemented as Programmable Logic Arrays (PLAs). Results with experimentation with certain functions shows that functions with imbedded addition are most benefited from this approach. Syndrome testing is particularly useful in two level circuits such as PLAs. It is shown that weighted sum syndromes of all the outputs covers all single stuck - at - faults, bridging faults and cross -point faults. An algorithm is presented, which checks for the WSS testability of a PLA and suggests hardware modifications, in four WSS - untestable

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Title : *Protection Coordination In Electrical Distribution Network*
Author(s) : *Reddy K Chandra Prakash*
Roll No : *9110416*
Supervisor(s) : *Srivastava S C& Kalra Prem Kumar*

Abstract

The protective devices provided in the electrical network act as sensing elements to any abnormal system operating conditions such as the overloading and short circuit conditions and help isolating the unhealthy part of the system. Some of the desirable features of the protective devices are their speed and the selectivity of operation which concerns with isolation of only the faulty region. These features are achieved by proper coordination of the operating characteristics of various protective devices fitted in the network for different fault conditions. In this thesis, protection coordination philosophy and procedure as applied to the industrial distribution system network, has been described for both phase faults and earth faults. A practical system of IIT Kanpur new distribution network, which is at present in planning stage, has been considered. A procedure to select and coordinate the protective devices for this system has been demonstrated. The selection of protective device and coordination of their characteristics, in general do not have any analytical form and depend more on the protection experts' experience. Moreover, since this problem has numerous solutions and some heuristics are required to decide the best or sometimes to resolve the conflicts, the expert system approach has been considered to be appropriate to the protection coordination studies. A rule based expert system using "CLIPS" package has been developed for distribution system coordination.

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Title : *Asymmetrically Thyristor Controlled Reactor For Static VAR System*

Author(s) : *Biswas Panna Lal*

Roll No : *9110480*

Supervisor(s) : *Sachchidanand& Varma Rajiv K*

Abstract

Asymmetrically triggered Thyristor Controlled Reactor (ICR) has been suggested as a possible alternative to the conventional Thyristor Controlled Reactor (TCR) in Static Var Systems. This thesis deals with the detailed investigation of asymmetrically triggered TCR. Steady State analysis of the asymmetrically triggered TCR has been carried out in relation to input current, output voltage, harmonic contents in various quantities and reactive power generation capability in all the three possible modes of operation. A comparative evaluation of this TCR and conventional TCR has been made. It has been observed that, from device point of view, the asymmetrically triggered TCR is decidedly better than the conventional one as it requires thyristor of lower current rating and inductor of smaller size for the same reactive power. A case study, ignoring transients, has been undertaken in order to assess the efficacy of this TCR in SVS applications.

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Title : *Investigation Of Lightning Strikes*
Author(s) : *Sawhney Rajiv*
Roll No : *9110437*
Supervisor(s) : *Arora Ravindra*

Abstract

This report presents the laboratory investigations carried out to study the effect of shape and size of lightning conductor air terminals provided for protection. Besides, topics like classification of electric fields, the lightning phenomena in nature and experimental set - up, have also been discussed. Preliminary laboratory investigations in the present work revealed a strong dependence of the surface area of the electrodes on the breakdown strength of air measured for gap lengths around 15 cm. Recommendations for a suitable shape of the terminal electrode could thus be arrived at after substantial amount of experimentation. During the course of experimental investigations accurate measurements of lightning impulse were possible by using an oscilloscope with high digitizing rate. This instrument, facilitated not only the accurate measurement of lightning impulse wave - shape but also the propagation velocity of discharge during breakdown. Breakdown characteristics of air in weakly nonuniform field configuration for lightning impulse have also been investigated in this work. The phenomenon of statistical time lag and the propagation velocity of leader discharge in such fields have been measured. This corroborated the well known phenomenon of the effect of magnitude of applied voltage on statistical time lag. Oscillograms of applied voltage at breakdown also confirmed the velocity of propagation of leader for such gap lengths as measured with high speed photographic techniques by other researchers earlier. A scaled model of the protection zone with multiple lightning conductors was fabricated. Investigations on this model confirmed the so called rolling sphere concept of protection zone.

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Title : *Fault Modeling And Testing Of Cmos And Bicmos Circuits*
Author(s) : *TiwariS S*
Roll No : *9110446*
Supervisor(s) : *HasanMohammad Mozaffarul*

Abstract

Many defects in CMOS and BiCMOS circuits are not detected by tests generated using traditional single stuck - at - fault model. These undetected faults may be detected by increased propagation delay time or excessive quiescent power supply current (IDDQ). This work provides the results of simulation based fault characterization study of nontraditional faults pertaining to CMOS and BiCMOS circuits, switching speed comparison of CMOS and BiCMOS inverters, variation in propagation delay time due to faults and due to load capacitance variation. An attempt has been made to detect certain faults which are neither stuck - at nor IDDQ detectable by monitoring propagation delay time. SPICE 3 has been used for all the simulations. Effect of bridging faults in CMOS circuits has also been studied.

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Title : *Economic Emission Dispatch*
Author(s) : *Srivastava Rakesh Kumar*
Roll No : *9010437*
Supervisor(s) : *SrivastavaS C& Singh L P*

Abstract

This thesis addresses to the problem of economic emission load dispatch which is used to minimize both the system fuel cost and the emission level and computes optimum real power output of generators. In the present work, the generation dispatch problem is formulated as a multiple objective optimization problem with two non - commensurable objectives (i.e. economy and environmental impact). Each objective is optimized in the light of individual performance index by classical method using Lagrange multiplier. Both deterministic and probabilistic formulations of economic emission load dispatch (EELD) have been developed. Further a fast and simplified approach for computing B - loss coefficients required in EELD formulation is presented. Deterministic as well as probabilistic EELD problems and computation of B – loss coefficients using proposed formulation have been tested on IEEE – 14 bus and IEEE – 30 bus test systems. In case of EELD and probabilistic EELD, various trade – off curves are shown which can be used by operating personnel to reduce emission level while economizing on fuel cost

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Title : *Study of AC Regulator and Static VAR Compensators Realized from AC- AC Matrix Converter*
Author(s) : *Mishra Barada Shankar*
Roll No : *null*
Supervisor(s) : *Dubey G K*

Abstract

In recent years, the progress of power device technology and the development of large power integrated circuits have sparked renewed interest in direct ac-ac power conversion and in particular Matrix Converter. Till now Rectifiers, Voltage Sourced Inverters and Current Sourced Inverters has been studied as special cases of Matrix Converter. This work presents the AC Regulator and Static VAR Compensators realized from Matrix Converter. A number of modulating functions for AC Regulator has been proposed and two methods for realizing Static VAR Compensator are also proposed. The effect of sequence of switching of switches of a row is also studied. Possible PWM methods are also discussed. The digital simulation results are given for all the cases. It is found that the sequence of switching affects the harmonic contents. It is also found that all the PWM methods gives almost same Harmonic Spectrum. At lower switching frequency the Asymmetrical Regular Sampling technique gives a better performance. The feedback control technique and few practical points have been discussed. The feedback technique has been extended to any voltage ratio (previously Prof. Venturini had proposed for the maximum voltage gain only) without making the equations

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Title : *PWM Single Phase Two-Stage Converters For Traction*
Author(s) : *Baad Shivanand*
Roll No : *9110441*
Supervisor(s) : *Dubey G K*

Abstract

Sequence control of multistage half controlled AC - DC converters reduce reactive power demand from the supply system. However they do not affect the requirements on power filters tuned to suppress predominant lower order harmonics. PWM techniques can be used to prevent the generation of these harmonics from the converters. In high power converters rated in megawatts, device capabilities limit the switching frequencies to only a few hundred hertz. To accomplish an acceptable performance through PWM techniques, series or parallel connection can be used. In this project, extension of PWM techniques to 2 - stage AC - DC converters is studied. Application of sinusoidal PWM (SPWM) and selective harmonic elimination (SHE) techniques is studied. Requirements on filters for converters operating with these techniques is considered and compared with the sequence controlled AC - DC thyristor converters.

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Title : *A Novel Approach To Minimum-Time Path Planning Of Robot Manipulators*
Author(s) : *Rao Madhav N*
Roll No : *9120408*
Supervisor(s) : *Prabhu S S*

Abstract

A method has been proposed to find a near minimum - time path for a robot manipulator. Joint position and input torque constraints and the manipulator dynamics along with obstacle constraints are considered in finding the path and the minimum time along it. The method uses a combination of the time minimization algorithm along a prespecified path and the energy - minimization algorithm for fixed time of traversal, to find the final optimal path. Both the algorithms have been implemented using the method of local variations. The local perturbations of the trajectories involved, which are required for this method, are achieved by approximating these trajectories by B - spline polynomials. The method requires a suitable initial feasible path. Guidelines for choosing such a path in the absence of obstacles are given. An algorithm has been presented to find a suitable initial collision -free feasible path in the presence of static obstacles. This algorithm uses a distributed representation of the robot workspace and is simple and fast. All the algorithms developed have been implemented and tested through computer simulation of the first three joints of PUMA 560 robot

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Title : *Study Of Stabilizing Controls In Multimachine Power System*
Author(s) : *SharmaNikhlesh Kumar*
Roll No : *9110426*
Supervisor(s) : *Varma Rajiv K& Sachchidanand*

Abstract

In this thesis the study of coordinated control of damping control in multi machine environment has been carried out. Also, three strategies have been evolved for selection of candidate device on which the auxiliary control should be installed. Strategies to minimize the number of damping control devices have been evolved. Eigenvalue analysis technique has been used for the design of damping control. Selection of candidate device for placement of damping control is based on state and voltage participation factors. Selection of potential feedback signal is based on observability factor. All the small signal analysis results have been validated through extensive time - domain simulation. Hitherto unrevealed insight into the co - ordinated action of various controllers from small signal analysis have been brought out from time - domain simulation

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