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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

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2019 - 2020

Development of Level Sensor for Lead – Lithium Loop System

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Abstract— Lead-Lithium (Pb-Li) eutectic alloy is considered as the coolant in Indian Lead-Lithium ceramic breeder blanket. This liquid metal alloy is circulated through the blanket modules of fusion reactors at operating temperatures around 450°C. The Lead- Lithium system which supplies the alloy to the blanket module is operating at high temperature and needs redundant level measuring sensors along with other diagnostic devices. The high operating temperature, high chemically active nature of Pb-Li allov and its reaction with air make its instrumentation difficult conventional over instrumentation. Since Lead Lithium is a good conductor of electricity, mutual inductance type continuous level sensors is the best choice. Design and development of the level sensor has been taken up based on the experience of mutual inductance level sensor used in sodium systems. This paper provides a brief discussion about conceptual design, specifications, modeling and simulation using Finite Element Method Magnetics (FEMM), study on skin depth and temperature compensation of sensor output for the mutual induction type continuous level sensor designed for Pb-Li loop system. It also includes the experimental validation of the level probe using solid aluminum blocks in place of Lead-Lithium alloy.

Keywords — Fusion reactor, Lead-Lithium alloy, Level measurement, MI type level sensor, Temperature compensation.

I.INTRODUCTION

In the Indian Lead Lithium Ceramic Breeder (LLCB) fusion blanket, the coolant used is Lead-Lithium (Pb-Li) eutectic alloy. Lead Lithium (Pb-Li) alloy is particularly

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selected as the blanket coolant of a fusion reactor as Lithium in the alloy is required to breed Tritium (fuel for fusion) by the high energy neutron reaction and Lead is needed to multiply the number of neutrons. Moreover an alloy of Lithium and Lead can bring down the melting point of Lead substantially and as a liquid metal, this alloy will act as an efficient coolant. Due to its reactive nature with air, the alloy is to be tightly contained in a loop made of Stainless steel. The operating temperature of the alloy is in the range of 300-480°C. Both these factors make it difficult to monitor and regulate the process without proper sensor arrangements. The major sensors required for Lead-Lithium alloy are Flow, Level, Pressure, Temperature and Leak detector sensors. IPR has already developed a discrete type level sensor for Lead-Lithium alloy. The main challenge associated with such sensor is that the level measurement is not continuous. Viswajyothi College of Engineering and Technology (VJCET) in Collaboration with IPR is developing a continuous type level sensor for Lead-Lithium eutectic alloy which works based on the Mutual Induction Principle. The design is based on the level probe design [1] carried out in IGCAR, Kalpakkam, TN for molten sodium system. Modifications in sensor components and its electronic chassis were done to address the increased electrical resistivity of Lead Lithium (Pb-Li) eutectic alloy compared to sodium. Conceptual design and detailed design of level sensor is completed initially and the size of the level sensor especially the active and nonactive length suitable for the Pb-Li loop system at IPR was finalized. Finite Element Method Magnetics (FEMM) based modeling and simulation was carried out to assess the sensitivity at operating conditions. Detailed technical specifications were prepared and the probe and electronics are manufactured as per specifications. In order to test the probe at room temperature conductive

A Review on Flow Measurement in Sodium Cooled Fast Reactor Circuits

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Abstract— The Alkali metal sodium in liquid state is used as the coolant in sodium cooled fast reactors because of its good nuclear properties and admirable heat transfer properties. The economic, safe and sustained operation of sodium cooled fast breeder reactors depends on reliable and dependable monitoring of process parameters such as flow, accurately in its primary, secondary and auxiliary liquid sodium circuits. Like other sensors for sodium systems the relatively good electrical conductivity of liquid sodium is successfully used for flow measurement in pipelines. Different types of electromagnetic flow meters with different configurations are designed, constructed and were successfully in use internationally. The challenges and issues faced in pipe line sodium flow measurement using electromagnetic flow meters were addressed by researchers in India and abroad. China, Russia, Japan, Korea and France have very active fast reactor programme now. SFRs are currently in operation in India, Russia and China. In India Fast Breeder Test Reactor (FBTR) is in operation and Proto Type Fast Breeder Reactor (PFBR) is being commissioned at Kalpakkam, Tamil Nadu. The size of various pipes in sodium circuits of a typical 500 MWe SFR ranges from 15 nominal bore (NB) to 800 NB. Numerical modelling and analysis of Alnico-V based flow meters, sodium calibration of the flow meters to assess the deviation from numerical prediction, stability studies on Alnico-V based flow meters, design, analysis and manufacturing of flow meter with Samarium Cobalt magnets, development of side wall type flow meters, design and development of bypass type flow meters and application of ultrasonic flow meters for sodium flow measurement are the major developments in the area of sodium flow measurement in the recent past. This paper gives a comprehensive review on the recent developments in this domain and the recommendations made for the most suited flow meter for different sizes of pipes in future SFR circuits.

Keywords— magnetic flow meter, sodium cooled fast reactor, stability, accuracy, flow measurement.

I. INTRODUCTION

Development of sustainable energy resources with minimum environmental impact is very much essential for future generation. Along with other sustainable energy sources, nuclear power is an inevitable option for producing electricity without carbon dioxide emission. Around 11 % of the electrical energy generated in the world today is from nuclear reactors [1]. To harness energy from abundantly available fertile isotopes, fast neutron reactors with closed fuel cycle are being deployed. Fast neutron reactors, when fueled with plutonium, have the potential for breeding new fuel by neutron capture in uranium-238 isotope which forms 99.3% of natural uranium and Thorium-232. In the Indian context, development of fast breeder reactor technology, which is Dr B Aruna

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capable to convert the large resources of fertile Thorium available in the country to fissile Uranium-233 isotope, is essential. The Generation IV International Forum (GIF) with thirteen countries as members have selected six reactor technologies for further research and development, which include Sodium cooled Fast breeder Reactors (SFR) [2]. This shows the international importance of SFR. The economic, safe and sustained operation of sodium cooled fast breeder reactors depends on reliable and dependable process parameters such as flow, monitoring of accurately in its primary, secondary and auxiliary liquid sodium circuits. The Alkali metal sodium in liquid state is used as the coolant in sodium cooled fast reactors due to its very good nuclear properties and admirable heat transfer properties. Sodium cooling allows the reactor to be at atmospheric pressure even at high temperature. Besides high boiling point, high thermal conductivity and low viscosity, sodium is very good conductor of electricity too. Like other sensors for sodium systems the good electrical conductivity of liquid sodium is successfully used for sodium flow measurement in pipes and circuits. Different types of electromagnetic flow meters with different configurations are designed, constructed and are successfully in use. The problems faced in sodium flow measurement is addressed by researchers in India and abroad. In India the experiential Fast Breeder Test Reactor (FBTR) [3] currently is in operation and Proto Type Fast Breeder Reactor (PFBR) [4] is being commissioned at Kalpakkam, Tamil Nadu. Flow sheet of FBTR is shown in Fig. 1. The size of various pipes in sodium circuits of a typical 500 MWe SFR ranges from 15 nominal bore (NB) to 800 NB. China, Russia, Japan, Korea and France have very active fast reactor programme presently and SFRs are in operation in Russia and China. This comprehensive review focus on the current trends in flow measurement techniques in the pipelines of primary, secondary and auxiliary sodium circuits of SFRs. Recommendations are also made for selecting the best suited flow meter for different pipe lines for future SFRs.



Experimental Investigation on PCE and SNF Type Admixture on Early Age Strength of M40 Grade Green Concrete



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Abstract Super plasticizers are chemical admixtures used where well-dispersed particle suspension is required. Its application in concrete facilitates the reduction of the water with respect to the cement ratio without adversely influencing the workability of the concrete sample. Nowadays, due to rapid constructions there is a huge demand for the use of chemical admixtures. Among these admixtures, super plasticizer poly carboxylic ether (PCE) and naphthalene formaldehyde sulphonate (SNF) has great market relevance. The optimum dosage of the admixture is to be determined and the percentage reduction of water content is also noted. Various tests are conducted on the sample at different mix proportion and at different age as per code specifications. Perlite, which is a type of amorphous volcanic glass, is replace with fine aggregate at optimum dosage of the super plasticizer and strength is determined [1]. Perlite addition will results in green concrete of superior strength, fire resistance, acoustic properties, thermal insulation, HVAC conditions along with the replacement of conventional materials used in concrete. This research investigates on the determination of optimum dosage of super plasticizer and possible replacement of fine aggregate with perlite for sustainable concrete.

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2L-2D Routing for Buffered Mesh Network-on-Chip

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Abstract. The rise in complexity and number of processing cores in SoC has paved way to the development of efficient and structured onchip communication framework known as Network on Chip (NoC). NoC is embraced as an interconnect solution for the design of large tiled chip multiprocessors (TCMP). It is characterized by performance metrics such as average latency, throughput and power dissipation which depend on underlying network architecture. In this paper, we propose 2L-2D (Two Layer Two dimensional) architecture to enhance performance of conventional buffered 2D mesh NoC where two identical layers of 8x8 meshes are stacked one on top of the other. 2L-2D uses conventional 5-port virtual channel router (VCR) architecture and vertical interconnections are made by utilizing unused ports at edge routers only. Experimental results indicate that our proposed approach improves throughput and network saturation point whereas average flit latency and power dissipation is considerably reduced when compared with standard 5-port 2D mesh and torus designs.

Keywords: Network-on-Chip · Virtual Channel Router · Average latency · Throughput.

1 Introduction

Rapid progress and innovations in IC technology have led to massive rise in transistor integration which resulted in the evolution of complex System-on-Chip (SoC) comprising of IP (Intellectual Property) cores that are connected either by classical shared bus or point to point intercommunication architectures. Network-on-Chip (NoC), a packet-switched network, has emerged to overcome integration restrictions of SoC and interconnect associated issues like global

DESIGN OF 28 GHz HIGH GAIN 5G MIMO ANTENNA ARRAY SYSTEM

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Abstract -In this paper, a design of linearly polarized MIMO antenna array working at millimetre wave (mmW) band is presented. It is a compact size antenna and gives high gain and Band width. Specifically, this 4-port MIMO antenna array working at centre frequency of 28 GHz with better ECC due to proper element spacing. The desired MIMO antenna is designed on a substrate Rogers Duroid 5880 with a relative dielectric permittivity of 2.2 and its thickness is 0.8 mm. The total size of the antenna designed is 17.16336×61.9755×0.8 mm3.The simulation results show; its return loss is less than -10 dB in the frequency range of 26.69– 30.29 GHz and it provides a wide bandwidth of 3.53 GHz. It gives a unidirectional radiation pattern and high gain of 19.6 dBi. Mutual coupling value is less than -25 dB for each element.

Keywords: - 5G, Multiple Input and Multiple Output (MIMO), Array of antenna. ECC

I INTRODUCTION

A huge demand of high data rate in mobile communication cause an intensive research on fifth generation (5G) system, which is much faster than the present technology. The licensed frequency spectrum proposed by the FCC (Federal Communications Commission) for 5G communication are 28 GHz,37GHz and 39GHz and also proposing unlicensed frequency spectrum for this application [1 2]. Due to high frequency path loss a high gain antenna with proper array structure of adaptive beam forming capabilities are required. A large band width is also required to achieve high data rate [3 4].

To enhance data transmission speed and to get a resistant to multiple paths fading, massive Multi-Input and Multi-Output (MIMO) is one of the promising technologies for 5G, which has been widely investigated. As a MIMO system, the transmitter or receiver needs two or more antenna elements [5]. However multiple antennas bring drawbacks in the increasing size of the system and worsen the isolation between them, therefore cause distorted radiation pattern and decrease channel capacity [6]. The designed MIMO antenna must take care of all parameters required and should maintained.

In this paper, a design of 2X2 square patch array which arranged as MIMO with using four such an array element for 5G applications is proposed, which will improve the total gain. Antenna is designed for 28 GHz centre frequency, which can produce wider bandwidth. This antenna expected to be used for 5G wireless communication network applications.

II DESIGN OF ANTENNA

The proposed Square patch 2X2 array MIMO antenna is designed on substrate Rogers Duroid5880, which has the relative permittivity of 2.2 with loss tangent 0.009 and thickness is set to 0.8 mm. The total size of the antenna system is $17.16336 \times 61.9755 \times 0.8 \text{ mm}^3$. It contains four 2x2 array antennas with four edge feeding ports at top layer and which is separated by a distance of 4.3565mm and a full ground plane at bottom layer.

A. 2X2 Array Antenna System

A single square patch with inset fed is used as the basic element for the array and its dimensions were optimized to operate at frequency 28 GHz. After its design finalization, a 2X2 array antenna system is designed with novel impedance matching stub that contains $100 \Omega, 70 \Omega$ and 50Ω microstrips line. Each basic element of the array is separated with a distance of 0.74λ , that gives better gain with minimum grating lobs [7]. To achieve proper impedance matching and reducing the mutual coupling between elements, here chosen even multiple of guided wave length of 100Ω microstrip line in the pulsed shape. its detail design dimensions and geometry are shown in *Fig.1(a)*.



Traffic Aware Deflection Rerouting Mechanism for Mesh Network on Chip

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Abstract-In two dimensional mesh Network on Chips (NoC), efficient routing algorithms route majority of the flits through the central routers of the network, whereas routers at the edges and corners experience relatively lesser flit flow. This in turn leads to higher traffic towards central routers than to edge and corner routers. Such uneven traffic distribution causes thermal hot-spots at the center of the chip where the load is high, and reduces the average life-time of the chip. In existing buffer-less deflection routing techniques, load balanced traffic distribution is not considered as a factor during assignment of links to mis-routed flits. Devising deflection routing techniques with greater load balancing capability is a major challenge for efficient thermal management of the chip. This paper proposes an adaptive routing mechanism that can provide a more balanced traffic profile in a deflection router based mesh NoC. Significant number of deflected flits are rerouted towards the edges/corners of the mesh, thereby reducing the load on the central routers. From evaluations, it is seen that the proposed technique reduces traffic variance compared to NoCs using baseline deflection routers. Transient temperature variation studies using Hotspot tool substantiate our findings.

Index Terms—Network on Chip, Deflection routing, Traffic rerouting, Traffic variance, Average latency

I. INTRODUCTION

With the aim of enhancing the performance of processors, multiple computational cores are integrated on a single chip and are termed as Tiled Chip Multiprocessors (TCMP) [1]. Network on Chip (NoC) is widely envisioned as the interconnect of such TCMPs. In a homogeneous TCMP, various tiles are connected using a two dimensional mesh topology where each Processing Element (PE) is connected to a dedicated router and routers are interconnected using links. Data is exchanged between tiles in the form of packets. A packet is further divided into flits (flow control units). Packets generated from a PE make multiple hops through intermediate routers and links and finally reach their destination core. Each router has input/output ports to North, South, East and West directions and also to the local core.

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The first generation NoCs used input buffered routers that use store-and-forward wormhole routing technique [2]. A flit occupies a buffer in the router until it wins arbitration for a productive output port. Buffers play a major role in improving the network performance parameters, but they consume significant amount of chip power. Buffer-less deflection routers are proposed as an alternate method for achieving energy efficient on chip communication [3]. Experiments show that buffer-less routers outperform buffered ones at low to medium injection rate [3]. Due to absence of buffers, flits that fail to occupy productive output ports are deflected through available output ports of the router. In deflection routing, a flit with higher priority is allocated to an output port of its choice. Output ports obtained by other flits are determined by the flit priority, port conflict and port allocation method. Consequently, traffic due to flit deflections may either be towards the center or the edges/corners of the mesh. Majority of the productive flit movements as well as large number of flit deflections occur through the central routers causing traffic imbalance and uneven thermal distribution across the mesh. In this paper, we propose a simple logic unit in the output port allocation stage of deflection routers that reroutes deflected flits away from the center of the mesh and improves the traffic evenness across the network.

II. RELATED WORK

Most of the NoC routers adopt minimal routing techniques that focus on network performance rather than traffic balancing [4]. Due to restrictions imposed by the routing algorithm, certain regions in the network tend to have more concentration of traffic than the rest, creating an uneven traffic profile. Over the past decade, a wide variety of routing techniques for resolving network congestion have been proposed for NoCs with input buffered routers. Beginning with the Free Buffer Priority (FBP) scheme, the count of free input buffers in downstream routers is taken as a measure for adaptive selection of output ports [5]. BOFAR utilizes the history of buffer occupancy time of flits to determine congestion in downstream routers [6]. Another work introduces an agingaware adaptive routing algorithm that routes packets along

ReDC: Reduced Deflection CHIPPER Router for Bufferless NoCs

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Abstract—Network on Chip (NoC) is emerging as a promising design paradigm as an on-chip interconnect for multi-core architectures to overcome scalability and bottleneck issues of traditional bus-based and point-to-point communication architectures. Minimum packet latency, power and area with improved performance are the important characteristics that determine the efficiency of an NoC router. In this paper, we propose a bufferless deflection router, ReDC, which minimizes the deflection rate of flits by selecting a Permutation Deflection Network with an input combination that gives most number of productive output ports. Simulation results show that our proposed design improves the network saturation point, reduces the average flit latency and deflection rate without significant change in critical path delay when compared to existing state-of-the-art bufferless deflection routers.

Index Terms—Network-on-Chip, bufferless, deflection routing

I. INTRODUCTION

The advancements in IC technology have resulted in miniaturization due to the fall in transistor feature sizes to ultra-deep submicron levels. This has led to sharp increase in transistor densities resulting in the development of complex System on Chip (SoC). The traditional SoC is composed of IP (Intellectual Property) cores or predesigned functional blocks, which are interconnected using point to point intercommunication using dedicated wires or classical shared bus. But the shrinking technology resulted in an imbalance between on chip wire delay and gate delay leading to increased power consumption, on-chip synchronization errors, unpredictable delays, etc. Network on Chip (NoC) concept, which is a packet-switched network, was introduced to overcome scalability, predictability and bottleneck challenges faced by the traditional SoC architecture. NoC communication is gaining popularity due to its advantages like improved parallelism, scalability, simultaneous communication between multiple pairs of processing elements, inherent fault tolerance, improved load handling capability and modular topology to interconnect the processing cores [1], [2].

The regular tile-based NoC architecture consists of highspeed routers, Network Interfaces (NI) and communication links as its main components. Each tile can be a general purpose processor, a DSP processor, a memory subsystem, etc

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and the communication between them is achieved by routing packets. A packet is the basic data unit in NoC and each packet is subdivided into flow control units called flits. In NoC, network traffic is initiated due to cache misses and coherence transactions. Router, which is the backbone of NoC, consists of five input and five output ports, one each for the north, south, east, west directions and one for local port connected to the processing core. The injection and ejection of flits to and from the network is done through local port [1], [3].

The conventional Virtual Channel (VC) based NoC has a set of buffers associated with each port of the router which increase their load handling capacity and throughput. But they consume significant portion of on-chip network power and area. Bufferless NoC routers, employing deflection routing have been proposed to overcome this rising power and area issues of the VC based router. In bufferless deflection router [4], [5], flits which do not get desired output link get deflected through a freely available output link. This increases latency of flits due to misrouting of flits. In this paper, we propose Reduced Deflection Chipper (ReDC), a modified version of CHIPPER [5], which uses a two stage router pipeline with single cycle latency at each stage, and is more energy efficient with reduced average latency and deflection rate while operating at almost the same speed as CHIPPER.

The remainder of this paper is organized as follows: An overview about the related work and the motivation behind the current work is present in Section II. Section III provides details about the new router architecture, ReDC. The experimental methodology followed is discussed in Section IV. Section V provides the results and analysis and finally Section VI concludes the paper.

II. RELATED WORK AND MOTIVATION

The scaling and applicability of the conventional input buffered virtual channel (VC) based router design is severely hampered by the presence of power hungry buffers [6], [7]. Even though VC routers eliminate unnecessary wastage of link bandwidth and deliver higher throughput, the buffers occupy significant area and consume large amount of static power when idle and dynamic power when active. Studies have shown that when the packet injection behaviour of real

Implementation of Aperture coupled Stacked layer Microstrip Patch Antennas for 5G Wireless Communication Systems

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Abstract— In this paper microstrip patch antennas for 5G wireless communication systems using aperture coupled feed has been implemented for 3.4GHz for improvement in better bandwidth and gain. The main mechanism of power transfer between its feed line and slot in between the patch is the technique implemented in aperture couple feed antenna. In this technique, the feed circuitry is shielded from the antenna by a conducting plane with a hole (aperture) to transmit energy to the antenna. In this work the simulated output is obtained for 3.4GHz by using ANSYS HFSS Software. Aperture couple feed is fabricated using network analyzer. The fabricated aperture coupled stacked layer microstrip patch antennas produced better return loss and impedance bandwidth for future 5G wireless communication systems.

Keywords—Aperture couple microstrip antenna (ACMA), microstrip metallic patch, 5G wireless communication systems.

I. INTRODUCTION

Wireless communication technology is expanding nowadays rapidly due to the increase in the numbers of users in terms of internet usage. Rapid evolvement of 1G, 2G, 3G and recently 4G LTE technologies has been evolving recently. One of the provoking factors that affect the today's wireless communication is lack of feasible frequency resources. In order to solve this problem, research has been started in 5G wireless communication at millimeter frequency band, which ranges between (3.4GHz-5GHz) low frequencies, (28GHz, 37GHz and 39GHz) high frequencies.

Numerous fields have adopted the 5G technology with Internet Of things (IOT).There are few challenges also to implement 5G wireless systems such as use of higher frequency bands to support high capacity, uniform service experience in a cell, highly efficient systems etc. These challenges are also discussed and explored to understand 5G communication. The main motive of 5G is to connect millions of devices together. The 5G technology system for wireless communication has been rapidly increasing at a very faster rate. Some of the future applications in wireless systems becomes a reality in rapid growth in 5G technology are Smart grids, Smart Cities, Smart transportation, Telemedicine, Machine to machine communication applications etc. which has been evolved rapidly.

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5G technology advances mitigating low profile advantage of microstrip patch antenna and it involves identifying the existence of various electromagnetic interference problems in 5G and need for identifying the solutions to overcome various problems in 5G technology. There are several feeding techniques to be implemented for microstrip patch antennas. The several feeding techniques are microstrip feed, coaxial feed, aperture coupled feed and proximity coupled feed. For better improvement in gain and bandwidth for microstrip patch antennas for 5G wireless communication systems microstrip line feed and aperture couple feed techniques has been implemented.

The microstrip patch antenna designed consists of a printed twisty probe (M-probe) and shortened patches to generate a wideband CP operation which implements circularly polarized antenna. The stacked patch implemented on the antenna enhances to improve the axial ratio (AR) bandwidth for future 5G Wi-Fi application .[4]

Horizontally polarized linear or cylindrical magneto electric dipole antenna fed with substrate integrated waveguide (SIW) composed with a pair of electric dipoles realized by 4 metallic patches is proposed. A ME dipole antenna with a bandwidth of 46.5% and a gain of around 6dBi has been proposed [6]. Wide band circularly polarized antenna has been proposed which achieves 42.3% of bandwidth and 16.8% Axial Ratio bandwidth, and gain of the antenna is 6.6 dBic less than 0.5 dB variation [8]. An omni directional circularly polarized antenna was designed operating at 28GHz has been proposed for device to device to wireless systems. The measured OCP obtains axial ratio bandwidth of 2.2GHz from 26.5GHz to 28.7 GHz and an 8% fractional bandwidth which completely covers the 27.5GHz to 28.35GHz for the proposed band for future 5G cellular systems [9]. Log-periodic dipole array antenna has been implemented for improvement in gain and bandwidth is proposed for future 5G communiation systems. The antenna is obtained with waveguide and the obtained antenna is less than -12 dB and the gain is about 7-13 dBi over the frequency band of 45-55 GHz [11]. New electronic beam forming technique has been implemented in this proposed design . A good scanning performance of about + or -20

A study of factors affecting supply chain performance

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Abstract. In the present global market, the competition is not between the companies but between the supply chains. The comparison of performance measures of supply chains helps to identify a good supply chain. The best performing supply chains may survive over a long period. The performance of a supply chain is affected by various internal and external factors. The objective of this paper is to identify and conduct a detailed study of the major factors affecting the supply chain performance. The factors are identified by reviewing various literature in the supply chain field. In this respect, a total of 54 literature are reviewed. The major factors identified as supply chain structure, inventory control policy, information sharing, customer demand, forecasting method, lead time and review period length. The optimum selection of parameters of these factors improves the supply chain performance.

1. Introduction

A Supply Chain (SC) can be defined as a network of members linked together by flow of materials, information, and funds with an objective to reduce overall system cost [1]. The supply structure may differ based on the number of intermediate facilities and position of the facilities within the supply chain. In general, the facilities in the supply chain are supplier, manufacturer, distributor, wholesaler, and retailer. Each facility in the supply chain processes order based on the available information and places order to the immediate upstream facility. From available stock, the upstream facility meets the demand of the downstream facility. The downstream facility represents the direction towards the end customer, and the upstream facility is the direction towards the end supplier. Finally, customers collect the product from the last facility of the supply chain. Figure 1 shows a representative supply chain. The goal of an SC is to maximize overall profitability, and it is calculated as the difference between the revenue generated from the customer and total cost incurred across all stages of the SC. The higher the SC profitability, the more successful is the SC. Nowadays the SC success is measured in terms of SC profitability and not in terms of the profits at an individual stage. SC profitability may decrease due to the lack of strategic fit between the competitive strategy and SC strategy. The competitive strategy defines the set of customer needs that it seeks to satisfy through its products and services. The SC strategy determines how the SC should perform with respect to efficiency and responsiveness. To achieve a strategic fit, a company must first understand the uncertainties and capabilities of the SC in

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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

2018 - 2019

A Review of Recent Advancements in Nuclear Power Generation

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Abstract --- Demand of Electrical Energy is increasing day by day. A steep increase in power generation capacity is needed to meet the demand. According to projections nuclear energy is having the potential to meet the demand in the long run. Twenty two nuclear power reactors are in operation now in India and have a total installed capacity of 6780 MW. Nine nuclear reactors are under construction which has a capacity of 6700 MW (including PFBR). Ten nuclear power reactors of 700 MW each are approved by Government of India recently and the site selection process is completed. Few more reactors aiming at a capacity addition of around 30000 MW are planned under international collaboration. We have limited quantity of Natural Uranium and abundant quantity of Thorium in our country. Three phase nuclear power programme of our country envisages to achieve energy security by effective use of these nuclear resources. Development and deployment of Fast Breeder Reactors with plutonium as fuel and sodium as the coolant, reprocessing of the fast reactor spent fuel to close the fuel cycle, development of advanced heavy water reactors, development of compact high temperature reactors and activities related to fusion reactor programme with international collaboration are the major advancements taking place in our country today. This paper reviews and summarizes the present status of Indian nuclear power programme and associated research and development activities progressing in our country to achieve energy security.

Key words: Nuclear; Reactors; Fuel; Fission; Fusion

I. INTRODUCTION

Energy is an essential commodity for human development and per capita energy consumption is a measure of human development index. Per capita energy consumption is an indicator of standard of living. The installed electricity generation capacity of our country as on September 2017 is 3.3 lakhs MW[1]. The present national per capita electricity consumption is around 1100 kWh[1]. Our target is to increase the per capita consumption to 1500 kWh by 2020 and to 5000 kWh by 2050. To achieve this target a fourfold increase in installed capacity is required in next 33 years. To meet

this demand, the power generation capacity has to be increased and all energy resources have to be utilized. Environment friendly power generation methods are needed to limit carbon dioxide emission and global warming. Green house gas emission and global warming is an alarming issue. Reliable and quality power should be available at optimum power cost. 16 % of world population is in India but our coal reserves are only 6 %. Estimated coal reserves are around 210 billion tones. 550 million tons of coal is consumed per year for power generation now [1]. Use of coal should be minimized from environmental consideration. There are limitations in mining and transportation. Coal formed in millions of years should not be exhausted in few years. According to projections, nuclear energy is having the potential to meet the demand in the long run in a sustainable manner. Three phase nuclear power programme of our country envisages to achieve energy security by effective use of these nuclear resources. Development and deployment of Fast Breeder Reactors with plutonium as fuel and sodium as the coolant, reprocessing of the fast reactor spent fuel to close the fuel cycle, development of advanced heavy water reactors, development of compact high temperature reactors and activities related to fusion reactor programme with international collaboration are the major advancements taking place in our country today. This paper reviews and summarises the research and development activities currently undergoing in our country in the area of nuclear energy.

II. THREE STAGE NUCLEAR POWER PROGRAMME

India's three-stage nuclear power programme was formulated by Dr Homi Bhabha to secure the country's long term energy independence, through the use of uranium and thorium reserves found in the monazite sands of coastal regions of South India.

Analysis of Scheduling Algorithms in Hadoop

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Abstract. Distributed system consists of networked computers that provide a coherent system view to its users. Distributed computing is the use of distributed system to solve complex computational problems. Cloud is a distributed environment, having large capacity data centers. It needs parallel processing and task scheduling. MapReduce is programming model for processing this big data. Hadoop is a Java based implementation of MapReduce framework. The task scheduling in MapReduce framework is an optimization problem. This paper describes about some advantages and disadvantages used in different Hadoop MapReduce scheduling algorithms. It also gives the important of performance metrics considered in different performance objectives.

Keywords: Cloud computing · Distributed computing · Hadoop · Map reduce Scheduling

1 Introduction

Big data represent a large volume of data that are stored in distributed data centres. It also includes techniques and technologies that are used for extracting hidden values of large data set as the requirements of the users. Cloud is a distributed environment that contains data centres with large capacity [1, 2].

Cloud computing is a paradigm that makes available the on-demand accessing configurable shared resources over the internet. The cloud deployment model comes in six types: Private Clouds, Public Clouds, Hybrid Clouds, Community Clouds, Federated Clouds and Multi-clouds and Inter-clouds. A public cloud is a publicly accessible cloud environment with the help of cloud vendors. The Community Cloud infrastructure is used by a specific organizations. Hybrid Cloud is a collection of cloud infrastructures like private, community, or public. A federated cloud is the deployment and management of multiple external and internal cloud computing services to match business needs.

This paper mainly deals with scheduling of cloud resources. The rest of the paper is presented as follows. Section 2 gives a description about distributed system. Sections 3 and 4 deals with cloud computing models and different performance metrics associated with scheduling respectively. Section 5 deals with some Hadoop scheduling algorithms used in Job Trackers and its analysis with performance objectives.

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Application of Distributed Arithmetic in Image and ECG Signal Processing

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Abstract-The core of many DSP applications involve convolution which was previously implemented by Multiply and Accumulate operations or MAC. It requires a number of multipliers and accumulators. The use of multipliers and accumulators result in faster execution but it also results in an increase in cost. Also the number of multipliers and adders are limited. Hence a new technique known as Distributed Arithmetic (DA) was proposed. It is basically a multiplier-less concept utilizing Lookup Table (LUT). It is used when one of the operand is fixed. The input enters into a serial register which is used to access the LUT. To get the address from the LUT we consider the bit positions and get the values of inputs by that bit position. The output from the lookup table is shifted accordingly and the shifted results are added together to form the final result. Hence it basically involves accessing the lookup table, shift and add operation. After implementing the DA logic and comparing it with the convolution scheme, we apply this concept in Discrete Wavelet Transform (DWT) of an image and ECG signal by using Haar filter coefficient.

Keywords— Distributed Arithmetic, Discrete Wavelet Transform, ECG Signal.

I. INTRODUCTION

Technological growth of semiconductor industry has led to unprecedented demand for low power, high speed complex and reliable integrated circuits for medical, defense and consumer applications. Today's electronic equipment comes with user friendly interfaces such as keypads and graphical displays [1]. In the last few years there has been a great amount of interest in wavelet transforms, especially after the discovery of Discrete Wavelet Transform (DWT). The DWT can be viewed as a multi-resolution decomposition of a signal [6]. In this paper we study the feasibility of applying a technique called Distributed Arithmetic in DWT of an image and ECG Signal. The JPEG2000 also adopts DWT into its standard. Recently several VLSI architectures have been proposed to realize single chip designs for DWT. Traditionally, such algorithms are implemented using programmable DSP chips [9]. We see that DWT is being increasingly used for image coding. This is because the DW can decompose the signals into different sub bands with both time and frequency information. It also supports features like progressive image transmission, compressed image manipulation and region of interest coding [1].

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Recently several VLSI architectures have been proposed to realize single chip designs for DWT. Traditionally such algorithms are implemented using programmable DSP chips for low rate applications or VLSI Application Specific Integrated Circuits (ASICs) for higher rates [1]. The decomposition of an image using 2D-DWT is shown in Fig. 1.



Fig. 1. Image decomposition using 2D-DWT

In normal DWT, the signals convolve with the specified filter coefficients and give the required frequency information. To perform the convolution we require fast multipliers which can perform the operations efficiently. Because filter coefficients remain constant during the entire duration of the transform, Constant Coefficient Multipliers (CCM) were considered for the design. In this paper, Distributed Arithmetic based multiplier is used for this purpose. Distributed Arithmetic is a bit level rearrangement of a multiply and accumulate to hide the multiplications. It is a powerful technique for reducing the size of hardware [12].

II. PRELIMINARIES

In 1982, Jean Morlet a French geophysicist introduced the concept of wavelet. Immediately, Alex Grossmann theoretical physicists studied inverse formula for the wavelet transform. The joint collaboration of Morlet and Grossman yielded a detailed mathematical study of the continuous wavelet transforms and their various applications [14].

Very little work has been done in mapping the DWT into VLSI. The first architecture for computing the DWT was designed by Knowles. This architecture was not well suited for VLSI since it used large multiplexors for routing the intermediate results.

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Effect of polarity in micro-electrical discharge machining

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ABSTRACT. Micro Electric Discharge machinging can be used to concente micro features.

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ABSTRACT. Micro Electric Discharge machinging can be used to concente micro features.



A Low Power Content Addressable Memory with Self-Control Mechanism and Segmented Matchlines

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Abstract— Content-addressable memory (CAM) is a hardware storage widely used in many applications, especially for those applications needing fast memory access. Power consumption of CAM is considerable due to the parallel comparison feature and the frequent precharge/discharge of match-line. In order to reduce the huge power consumption of CAM a new fast and automatic charge balancing CAM is proposed here. In this design, the complementary property of the N-type CAM and the P-type CAM is used to balance the charge of match-lines. Also a new word architecture is included, known as the segmented word architecture, which aims at charge refill minimization so as to reduce the CAM power dissipated in the match lines. Unlike the conventional design, where only one single matchline is used, this design uses one master matchline and several segmented matchlines to perform the search operation. By sharing the master matchline charge with only the mismatched segmented matchlines, this design can minimize the matchline charge refill swing, such that the matchline power consumption can be reduced effectively.

Index Terms— Charge balance, content addressable memory (CAM), low power, match-line, self-control, translation lookaside buffer (TLB).

I. INTRODUCTION

Designing a fast and efficient data search engine is a challenge for designers. A content addressable memory (CAM), is a high performance, fully associative memory that executes a look-up table function in parallel. In a RAM, a data word is accessed for reading or writing by using a unique address associated with that data word, but here in case of CAM, data words are accessed by specifying only a part of its contents. An input search word to a CAM is compared with a table of stored words and the matching word is obtained at high speed through a parallel equality search. i.e., a CAM compares the incoming data with all stored words in parallel and returns the address of the best match.

A CAM is storage that is addressed by contents rather than the address. The search operation in CAM only spends one clock cycle, but it may need two or more clock cycles in traditional RAM.CAM's are more expensive and power hungry due to per cell comparison logic and parallel search

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operation. One of the key design challenges of today's highcapacity CAM's is reducing power consumption. The high power consumption of CAM is due to the parallel nature of the CAM search operation in which large amount of circuitry is active on every cycle.



Fig1. Content Addressable Memory

The CAM is a fully associative memory and its memory cell serves two basic functions, namely bit storage and bit comparison. These functions of CAM can be applied in variety of applications including network routers for packet forwarding and packet classification, lookup tables, pattern recognition, database management etc. However managing high speeds and large lookup tables requires large silicon area and power consumption.

The power dissipation, silicon area and the speed are the three major parameters that the designers strive to reduce. Since there is always a trade-off between them, reducing one without sacrificing the others is the main threat in recent research for large CAM's.

Backscattereing Reduction of Dihedreal Corner Reflector with Metallo-dielectric Structure Based on Sierpinsky Carpet Array

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Abstract— Dihedral corner reflector is an important class of object in radar cross section (RCS) studies. A right angled corner reflector provides a large back scattering over a wide angular range in a plane normal to its wedge. Since complex targets consist of corners, RCS reduction of corner reflector is an important research area. This paper presents the backscattering reduction of a 90 degree dihedral corner reflector by loading metallo-dielectric structures based on Sierpinski carpet arrays. Measurements at X-band using arch method show a reduction of back scattering of around 19 dB at 8.5 GHz. Here, the internal reflecting surfaces of dihedral corner are loaded with Sierpinski carpet array of second iterated fractals. The variation of back scattered power with frequency as well as angle of incidence is measured and presented. Effect of the thickness of the metallo-dielectric structures is also studied and the results are presented. This technique may find application in RCS reduction of complex targets.

1. INTRODUCTION

Radar cross section reduction of complex targets over a wide frequency band is a challenging research area. Corner reflectors are inadvertently formed on targets such as ships and military vehicles wherever flat surfaces meet at an angle and form a major scattering center in the radar signature of these targets. A right angled corner reflector provides a large back scattering over a wide angular range in a plane normal to its wedge. Since complex targets consist of corners, backscattering reduction of corner reflector is an important research area [1–3]. Several researchers have studied the backscattering properties of perfectly conducting as well as loaded dihedral corner reflectors [4–7]. The RCS of dihedral corners can be reduced by changing the mutual orthogonality of the flat surfaces [8]. But this method needs changes in the original engineering design of the target. W. C. Anderson has analyzed the consequences of non-orthogonality of the flat surfaces on the scattering properties of the dihedral corner reflector [9].

Several studies are reported in reducing specular reflection and backscattering reduction of plane metallic plate by employing metallo-dielectric structures based on conventional Euclidian geometry [10–12]. But fractal geometry emerged as a new field in antenna engineering and Radar cross section reduction [13–16]. Sierpinski carpet fractal structures are extensively studied in antennas and RCS reduction applications. Here a Sierpinski carpet array is used to cover the dihedral corner reflector for backscattering reduction.

2. METHODOLOGY & EXPERIMENTAL SETUP

Various iterated stages of the Sierpinski carpet array used in the present work are shown in Figure 1. Metallo-dielectric structure based on Sierpinski carpet array for first, second and third iterations were fabricated using photo etching method on an FR4 substrate ($\varepsilon_r = 4.4$) of size $30 \times 30 \text{ cm}^2$. The dihedral corner reflector is formed by attaching two square metal plates of side L = 30 cm at a corner angle of 90 degrees.

Two identical metallo-dielectric structures based on sierpinski carpet array stuctures were loaded to the internal reflecting surfaces of 90 degree dihedral corner reflector. Figure 2 shows the schematic diagram of the dihedral corner loaded with metallo-dielectric structure based on sierpinski carpet array. The corner reflector was mounted on a turn table placed in an anechoic chamber. Backscattering measurements were taken over the X band using Rohde & Schwarz ZVB20 Vector Network Analyzer.

3. RESULTS AND DISCUSSIONS

The effect of loading of metallo-dielectric structure with first, second and third iterated stages of Sierpinski carpet array on the backscattering of dihedral corner reflector was studied and shown in Figure 3.



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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

2017 - 2018

A MODIFIED CRYPTOGRAPHIC APPROACH FOR SECURING DISTRIBUTED DATA STORAGE IN CLOUD COMPUTING

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Abstract--STaaS (STorage As a Service) is a cloud model that gains popularity among both private users and business enterprises ensuring remote data storage providing giant and scalable cloud based storage spaces. The modified cryptographic approach makes use of the RSA algorithm along with Diffie-Hellman to increase the security of the encrypted data stored in cloud. The input file is split into two, in order to make the access of the whole data difficult, and the split data is encrypted using RSA and Diffie-Hellman before storing them into two different cloud accounts. The split data is then retrieved, and the retrieved cipher data is decrypted to get the original data. The split mechanism does not produce big overheads, and also assures data retrievability. Thus data stored in the cloud is more secured and it prevents cloud providers from directly reaching the cloud data.

I. INTRODUCTION

Cloud storage is a service that helps to store, manage and backup data remotely by storing files online to access using internet from anywhere. Due to wide range of applications of cloud computing it has become very popular in current era of the computing [1, 2]. Many companies and academies have started migrating their data from their expensive servers to clouds. Mass storage refers to storing the large volume of data that involves confidential and private data when it comes to organizations.

One among the significances of cloud, STaaS, is the key feature in data storage [8]. It is an architecture model offered by vendors like Amazon S3, Dropbox, and OneDrive etc [3]. that let users to store files and assets into the cloud. Mass Distributed Storage (MDS) works in increasing the volume of data storage [4, 5]. One aspect to improve is the privacy and safety of the data that is hosted in cloud, which may be reachable to the cloud service providers because there is possibility for the private data to get leaked that makes businesses uneasy [6].

This paper improves on the attempts to avoid cloud providers access to users' private data. The proposed idea uses a modified approach to store data securely in the cloud. The data is split into two and encrypted before storing into the cloud. The data split avoids leakage of sensitive information and the encryption process ensures security to the data. Through this approach, even the service provider will not be able to reach the sensitive information directly.

The splitting of data takes place through the *Random Split* algorithm, and the encryption process is undergone using the *RSA* and *Diffie-Hellman* algorithms. The data again undergoes decryption process using both the algorithms in the reverse order.

II.RESEARCH METHODOLOGY

The section reveals the cloud security issues, the evolution of the security mechanism and the recent research methodologies that laid foundation for the background of the paper. Most solutions try to balance the trade-off between the security and data processing though it is difficult in finding a solution to fit in most of the storage systems. [7]

A.CLOUD SECURITY ISSUES

Some of the security issues found in cloud are:

1. Privacy:

Once data is hosted in cloud, there should be some security measure that ensures that it is accessible only by that user. It should restrict any

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Smart Surveillance Based on Video Summarization

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Abstract-In recent years, video surveillance technology has become ubiquitous in every sphere of our life. But automated video surveillance generates huge quantities of data, which ultimately does rely upon manual inspection at some stage. The present work aims to address this ever increasing gap between the volumes of actual data generated and the volume that can be reasonably inspected manually. It is laborious and time consuming to scrutinize the salient events from the large video databases. We introduce smart surveillance by using video summarization for various applications. Techniques like video summarization epitomizes the vast content of a video in a succinct manner. In this paper, we give an overview how to use an optimal summarization framework for surveillance videos. In addition to reduce the search time we propose to convert content based video retrieval problem into a content based image retrieval problem. We have performed several experiments on different data sets to validate our proposed approach for smart surveillance.

Index Terms—Smart surveillance, video summarization, optimization, content based video retrieval, visual saliency

I. INTRODUCTION

Cameras have always been the eyes of the security industry. As demand continues to grow and costs decline, thousands of cameras are added to surveillance networks every year. With the intention of reducing crime and increasing public safety, an explosive growth in the surveillance industry is seen, leading to an eruption of videos. Video surveillance [1] is expected to generate nearly 24 billion U.S. dollars in revenue worldwide in 2018. Surveillance cameras can be installed at every nook and cranny without much hassle. These cameras work round the clock and capture stack of videos. These large videos pose a serious threat to careful human monitoring. It is highly impractical to scrutinize each and every moment of the video. Techniques such as video summarization have been developed to solve this problem.

A video summary is either a static summary or a dynamic summary. A static summary is a series of key frames and a dynamic summary is a set of short video clips, joined in a sequence and played as a video.

In this paper, we address the following issues.

- The monitoring of surveillance videos round the clock.
- The incorporation of the properties of the Human Visual System (HVS) into the video summarization to make the summary more ergonomic and effective.
- The usage of the summarized output for video retrieval.

Significant research work has occurred in the area of surveillance for various applications. Bilal et al. [2] detected

pedestrians in a surveillance video using the discriminating power of the locally significant gradients in building orientation histograms while computing the Histogram Intersection Kernel SVM classifier. Zhou et al. [3] proposed a system for public bus transit system at bus stops. Birnstill et al. [4] anonymized video data to make privacy-aware smart video surveillance.

Video summarization is a crucial technique to analyze surveillance videos. Evangelio et al. [5] proposed a system for the summarization of safety and security surveillance video using low level features and high level events. Wang and Kato [6] presented a system for summarizing nursery school surveillance video. Salehin and Paul [7] used object motion cues to obtain key frames from the surveillance video.

Research work in the area of visual saliency increased after a mathematical model for finding out the salient areas in the image was proposed by Itti [8] using human attention as the basis. Following this work, the research community started using saliency models for summarizing videos. Ma et al. [9] used human attention model for efficient information prioritizing and filtering for video summarization. This was the first work that shows the application of an attention model in video summarization. Following this, Thomas et al. [10] added some more features of human attention for summarizing a video. Along these lines, we propose to use a human attention model to detect events in the surveillance videos. The HVS based attention model helps to find the salient regions from the image and this in turn leads us to extract the key frames from the video. This type of system can be used for cameras installed at any public place including traffic, shopping malls, etc.

In content based video retrieval, the search space is large and cumbersome due to the large size of the video database. To reduce the search space, we propose to combine the extracted key frames from the video shot into a single frame in the database instead of videos. A wide range of experiments carried out shows the superiority of the approach.

The remainder of this paper is organized as follows. Section 2 describes the proposed methodology of summarization and retrieval for surveillance videos. Simulation results are presented in Section 3. Section 4 presents the conclusion of this paper.

Design of Smart Video Surveillance System for Indoor and Outdoor Scenes

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Abstract-Smart video surveillance of indoor and outdoor scenes is a challenging task for modern surveillance systems. Different imaging conditions like bad illumination, adverse weather, etc., makes the surveillance process difficult. Recently, researchers have proposed smart surveillance systems with additional features for more accurate monitoring of events, but not much attention is paid to improve the system such that the monitoring process consumes as minimum resources as possible. In this paper, we propose a novel surveillance system that enhances visibility in adverse weather conditions and summarizes the captured videos automatically to reduce storage space. As the summarization process is based on the events in a scene, video interpretation becomes fast and easy. We propose perceptual features that can be used for more meaningful and robust summarization of the video than the existing summarization algorithms. We test the system for both indoor and outdoor scenes and show that the system works well even with multiple moving objects and complex motions.

Index Terms—Surveillance System; Image Enhancement; Video Summarization

I. INTRODUCTION

In modern world, surveillance plays an important role for private as well as public security. However, the ubiquitous and continuous monitoring process is difficult to manage for two major reasons- first, the voluminous video data recorded needs large storage space and secondly a typical surveillance video captures same scene repeatedly in the absence of an event in the scene. Thus, the data captured by conventional surveillance system has high redundancy. The common problem associated with surveillance systems is the browsing of the huge video data to detect the required meaningful event. Presently, it requires huge amount of manual intervention and this process is time consuming. Though, surveillance systems are common to both indoor and outdoor conditions, in almost all the cases, the present surveillance systems fails to monitor a scene appropriately in adverse weather conditions because of the absence of image processing unit to enhance the visibility.

Several leading industries have proposed smart surveillance systems with enhanced features to make remote monitoring easy and efficient. Some pioneering works proposed by researchers of IBM are reported in [1], [2], [3], [4]. The smart surveillance system proposed in [1] has additional analytical steps to annotate a video to detect several features, e.g. behaviour analysis, face recognition, action recognition, etc., for better representation of the surveillance data. In [5], authors proposed a smart surveillance system based on background subtraction, tracking, and feature extraction. Chen et al. [6] proposed a smart system for indoor monitoring based on human behaviour analysis using support vector machines and data from microphone array. In [7], the authors proposed a smart system for event driven monitoring of distributed surveillance systems consisting of multi-modal cameras using space-time correspondence.

Though the traditional surveillance system is slowly moving towards more flexible framework, the problems of the data storage and analysis are still prominent. Moreover, there is not much work done to make these surveillance systems independent of the external weather conditions. Thus, even the performance of the smart surveillance system deteriorates in adverse weather conditions. In this paper, we propose an unified model to event driven monitoring and summarization of the surveillance data. The system also includes a preprocessing step to increase the visibility in the adverse weather conditions for better performance than the traditional monitoring systems.

Contributions:

- We propose a novel visibility range expansion algorithm as a pre-processing step to get optimal result in adverse weather conditions.
- We present a novel event based automatic monitor system for surveillance
- The proposed system summarizes parts of the video data based on the contents in the shot to reduce the overall storage space of the data.

The rest of the paper is divided as follows. In Sec. II, we discuss the proposed system and its different building blocks. We show the results of each block in Sec. III. Finally, we conclude the paper discussing different aspects of the proposed system and its future applications.

II. PROPOSED SYSTEM

The proposed surveillance system has a preprocessing unit to enhance visibility, a background suppression unit to extract the moving objects, and a summarization unit to summarize a scene depending on the content present in the video.

Figure 1 shows the sample flow diagram for the surveillance system. Firstly, we detect the change present in every input frame with reference frame. If no sufficient change occurs in the shot, there is no need for video summarization. In case, there is change present in the shot, we detect whether there is a need of visibility enhancement for adverse weather condition using metric such as dark channel prior [8]. After IEEE - 40222

Implementation of Algorithms for L(2,1)-Coloring Problems

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Abstract—Graph coloring problems are widely used to study and model the different real time applications. Many real time applications such as Job scheduling, Aircraft scheduling, Byprocessor tasks, region identification use the concept of graph coloring. An L(2, 1)-coloring of a graph G is a function f from vertex set V(G) to the set of all non-negative integers such that the following two conditions are satisfied,

i). $|f(x) - g(x)| \ge 2$ if d(x, y) = 1ii). $|f(x) - g(x)| \ge 1$ if d(x, y) = 2

where d(x, y) is the distance between two vertices x and y of the graph. The L(2, 1)-coloring number also called as *Chromatic* number $\lambda(G)$ of graph G is the smallest number k such that G has an L(2, 1)-coloring with $maxf(v) : v \in V(G) = k$. In this paper, four algorithms are proposed for finding the exact and another four for the approximate values of $\lambda(G)$. The algorithms are compared based on their running time and optimality of the solution for many special types of graphs like general graphs, bipartite graphs and sparse graphs.

Keywords: Graph Coloring, Chromatic Number $(\lambda(G))$, NP-Complete and Polynomial Time Algorithm.

I. INTRODUCTION

The field of graph theory plays a crucial role in different areas such as structural models. Especially computer science applications will use graph theory widely. Networking, clustering and image segmentations are the main applications where the graph theory plays a highly important role. To study and model various applications, the graph theoretical knowledge is necessary. Graph coloring is one of the most widely used concept in many real time situations. Some of the scheduling concepts such as Job Scheduling, Aircraft scheduling and time table scheduling uses graph coloring concepts. Graph coloring methodologies used by the scheduling algorithms are pre-coloring, multi-coloring, list-coloring and optimal sumcoloring. There will be a one-to-one mapping between the coloring of the graph and the feasible scheduling. The vertices of the graph correspond to the flights in aircraft scheduling. If the corresponding time intervals overlap, then two vertices will be connected.

Will be connected. In human life, an area which is playing tremendously an important role in communication is cellular network. It offers a number of advantages such as reduced power consumption, larger coverage, increased capacity and reduced interface in comparison with other communicating techniques. The characteristics of the cellular networks can be understand with

the help of graph coloring problems. For effective network coverage, cell phone towers are placed at strategic positions across the globe with the aim of minimizing the overlap in frequency bandwidth of adjacently placed towers. That is, each cell phone tower has a frequency range that it operates with. This range for nearby towers must be as far away as possible to reduce the interference of signals. The channel assignment problem is to assign a channel (non-negative integer) to each radio transmitter so that interfering transmitters are assigned channels satisfying certain constraints. Roberts [1] proposed a variation of the channel assignment problem in which close transmitters must receive different channels and very close transmitters must receive channels that are at least two channels apart. This problem can be specified in terms of graph theory as the L(2, 1)-coloring problem. A solution to this problem will correspond to an assignment of frequency ranges to cell phone towers so that the noise in communication is minimized.

Graph coloring is the problem of coloring vertices (edges) with minimum number of colors such that no two adjacent vertices (edges) should have the same color. The minimum numbers of colors needed to color a graph is called chromatic number. Graph coloring can also be defined as an assignment of labels traditionally called colors to elements of a graph by following certain constraints. In its simplest form, it is a way of coloring the vertices (edges/regions) of a graph such that no two adjacent vertices (edges/regions) have the same color; this is called a vertex (edge/region) coloring. To formulate the channel assignment problem in terms of graphs, the transmitters are represented by the vertices (connections) of a graph; two vertices are very close if they are adjacent in the graph and close if they are of distance two in the graph. More precisely, an L(2, 1)-coloring of a graph G is a function f from the vertex set V(G) to the set of all non negative integers such that $|f(x) - g(x)| \ge 2$ if d(x, y) = 1and $|f(x) - g(x)| \ge 1$ if d(x, y) = 2 where d(x, y) is the distance between the two vertices x and y of the graph G. A k - L(2, 1)-coloring number of G, denoted by $\lambda(G)$, is the smallest number k such that G has a k - L(2, 1)-coloring. The main objective of the paper is to find $\lambda(G)$. However, the L(2, 1)-coloring problem is an NP-complete problem and hence any algorithm for finding the exact value of $\lambda(G)$, is likely to take exponential amount of time. In this paper,



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An investigation on the effects of Co, Ti and Si on microstructure, hardness and wear properties of AlCuNiFe based entropy alloys

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Abstract

An investigation was carried out to understand the effects of Co, Ti and Si additions to the AlCuNiFe entropy alloys on the microstructure, hardness and wear properties. The entropy alloy samples were prepared by an arc melting process under an argon atmosphere. Hardness and wear rate were measured using a microhardness tester and a Pin-On-Disc wear tester respectively. EDAX and XRD analyses were also carried out. The entropy alloys showed a high hardness and a low wear rate compared to several conventional alloys. Si and Ti contribute significantly to the increase in the hardness when compared to Co in the AlCuNiFe system. Si tends to form a separate phase due to the effect of entropy of mixing. The results of this study are comparable to those of previous works.

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Keywords: Entropy alloys, Pin-On-Disc, entropy of mixing,

1. Introduction

The conventional alloys have a single element as the principal component/constituent of the alloy system and these alloys have been in the engineering use for a long time. The properties such as strength, wear, thermal stability, etc., have been enhanced in these conventional alloys by several methods such as heat treatment, mechanical working, rapid solidification, mechanical alloying, spray/superplastic/semisolid forming, and friction stir welding.

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A Combined Approach of Steganography with LSB Encoding technique and DES Algorithm

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Abstract—Steganography has become one of the widely used tools in today's world for hiding information within another data or an image. It is a technique that takes cryptography to the next level by concealing the presence of a message itself. Data Encryption Standard algorithm is such a cryptographic key which is applied to a block of plain text to convert it into a cipher text and vice-versa. This paper presents an innovative idea to hide a message within an image of any dimension by encrypting the message through Data Encryption Standard algorithm and concealing the message by applying LSB encoding technique in a spiral manner thus enhancing the difficulty of the decoder. The main objective is that, securing of data becomes more potent and secretive than the previous ones.

Keywords—Cipher, Cryptography, Data Encryption Standard, Spiral, Steganography, Transposition.

I. Introduction

Information is a very critical resource to all of us. Thus cryptography [3] and steganography are the two major methods of attaining it. Steganography is the technique of manipulating information to cipher texts and hiding their actuality and existence itself.

This is done by embedding the cipher texts into various other streams such as graphics, audios or other messages too. Cryptography is the art of shielding information by converting it into an illegible format known as cipher text. The basic difference between the steganography and cryptography is that while a cipher text could be deciphered in minutes steganography allows us to cover up the cipher text itself.

In this paper we are achieving this by DES algorithm that uses a 64-bit block of data every time and applies cipher key to modify the normal text into a code text. And then the code text is concealed into the image in a spiral manner.

II. Literature Review

Wu, H.-T et al. [1] proposed an algorithm in the field of steganography for JPEG images altering the block DCT coefficients. In this method the DCT coefficients are divided into four frequency bands by matrix encoding. A new method for selecting the coefficient is also used to make the concealed message less perceivable.

Gupta, R. et al. [2] proposed a new method for image security integrating cryptography stenography and watermarking techniques. It not only hides the message but also gives better results for MSE, PSNR and embedding power even after the noise attacks. It also provides security for watermarked video.

Baek, J et al. [3] presented a steganographic method for secret sharing of information using gray scale images. The relationship between the binary and gray code representation of a pixel is taken into consideration here. And an EX-OR operation is used upon N cover images accessible to sender and receiver.

Bajwa, I.S. et al. [4] proposed two methods for color image steganography. They have proceeded with a hashing approach for secure data hiding. Here secured images are transmitted at higher speed using gray scale images with this approach. Also various file formats such as bmp, JPEG, gif are supported in this technique of secured transmission.

Bouslimi, D. et al. [5] put forward an algorithm for concealing message in encrypted images using a predetermined watermark embedding before the process of encryption. Here the encryption/decryption has a unique key and watermark processing has a different key thus decryption of message is independent of extracting the image.

Zhang et al. [6] presented an approach for data concealing by reversible image transformation. Here RTIbased framework is used to convert the content of original image into another target image having same size. Traditional RDH scheme and unified embedding and scrambling scheme are used to insert watermark in the encrypted image.

A Simple Bit Plane based Robust Watermarking Scheme

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Abstract— Proliferation of applications, complexity of business processes, and requirements of stronger security systems have put increasingly higher demands on Information Hiding. The increasing levels of Internet penetration has not only made communication easier, but has also increased the need for digital securities for individuals as well as enterprises. Hence, there is a need for simple and powerful techniques for improving security and watermarking that can be used by the simple user. This paper using two methods, namely splitting and randomization, proposes an efficient and novel method for information hiding and invisible watermarking of images. By splitting the image, a large number of smaller images are obtained which can be recombined in various combinations to simulate scrambling. In this paper, scrambling is achieved by randomizing the smaller images, using some random number generation algorithm, and then merged. These ideas are discussed and the case is made, through a number of examples that this simple watermarking procedure is both robust and powerful.

Keywords: Steganography, watermark, dewatermark, Bit-Plane, shuffling, reshuffling

I. INTRODUCTION

Communication is the process of transferring useful in-formation between one another. Throughout history, humans have always had a keen interest in information security [1]. With evolution in technology and expansion of the inter-net, digital communication has become the primary mode of communication [2]. Hence, with the increase in information transmission through digital means, it is imperative to be able to protect the transmitted information from malicious users. An effective and appropriate solution to this problem has been information hiding [3].

The three major methods of information protection are Cryptography, Steganography and Watermarking. In cryptography, the contents of the message sent are themselves modified. Anybody who intercepts the message knows that the message has been encoded, and needs to decode the message in order to view it. In Steganography, the actual message to be transmitted is hidden within another message. Anybody who intercepts the message would not be able to evidently see the presence of the hidden message, i.e. it is imperceptible to human eye. Thus by using two concepts, namely cryptography and steganography, the security has been enhanced [4]. In digital watermarking, an image or a pattern is embedded into the source data or signal. It is closely related to steganography, the difference being that in K.P.Akshaya, V.S.Ramanujan, C.S.Srirag** School of Computing SASTRA University Thanjavur, India

watermarking, the message hidden is related to the actual content of the source signal whereas in steganography, there is no relation between the source signal and the message to be hidden [5]. Due to the increase in the usage of digital images for communication through the internet, image wa-termarking has gained immense importance as a promising technology for copyright protection [6,7,8,9,10].

Image Scrambling is one among the several methods used widely in the pre and post stages of watermarking of images. The main concept behind image scrambling is the generation of a disordered image that makes it impossible for a human or a computer to understand the actual meaning of the source image. The scrambling algorithm can be made use of to obtain the scrambled image [11].

The digital representation of an image is in term of pixels. Each pixel can be further represented as a series of 0s and 1s. This is known as binary representation. If the binary representation contains 8 bits, then the 8-bit image is said to be made up of eight 1-bit planes. This method is known as bit plane slicing. This method is made use of in watermarking and steganography where the information to be hidden (watermark) and the cover image are both sliced into their respective bit planes and the most significant bit planes of the watermark are placed into the least significant bit planes of the cover image. This can be used to obtain an invisible watermarked image.

To ensure digital data integrity by protecting the valuable data from outside attacks, various spatial domain techniques have been devised [12,13,14,15]. One such technique em-ploys a simple method that involves the compression of a part of the cover image to embed data [2]. In this paper, we combine steganography, cryptography and bit plane slicing watermarking technique to provide a powerful method for encrypted steganography. Two layers of encryption are used before the actual message is concealed within the cover image and the appropriate decryption is performed upon retrieval.

Most algorithms present today are very complex and suggest multiple levels of modifications to be done on the images. The feasibility of implementation of these algorithms by a normal user is thus very less. An algorithm that is easy to implement and at the same time robust and secure is thus the need of the hour. This paper proposes an algorithm that is not only robust and secure but is also relatively simple to implement by the user.



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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

2016 - 2017

Detecting Video Shot Boundaries by Modified Tomography

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ABSTRACT

Videos are large volume objects. They are used for variety of applications in our day-to-day life. Manual operations on video are inconvenient. Hence an automatic system is required to analyse the video content. The first and most important step in any video processing application is shot boundary detection. We propose a novel and very simple approach for Shot Boundary Detection (SBD). This work has lesser complexity compared to existing methods. We use a technique called Computed Tomography for SBD. The method can be applied to any type of videos such as home, surveillance, sports or entertainment videos. The result of our work shows the excellence of the technique in SBD.

CCS Concepts

- Information systems~Video search
- Computing methodologies~Visual inspection
- Computing methodologies~Video segmentation
- Computing methodologies~Feature selection

Keywords

Tomography, Shot Boundary Detection (SBD), Video Processing.

1. INTRODUCTION

Video processing is a rapidly growing area. Every day thousands of videos are created and processed by machines. Recent innovations in media technologies and digital cameras caused exponential growth in number of videos. Video data are produced and used by a wide variety of applications. A few to list are multimedia information systems, distance learning, video on-demand etc. Videos are to be effectively categorized, searched and retrieved for meeting the diverse demands of applications.

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Thus the digital world requires a mechanism to process the video. These mechanisms are referred to as 'Video Content Analysis' algorithms. The first and the most important operation in any video processing application are identifying video shots.

Shot boundary detection is also known as temporal segmentation. A shot is a series of video frames taken by a single camera action, such as, camera zoom-in, zoom-out, pan, tilt etc over a background. During a shot, object or camera may move in any direction. The content is similar within a shot region. Shot boundaries are the regions where content changes significantly.

The structure of the video is shown in Fig 1[15].



- Shot: sequence of frames recorded in a single camera operation
- **Scene**: collection of shots forming a semantic unity conceptually, a single time and place

A video is a collection of different scenes clustered together with a semantic continuity. ie., Scene 2 should follow scene 1. A scene is a collection of different shots whereas a shot is a set of frames taken in a single camera operation. A semantically meaningful scene might include different shots; each may be of different length.

A shot boundary is identified when there is a significant discontinuity in the shot parameters. The parameters can be statistical or non-statistical. Shot boundary detection algorithms neglects simple object or camera motion sequences.

The rest of the paper is organized as follows: Section 2 describes the previous work on SBD. Tomography based shot boundary detection method is illustrated in section 3. Result of our proposed approach is shown in section 4. And analysis is written in section 5.

330	Eluid Mechanics and Eluid Power - Contemporary Research pp 229-238 Cite as Numerical Simulation and Experimental Validation of Future FBR Surge Tank Hydraulics		
-	Authors Authors and affiliations		
	P. Lijukrishnan 🖂 , D. Ramdasu, V. Vinod, G. Padmakumar, K. K. Rajan		
	Conference paper First Online: 21 September 2016 Downloads		
	Part of the Lecture Notes in Mechanical Engineering book series (LNME)		
	Abstract		
	Surge tank is provided in the secondary sodium circuit of Sodium cooled Fast Reactors (SFR) to protect the secondary sodium circuit components from the pressure surges due to sodium water reaction in Steam Generator (SG). The pressurized argon gas inside the surge tank above sodium will act as a cushion and absorb the pressure surges. The entrainment of argon gas into		

An Algorithmic Approach for General Video Summarization

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Abstract: In the current world, multimedia has a significant role in communicating information. Videos can convey more information. Two drawbacks of the video make it inconvenient in some circumstances. First, it requires more storage. Second, we require watching a video completely to identify the content, which takes too much time. Our proposed work makes the video easy to use by solving these issues. We are trying to reduce the volume of a video by creating its summary. Summarization may either produce a image/video as output. We generate a summary video. Duplicate frame removal and stroboscopic imaging are the main techniques used in the work. For better results, the shots identified at the initial step are further processed to create their own summary clips. Summary clips are clustered together to form the final summary. The result of the proposed work is a summary video with very limited number of frames. Our proposed work can generate summary for any type of videos such as entertainment, game, surveillance and home videos. The summary video keeps the continuity of the video and conveys the meaning too.

Keywords: Shot Boundary Detection (SBD), Stroboscopes, Unnecessary frame removal, Video Summarization.

I. INTRODUCTION

Video is an inevitable media in the current world. Video has great significance in the areas of academics, entertainment and sports. Different organizations are using videos for variety of applications. Commercial organizations have CCTV videos for security reasons; public media have a variety of videos. Video analysis should be performed for understanding the information content. It is costly because of its big volume. Hence some sort of video processing techniques are required to reduce the cost of video operations.

The large memory requirement of video creates difficulties in video repositories. When a user tries to retrieve required video from a video archive, he should go through all videos to find a matching one. This is a time consuming operation. Searching for main content in the video is another problem. Video should be watched entirely to derive what is happening in it.

Video summary can provide solution for these problems. Video summary is the summary of the raw video. It extracts the main contents in the video. The volume of the summary video will be very less compared to that of raw video, hence requires only less memory. Since the summary contains important segments in the video, the user needs to watch only the summary video to K N Ramachandran Nair Professor and HOD, Computer Science Engineering Department, Viswajyothi College of Engineering and Technology, Muvattupuzha, Kerala, India <u>drknr@vjcet.org</u>

understand the content. The summary video can be used as index in video repositories, which makes it more suitable for commercial and multipurpose applications. Users can check the worthiness of watching a video through its summary video.

There are more applications for video summary. Lengthy parliament sessions can be summarized to avoid viewing the complete video sequence. Critical events occurred in a game can be easily identified through its summary. The semantic content in an entertainment video can be easily extracted to check worthiness of the video. Summary video helps space research organizations to process data with reduced memory, time and power. Pervasive devices with less memory and less processing power need to store only the summary video to meet their requirements. Public media and other such organizations can use summary video as an index to their databases. This summary can be utilized to get the underlying content in the requested video.

Definition of video summarization: A video summarization technique produces condensed version of a full length video stream by extracting the most important content in it.

The structure of the video is shown in Figure 1.



A video is a collection of different scenes clustered together with a semantic continuity. ie., Scene 2 should follow scene 1. A scene is a collection of different shots where a shot a set of frames taken from a single camera operation. The video rate of a normal video is 24 to 30 frames per second. Most frames in the video are redundant frames. A semantically meaningful scene might include different shots each of different length.

Significance of a video can be identified only by viewing it completely, which is very time consuming. It becomes severe especially when the video is lengthier. Video summary is a representative of raw video sequence by excluding more redundant frames.

The paper is organized as follows. Section II describes the previous work in this domain. Different authors have made major contributions to this area. Section III



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3.3.3 Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years

2015 - 2016

An Approach of Cryptography and Steganography using Rotor cipher for secure Transmission

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Abstract- This paper manifests an innovative approach to transfer sensitive data in an interrupted communication channel using the dyad protection techniques of Cryptography and Steganography. Applying Rotor Caesar cipher on the message followed by 2 bit LSB Steganography helps to conceal the information from the intruder. This Steganography strategy is achieved by using Python Image library along with OpenCV framework.

Keywords— Steganography, Cryptography, Rotor cipher, Data Hiding, LSB Steganography.

I. INTRODUCTION

The foremost concern in digital world is data security. Many applications require data transmission across the network [1]. In order to increase the security of data, a novel method of combined steganography and cryptography is suggested. This involves the usage of Rotor Caesar cipher for converting the plain text into cipher format. This mechanism is a classic stream ciphering technique which increases the complexity 26ⁿ every time it loops [13]. The message concealing practice employed here is LSB Steganography which replaces the last two least significant bits of the cover image with the secret message. This method suggested is robust and resilient [14].

II. LITERATURE SURVEY

This is to evaluate different techniques and algorithms being implemented and helps us to analyze the efficiency in our technique. As Mohammad Shirali Shahreza [2] stated the implementation of steganography in mobile phones, in his disadvantages section, he tells that several variety of mobile phones on the market and stego image is sensitive to size and other properties of the original image. He also states that the optimization of processors and graphical processors in mobiles leads to create a stego-image at any remote place.

A generalized strategy of doing the basic 8-bit LSB steganography approach as stated by Deshpande Neeta [3] over several file types and this holds good in the case of BMP file format and all other formats works less efficient. Moreover BMP images has less applicative impact over the Internet applications and can cause identification threat to the intruder. The methodology of data hiding in least significant bits using hypothetical testing theory is being implemented in this paper

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[4] described by Cogranne. It exploits the heteroscedastic noise model which enhances the noise variance estimation and improves the detection performance. It also considers the clipping picture as criteria for hiding the data by analyzing overexposed and underexposed pixels which are statistically modeled and taken into account for pixel embedding.

Koziel proposes a methodology on modern steganography method which is used to perform anonymous communication by hiding the data bits in the sound container in the paper. The data is directly attached to the sound pixel and Fourier transform is applied on the processed signal. Masking Technology is being used and data is hidden in high frequency bands which improves the efficiency of concealing the information [5].

Manikandan explained their technique of sending the message to be sent is encrypted modified blowfish algorithm and then embedded into cover image [6, 7] in the paper. The resulting stego image is reduced using discrete wavelet transform and sent to the recipient. On the recipient side the reverse process is applied to get back the original message. The paper published by Karthikeyan proposes a new technique in which the image is encrypted using the hill cipher technique and it is encoded to the cover image using the lsb substitution technique and various scanning patterns like horizontal and vertical raster scan, horizontal and vertical snake and z scan [8, 9].

The work done by Varsaki, the message of steganography based on discrete Gould transform, a new way of embedding technique. The Gould transform represents the difference in the neighboring pixel of the image. This results in fragile steganography technique with high capacity. Any manipulation in the data results in destroying the data, hence helpful in authentication and security purpose [10]. In the work carried out by Sruti, The improved steganography technique using LSB uses a raster scan along with a random key. This technique is suitable for embedding a large plain text with the image. Here the similarity index of the image is refined by applying the OPAP Technique [11].

We exploit the texture property of binary images and propose a secure binary image steganographic scheme by minimizing the distortion on the texture. The proposed complement, rotation, and mirroring-invariant local texture pattern (crmiLTP) is tolerant of binary image processing and thus can stably describe the local structure of binary image texture. This characteristic provides a reasonable tradeoff

Composite Pricing Strategy for Energy Storage in Wind Electric Generation

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Abstract:- As the penetration of wind energy increases in the utility grid, the intermittent nature of wind invariably imposes stress to the utility and creates chaos in scheduling energy dispatch. This situation can be improved to a greater extent by introducing energy storage systems along with the wind generation. The addition of energy storage ensures levelised energy output, supports the grid under fault, offer minimum wind curtailment and provide opportunity for the independent power producer to participate in the energy trading. To evaluate the utilization of energy storage in wind farms and measure the net return on investment, a composite pricing strategy is necessary rather than the conventional levalised cost of energy. The effectiveness of the matric utilized for the evaluation of combinational use of energy storage in wind farm is verified by sensitivity analysis.

Index Terms—utility grid, levelized cost of energy, energy storage, hybrid system, energy arbitrage

1. INTRODUCTION

The wind electric generators that provide carbon free energy introduce various challenges throughout their integration to the existing energy systems. The wind power being abundant and cheaper compared to other sources of energy resulted in the installation of wind electric generators worldwide. At present, with possible technological developments the levalised cost of energy (LCOE) for on shore wind energy varies between \$71.3 to \$ 90.3/MWh. The installation cost is expected to come down to \$1150-1525/kW with an increase in capacity factor by 40-45% by 2017. For wind installations, LCOE is greatly affected by the system capacity factor. It is found that an increase of 20% in capacity factor will reduce the LCOE by 50% [1]. Onshore wind is now one of the lowest-cost sources of electricity available, with weighted average LCOE by region of between 0.06 to 0.09 \$/kWh. The best wind projects around the world are consistently delivering electricity for \$0.05/kWh without financial support. With technological improvements there is much reduction in installation cost, leading to a situation where LCOE of onshore wind is now within the same cost range, or even lower, than fossil fuels [2]. Wind turbine prices in developed countries have fallen by around 30% since their peak in 2008/2009, while Chinese wind turbine prices fell by 35% from their peak in 2007. The regional weighted average installation cost for onshore wind range from 1280 to 2290\$/kW. China and India have weighted average installation costs of 35% to 44% lower than in other regions [3-4]. The installation costs and the LCOE of offshore wind projects also stabilised, after rising through its maximum in the last decade [5]. The project developers expects that net cost will reduce by 2020, whereas the cost of offshore wind will remain to be expensive than onshore.

It is vital to make sure that the addition of renewable sources should not be done, compromising the quality of power within the grid. However, the reliability and availability of the utility grid are usually reduced with the acquired level of penetration of renewable sources [6]. This makes it imperative to place clear amendments and policies for the independent power producers (IPPs) and utilities while selecting integrated operation. The intermittent nature of renewable supply is beyond the control of IPPs. Moreover automated and real time generation/ load measurement and management are necessary to participate in energy market for arbitrage. Electricity utility planers, vendors, policy makers and developers need to categorize the potential demand for the storage to ensure optimum return.

The effect of intermittent/ unpredictable nature of wind on the utility grid can be understood by analyzing the Emergency Electric Curtailment Plan by Electric Reliability Council of Texas on February 26, 2008[7]. There was a decline in the wind energy production to 300MW against the prediction for 1700MW in Texas when the demand was on the rising path. Situation end up in curtailing power to interruptible customers to meet shortage of 1110MW. By managing the intermittent nature of renewable energy sources, one can determine the extent and quality of wind energy, which can be utilized in grids. Energy output fluctuation owing to intermittency is reduced to a great extent by the utilization of energy storage alongside renewable sources. Energy storage helps in reducing revenue loss throughout low load hours due to wind energy curtailment. In West Virginia 32MW/84 MWh storage at AES Laurel Mountain 98MW wind energy park operating at advanced lithium- ion technology which provides frequency regulation and helps to ensure 95% availability of the system [7] is one of the example for the wind farms utilizing energy storage. RPS requirements imply 20% renewable generation by 2020. A PNNL study





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The Relationship Between the WHT and the CIT

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Abstract

The Walsh-Hadamard Transform is an important signal transform that converts real input to real output, and it has found applications in many signal processing tasks. The Cosine Integer Transform is a recently developed transform and it shares the real-to-real conversion property of the Walsh-Hadamard Transform. Although these two transforms have different kernels, there exist relations between the two transforms. This paper attempts to study and mathematically formalize these relations.

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Keywords: Walsh-Hadamard Transform; Cosine Integer Transform

1. Introduction

Signal transforms are important tools for signal analysis. The Walsh-Hadamard Transform (WHT) [1] is a transform that converts real-numbered signals into real transform coefficients, and may thus be called a real-to-real transform. The Cosine Integer Transform (CIT) [2-3] is a recent addition to the class of real-to-real transforms. In this paper, a connection is developed between the WHT and the CIT. Section II reviews the WHT and the CIT. Relationships between the two transforms are presented in section III.

2. WHT and CIT

In this section, both the WHT and the CIT are reviewed.



A NOVEL MULTIPLE ERRORS RECOVERY TECHNIQUE IN TMR SYSTEMS

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Abstract-

Embedded systems are widely used in safety critical applications like process control in industries and in medical field for patient life support monitoring etc. It should be equipped with appropriate error recovery techniques, as any type of faults in the system are in tolerable. Triple modular redundancy (TMR) is a fault tolerant system. It can mask single fault in a module but it cannot recover from the fault. A scan chain technique (ScTMR) can recover from a single fault but it cannot detect latent fault. So a scan-chain-based multiple error recovery technique for triple modular redundancy systems (SMERTMR) which reuses scan chain flipflops fabricated for testability purposes to detect and correct faulty modules in the presence of single or multiple transient faults. In order to detect and correct multiple errors in SMERTMR technique there are two modes of operation which are comparison mode and recovery mode. In order to reduce the area overhead of SMERTMR a new technique called **SMERTMR** modified technique is proposed here. In this proposed technique the two modes are combined and the area is reduced. Upon detection of any mismatch, the faulty modules are located and the state of a fault-free module is copied into the faulty modules to recover from the fault.

Index Terms-Triple modular redundancy, scan chain based technique, roll-forward technique

I. INTRODUCTION

The use of embedded systems in safetycritical applications such as process control, and patient life support monitoring has become a common trend[1]. Such a system often has both timing constraints and fault tolerance requirements. То meet the requirement, such embedded reliability systems should be equipped with appropriate error detection and correction mechanisms. One of the widely used fault-tolerant techniques in safety-critical applications is triple modular redundancy (TMR). Triple Module Redundancy (TMR), first proposed by Von Neumann, is one such technique where a module is replicated three times and the output extracted from a majority voter. Triple modular redundancy (TMR) is a faulttolerant form of N modular redundancy, in which three systems perform a process and that result is processed by a majority-voting system to produce a single output[2]. If any one of the three systems fails, the other two systems can produce correct mask the fault. The main drawback of modular redundancy technique is excessive area overhead as the base design is implemented thrice. Another shortcoming of the traditional TMR is its inability to cope with TMR failures[3]. TMR failure refers to a failure in a TMR system caused by multiple faulty modules or a faulty

Bit Error Rate Analysis of Coded OFDM for Digital Audio Broadcasting System, Employing Parallel Concatenated Convolutional Turbo Codes

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Abstract— In this paper we present a study of Bit Error Rate (BER), for Digital Audio Broadcasting (DAB) system, employing Coded OFDM with different channel coding schemes. Analysis is carried out for convolutional coded and turbo coded data in an Additive White Gaussian Channel (AWGN) based on different constraint lengths and code generator polynomials used for coding. A comparative study on the computational complexity is also done by applying an audio signal and measuring the data processing time per frame, on computers with different processor speeds. It is shown that a coding gain of approximately 6 dB is achieved using turbo codig when compared to convolutional coding, at a cost of higher computational complexity.

Keywords - DAB; OFDM; Convolutional Codes; Turbo Codes.

I. INTRODUCTION

The requirement of mobility while connected to network is fueling the growth of wireless communication. The conventional analog transmission techniques do not perform well in mobile environment, since suitable techniques to mitigate the effects of multipath propagation induced fading have not been developed for these systems. Orthogonal Frequency Division Multiplexing (OFDM) is one such technique to combat the effect of multipath fading, frequency selective fading and Intersymbol Interference (ISI) [1]. OFDM decreases the amount of hardware implementation since multiplexing and filtering operations can be performed by employing the Fast Fourier Transform (FFT). This eliminates the need to have multiple oscillators at the transmitter and synchronizing loops at the receiver. Due to the cyclic extension of signal period into a guard interval, OFDM system is suitable for Single Frequency Networks (SFN) [5].

In this paper an OFDM application standard called Digital Audio Broadcasting (DAB) system model is implemented in Matlab/Simulink environment. The performance of this system over a channel perturbed by AWGN noise is studied. Coded Orthogonal Frequency Division Multiplexing (COFDM) technique is studied in which convolutional codes and turbo codes are employed and computed the resulting bit error rates (BER). The variation in BER is analyzed based on different coding parameters. An audio signal is transmitted and data processing time per frame is measured and compared for different channel coding schemes.

II. SYSTEM MODEL OF DAB USING CODED OFDM

A. A Simplified DAB Block Diagram

A general block diagram of the Digital Audio Broadcasting transmission system is shown in Fig. 1. The

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analog signal is encoded and applied to channel encoder. After channel coding the bit streams are QPSK mapped. The data is then passed to OFDM generator. The high data rate bit stream is divided into 'N' parallel data streams of low data rate and individually modulated on to orthogonal subcarriers which is realized using IFFT algorithm. Orthogonality of the subcarriers helps to achieve zero Inter Symbol Interference, theoretically [1]. Finally, the OFDM symbol is provided with cyclic prefix and the completed DAB frame structure is transmitted through an AWGN channel.



Figure 1. DAB transmitter - Block Diagram.

B. DAB Transmission Modes

DAB system has four transmission modes, each with its own set of parameters, shown in Table-I [12]. In this paper Transmission Mode-I is selected for simulation.

TABLE I. DAB TRANSMISSION MODES

Trans- mission Mode	No. of Sub- carriers	Sub carrier spacing	FFT Length	Maximum Radio Frequency
TM I	1536	1 KHz	2048	$\approx 375 \text{ MHz}$
TM II	384	4 KHz	512	$\approx 1.5 \text{ GHz}$
TM III	192	8 KHz	256	$\approx 3 \text{ GHz}$
TM IV	768	2 KHz	1024	$\approx 750 \text{ MHz}$

III. CHANNEL CODING

A. Convolutional Encoding & Viterbi Decoding

A convolutional encoder consists of an M-stage shift register with 'k' inputs, prescribed connections to 'n' modulo-2 adders and multiplexer that serializes the outputs of the adders. Here the encoder selected has k=1, ie; the input sequence arrives on a single input line. Hence the code rate is given by r = 1/n. In an encoder with an Mstage shift register, the memory of the coder equals M message bits and K = (M+1) shifts are required before a message bit that has entered the shift register can finally exit. This parameter K is referred to as the constraint length of the encoder.

A New Reliability Index for Turbine Selection

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Abstract—For the development of smart grid more and more distributed generation like wind, solar, fuel cell are introduced to the distribution networks in the power systems. Among them wind power generation is identified as the most advantageous and promising source for the future. Wind resource assessment and analysis is a crucial step in gauging the potential of many areas to produce electrical energy. After analyzing the potential, identifying a suitable turbine for a potential site is very significant in wind energy conversion system (WECS). Usually the turbine selection for a potential site is done on the basis of capacity factor, which is the ratio of the average power output to the rated power of the turbine. The intermittent nature of wind calls for its attention for reliability evaluation to integrate the same to the conventional system. The commonly defined reliability indices like Loss of Load Expectation (LOLE), Loss of Load Probability (LOLP), Expected Energy Not Supplied (EENS) give indication about the insufficiency of the power generation to meet the load, but it does not give indication about the consistency of operation. A new reliability index, Turbine Reliability Index (TRI) is proposed to evaluate the performance of turbines in the selected sites. The wind data of a potential site, Kavathar in Tamil Nadu in India was collected for the analysis. Along with the capacity factor, which is the basis of selection of a turbine, if we include the newly proposed index also for the selection of a turbine for a particular site, the performance of the wind energy conversion system can be improved.

Keywords—Turbine selection, Reliability Index, Capacity factor.

I. INTRODUCTION

The economic progress and living standards of people in a country is influenced by the energy production and its proper utilization. So both the developed and developing countries in the world give significant importance for energy production. Conventional as well as non-conventional energy sources have their own significance. Renewable energy sector is undergoing a tremendous transformation at present. Due to recent price spike of the conventional fuels and the increased concern of global warming, the development and deployment of renewable energy become one of the most important energy policies around the world. Another aspect is the introduction of smart grid in which the very important part is the distributed generation (DG), most of which are based on renewable energy. Among the renewable energy sources wind energy is notified as the most promising and encouraging energy source, because of the technological advancement and low cost of power generation per kilo-watt. According to Global Wind Energy Council, 2014 witnessed a growth of around 51.477

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GW for wind power with a total annual installed capacity of 369.553 GW.

The economic and reliability benefits of adding WECS to a power system are highly depend on the wind turbine selected for each WECS. To maximize the energy production from a potential site, the turbine parameters like cut in speed (v_c) , rated speed (v_r) and cut out speed (v_f) should match with the statistical parameters of wind potential at the site. The long term wind speed measurements at a given location provide fundamental and valuable information for the assessment of wind power availability and the economic viability of wind energy conversion system, as well as the technical design of such systems.

Since the wind speed varies from site to site, season to season, it should be mathematically modeled for the proper analysis and several models have been proposed in literature. In [1] probability density functions are identified as the best suitable functions to model wind speed and the commonly accepted distributions are Rayleigh and Weibull two parameter distributions. Ref [2-4] examined the selection of a site matching turbine on the basis of the term 'capacity factor', which is the ratio of annual energy produced to the actual energy that could have been produced by the turbine if it has operated at its rated power. In [5] the different statistical methods such as arithmetic mean, root mean and cubic mean cube root of the observed wind speed are compared to calculate the Weibull distribution parameters and thereby capacity factor. The estimates of capacity factor using cubic mean cube root fall to be the closest to the actual value.

The wind velocity because of its intermittent nature, draws its attention for reliability evaluation for both velocity and power generation [6]. Reliability of any system or component is termed as the probability to perform the specified function for the specified period under the specified operating conditions [7]. So for the proper selection of wind turbine for a site, along with the capacity factor, reliability of operation of the turbine in the selected site turned to be very significant.

The commonly used reliability indices for reliability evaluation are Loss of Load Expectation (LOLE), Loss of Energy Expectation (LOEE) and Loss of load probability (LOLP). These indices concerned with the end users as they significantly reflect the load management by the system. The generating system or the WECS reliability is only partially reflected in these indices [8]. These indices are commonly known as generating capacity adequacy indices. They do not give a physical insight or a direct indication to the capacity

