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Nano Trends: A Journal of Nanotechnology and Its Applications
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Extraction and Characterization of Nanocellulose from Saw Dust

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Abstract

In this work, nanocellulose was extracted and fibrillated from wooden saw dust of Malaysian wood. The fibrillation of cellulose nanoparticles was done by two major steps such as chemical pre-treatment and acid hydrolysis. Firstly, the saw dust was pre-treated with alkali, and then de-waxing of saw dust was done. Then cellulose was extracted. Finally, it was chemically washed etc. The extracted chemically purified cellulose was further treated with acid hydrolysis process and then fibrillated into nanofibres by using high intensity ultrasonication. After the fibrillation process of nanofibres, some basic characterization process were adopted for determination of presence of functional groups, morphology, shape and size etc. by FTIR, FE-SEM, EDS and XRD. The FTIR result indicated that lignin and hemicelluloses were eliminated from cellulose. The XRD result showed that the crystallinity was approximately 61.64% and diameters of fibres ranged from 8 to 20 nm. The EDS result confirmed that nanocellulose particles contain carbon and oxygen as main component.

Keywords: *Saw dust, chemical treatment, ultrasonication, nanocellulose, nanocomposite*

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INTRODUCTION

Cellulose is a naturally occurring bio-polymer which is extracted from various types of natural sources like roots, leaf, stem of trees and plants, domestic waste and agro-industrial residue etc. Nowadays cellulose is widely used in many fields and industries for different kinds of applications because of its availability, bio-compatibility, bio-degradability and sustainability [1]. Nowadays nanocellulose has gained more attention by researchers due to their exceptional mechanical properties (high specific strength and modulus), large specific surface area, low coefficient of thermal expansion, high aspect ratio, environmental benefits, low cost and widely used in medicine and pharmaceuticals, electronics, composite materials, construction and industries etc [2]. But their major application are used in the field of composite materials, where nanocellulose are used as reinforcing agent in matrices of polymer, which enhance the mechanical strength as well as thermal barrier properties of composites.

The major sources of cellulose are wood, soybean, wheat straw, rice husk, lemon, maize, coconut husk fibre, banana rachis, sisal and many other natural products [3]. But extraction of cellulose from these natural products is a very complex and it involve various chemical processing steps like alkali treatment, de-waxing of sample, extraction of cellulose, acid hydrolysis and ultrasonication of cellulose. In all these chemicals processes de-waxing and extraction of cellulose is very essential. De-waxing is very long and time-consuming process but major advantage of this process is removal of wax/oily liquid from the sample of products. After that one more important process is extraction of cellulose, where some chemicals can be used for removal of lignin from the sample in order to obtained pure cellulose [4].

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AXISYMMETRIC VIBRATION FOR MICROPOLAR POROUS THERMOELASTIC CIRCULAR PLATE

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The present investigation is concerned with a two dimensional axisymmetric problem in a homogeneous isotropic micropolar porous thermoelastic circular plate by using the eigen value approach. The Laplace and Hankel transform are used to solve the problem. The expression of displacements, microrotation, volume fraction field, temperature distribution and stresses are obtained in the transformed domain subjected to thermomechanical sources. A computer algorithm is developed for numerical computations. To obtain the resulting quantities in a physical domain, a numerical inversion technique is used. The resulting quantities are depicted graphically for a specific model. Some special cases are also deduced.

Key words: micropolar porous thermoelasticity, eigen value, Laplace and Hankel transforms, thermomechanical sources.

1. Introduction

The theory of micropolar elasticity developed by Eringen [1] aroused much interest because of its possible utility in investigating the deformation properties of solids for which the classical theory is inadequate. The micropolar theory is significantly useful for investigating materials consisting of bar-like molecules which exhibit microrotation effects and support body and surface couples. A special micropolar material was fabricated in which a uniformly distributed rigid aluminium shot was cast in an elastic epoxy matrix by Gauthier [2] and the values of the relevant parameters based on specimen of aluminium-epoxy composite were investigated.

The linear theory of micropolar thermoelasticity was developed by Eringen [3] and Nowacki [4] to include thermal effects. Touchert *et al*. [5] developed the linear theory of micropolar thermoelasticity in which Duhamel-Neumann analogy is extended to micropolar materials and the thermoelastic problem is reduced to a corresponding isothermal one with body forces and couples. Boschi and Iesan [6] investigated

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Optimal Eighth Order Convergent Iteration Scheme Based on Lagrange Interpolation

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Abstract In this paper, based on fourth order Ostrowski method, we derive an optimal eighth order iteration scheme for obtaining simple roots of nonlinear equations using Lagrange interpolation and suitable weight functions. The scheme requires three evaluations of the function and one evaluation of the first derivative per iteration. Numerical examples are included to confirm the theoretical results and to show the competitive performance of the proposed iteration scheme.

Keywords nonlinear equations; Ostrowski method; Lagrange interpolation; order of convergence; efficiency index

2000 MR Subject Classification 65H05; 65B99

1 Introduction

Solving nonlinear equations is one of the most important problems in numerical analysis[5,26]. A great importance of this subject has led to the development of many iterative methods. Throughout the paper, we consider iterative methods to find a simple root α i.e. $f(\alpha) = 0$ and $f'(\alpha) \neq 0$ of a nonlinear equation $f(x) = 0$, where $f : I \subset \mathbb{R} \to \mathbb{R}$ for an open interval I.

Newton method is probably the most widely used algorithm for the calculation of α, which is given as

$$x_{k+1} = x_k - \frac{f(x_k)}{f'(x_k)}. \tag{1}$$

This method has quadratic convergence[26,36] and requires two evaluations per iteration namely f and f'.

As the order of an iterative method increases, so does the number of functional evaluations, which increases cost of method also. The efficiency index[11] of the method gives a measure of the balance between these quantities and is defined by $p^{1/n}$, where p is the order of the method and n is the number of functional evaluations per iteration. The major aim in category of iterative methods is to develop most efficient methods. Kung and Traub[21] introduced the idea of optimality that order of a method cannot exceed optimal order 2^{n-1}. Among the category of two-step methods requiring three functional evaluations, a method of optimal order four would be constructed and in case of three-step methods requiring four functional evaluations, an optimal formation is the construction of eighth order methods.

The famous Ostrowski method[27] is an example of two-step fourth order optimal method,

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Eigen value approach for dual phase lag micropolar porous thermoelastic circular plate with ramp type heating

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Abstract

Purpose – The purpose of this paper is to investigate a two dimensional problem of micropolar porous thermoelastic circular plate subjected to ramp type heating.

Design/methodology/approach – Three phase lag theory of thermoelasticity has been used to formulate the problem. A numerical inversion technique is applied to obtain the result in the physical domain. The numerical values of the resulting quantities are presented graphically to show the effect of porosity and dual phase lag model. Some particular cases are also presented.

Findings – The Laplace and Hankel transforms are employed followed by the eigen value approach to obtain the components of displacements, microrotation, volume fraction field, temperature distribution and stresses in the transformed domain.

Originality/value – This paper fulfils the need to study the two-dimensional problem of micropolar porous thermoelastic circular plate subjected to ramp type heating.

Keywords Dual phase lag model, Eigen value approach, Laplace and Hankel transform, Micropolar porous thermoelastic

Paper type Research paper

1. Introduction

Eringen and Suhubi (1964) and Suhubi and Eringen (1964) presented a general theory of non-linear microelastic continuum in which the balance laws of continuum mechanics are supplemented and the intrinsic motions of the microelement contained in a macro-volume are considered. The micromorphic continuum theory was developed by Eringen (1965) as an extension of the theory introduced by Eringen and Suhubi (1964). A micromorphic continuum is a collection of material particles which can undergo classical motion and deform. The deformation of material is assumed to be affine. Thus, every material point in this body possesses 12 degrees of freedom: three for macro motion and nine for micromotion. Eringen (1966a, b) established theories for a subclass of micromorphic materials show microrotational effects and microrotational inertia.

The theory of micropolar elasticity was extended to include thermal effects by Nowacki (1966a, b, c), Eringen (1970), Tauchert *et al.* (1968), Tauchert (1971), Nowacki and Olszak (1974). Sherief (1986) obtained the solution of the problem of determining the stress and temperature distributions with a continuous heat source in an infinite elastic body by using Laplace transform technique governed by the equations of generalised thermoelasticity. One can refer to Dhaliwal and Singh (1987) for a review on the micropolar thermoelasticity and a historical survey of the subject, as well as to Eringen and Kafadar (1987) in the Continuum Physics series, in which the general theory of micromorphic media has been summed up.

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PLANE STRAIN PROBLEM IN A ROTATING MICROSTRETCH THERMOELASTIC SOLID WITH MICROTEMPERATURES

Praveen Ailawalia, Sunil Kumar Sachdeva, and Devinder Singh Pathania

Abstract. A two-dimensional problem in an infinite microstretch thermoelastic solid with microtemperatures subjected to a mechanical source is studied. The medium is rotating with a uniform angular velocity $\vec{\Omega}$. The normal mode analysis is used to obtain the exact expressions for the component of normal displacement, microtemperature, normal force stress, microstress tensor, temperature distribution, heat flux moment tensor and tangential couple stress. The effect of microrotation and stretch on the considered variables are illustrated graphically.

1. Introduction

The dynamical interaction between the thermal and mechanical response has great practical applications in modern aeronautics, astronatics, nuclear reactors, and high-energy particle accelerators. Classical elasticity is not adequate to model the behavior of materials possessing internal structure. Furthermore, the micropolar elastic model is more realistic than the purely elastic theory for studying the response of materials to external stimuli. Eringen and Suhubi [**1**] and Suhubi and Eringen [**2**] developed a nonlinear theory of micro-elastic solids. Later Eringen [**3**–**5**] developed a theory for the special class of micro-elastic materials and called it the "linear theory of micropolar elasticity". Under this theory, solids can undergo macro-deformations and micro-rotations. Eringen [**6**] developed a theory of thermo microstretch elastic solids in which he included microstructural expansions and contractions. The material points of microstretch solids can stretch and contract independently of their translations and rotations. Microstretch continuum is a model for Bravais lattice with a basis on the atomic level and a two phase dipolar solid with a core on the macroscopic level. For example, composite materials reinforced with chopped elastic fibres, porous media whose pores are filled with gas or inviscid

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Key words and phrases: thermoelasticity, microstretch, microtemperature, rotation, normal mode analysis.

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APPLIED & INTERDISCIPLINARY MATHEMATICS | RESEARCH ARTICLE

Effect of mechanical force along the interface of semi-infinite semiconducting medium and thermoelastic micropolar cubic crystal

Praveen Ailawalia[1]*, Sunil Kumar Sachdeva[2,3] and Devinder Singh Pathania[4]

Abstract: The present investigation deals with the two-dimensional deformation in a thermoelastic micropolar solid with cubic symmetry at the interface of the semi-infinite semiconducting medium under photothermal theory. A mechanical force is applied along the interface. The analytic expressions for the components of normal displacement, temperature distribution, normal force stress, and tangential couple stress for a thermoelastic micropolar solid with cubic symmetry have been obtained using normal mode analysis technique. The effect of anisotropy, microrotation, and thermoelasticity on the derived components have been depicted graphically.

Subjects: Science; Mathematics & Statistics; Applied Mathematics; Engineering & Technology

Keywords: thermoelasticity; cubic symmetry; semiconducting; photothermal; normal mode

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Additional information is available at the end of the article

1. Introduction

A micropolar continuum is a collection of inter-connected particles in the form of small rigid bodies in which materials' deformation is determined by both translational and rotational motion. In such type of motion, the force at a point of the surface element of the body is completely characterized

Praveen Ailawalia

ABOUT THE AUTHORS

The author, Praveen Ailawalia working as a professor at Maharishi Markandeshwar University, Sadopur, Ambala, Haryana (India) is actively involved in the field of thermoelasticity, micropolar elasticity. He has 19 years of teaching experience in different Universities and institutions. The author has more than 80 research publications in International Journals of repute. He has guided four PhD students and four students are currently working with him. The author has discussed deformation in thermoelastic medium and micropolar elastic medium in many of his research papers. The research problem discussed in the paper helps in analyzing the behavior of a medium with temperature changes if the medium undergoes deformation due to a mechanical force applied at the interface of two media. The results obtained in the paper may be applied to various geological problems which involves sources acting in the medium. The problem can be further discussed in case of thermal sources and internal heat sources applied in the medium or along the interface of two different media.

PUBLIC INTEREST STATEMENT

Studying the two-dimensional deformation due to a mechanical force in a micropolar thermoelastic cubic crystal is very useful in the study of earthquake engineering, seismology, and volcanic eruptions. It helps us to study the effect of anisotropy, microrotation, and temperature changes in the medium and the deformation caused in the medium due to a mechanical force.

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A novel family of weighted-Newton optimal eighth order methods with dynamics

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Abstract In this paper, we present a family of eighth order methods for solving nonlinear equations. Formula is composed of three steps, namely; Newton iteration in the first step and weighted-Newton iterations in second and third steps. Hence the name weighted-Newton methods. In terms of computational cost, the family requires three evaluations of function and one of first derivative. Therefore, it is optimal in the sense of Kung–Traub conjecture and has efficiency index 1.682 which is better than that of Newton method of efficiency index 1.414 and many other higher order methods. Numerical examples are considered to support that the method thus obtained is competitive with other similar robust methods. Moreover, basins of attraction are presented to demonstrate the performance in complex plane.

Keywords Nonlinear equations · Eighth order convergence · Weight function technique · Computational efficiency · Basins of attraction

Mathematics Subject Classification 65H10 · 47H99

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JOURNAL OF COMMUNICATION ENGINEERING & SYSTEMS

PERFORMANCE ANALYSIS OF DWT BASED OFDM SYSTEM USING SRRC FILTER IN MOBILE WIMAX OVER FADING ENVIRONMENT

Harpreet Kaur, Manoj Kumar, Ajay K. Sharma, Harjit P. Singh

ABSTRACT

Wavelets amid its capability to provide simultaneous information in both time and frequency domain, along with minimization of interference and improved bandwidth efficiency, is considered broadly as an efficient approach to replace fast Fourier transform (FFT) in the conventional orthogonal frequency division multiplexing (OFDM) systems. Efficient filter pulses are employed spectrally in such systems in order to mitigate the effect of inter-symbol interference (ISI) as well as satisfy the bandwidth limitations imposed by the multipath fading channels. In this paper, SRRC pulses are employed as transmit and receive filters to perform matched filtering in the wavelet based OFDM system of mobile worldwide interoperability for microwave access (Wimax) that facilitate to meet higher data rate demand along with reducing the probability of errors at the receiver. The physical layer performance of this simulated system is measured and compared in terms of bit error rate (BER) by varying signal to noise ratio (SNR) for different modulation techniques under wireless channel with realistic multipath fading and noisy conditions with path-loss model specifications in a semi-urban environment. The simulation outcome demonstrates significant improvement in BER which substantiates to enhance the performance of the physical layer in mobile Wimax under realistic environment conditions for various modulation schemes. Performance analysis by varying certain parameters of SRRC filter is also demonstrated to measure its comparative effectiveness. The simulation model is developed in MATLAB.

Cite this Article

Harpreet Kaur, Manoj Kumar, Ajay K. Sharma, Harjit P. Singh. Performance Analysis of DWT Based OFDM System using SRRC Filter in Mobile Wimax over Fading Environment. Journal of Communication Engineering & Systems. 2017; 7(1): 1–10p.

KEYWORDS

Root raised cosine, pulse shaping, oversampling rate, roll-off factor, DWT-OFDM, mobile Wimax

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REFBACKS

- There are currently no refbacks.

Novel Technique for Adaptive Modulation in Wireless Sensor Networks

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Abstract: The wireless sensor networks are the decentralized type of network which sense data and pass sensed information to base station. The network is deployed on the far places and size of the sensor nodes is very small due to which energy consumption, quality of service is the major issue of the network. The data which is sensed by the sensor networks are of low frequency due to which network interferences affect the network. In this work, the adaptive modulation scheme is proposed which is based on PCA algorithm which selects best modulation signal to increase frequency of the data. The proposed and existing algorithm is implemented in MATLAB and results are analyzed in terms of various parameters.

Keywords: WSN. Modulation, PCA, SVM

I. INTRODUCTION

Wireless sensor network is a collection of nodes that are organized in a cooperative network. These nodes are the sensor nodes which communicate over the wireless medium. All sensor nodes use the direct transmission or multi-hop transmission to communicate with the base station because all sensor nodes are immobile. Sensor nodes sense conditions at different locations at a fixed rate and always have data to send to the base station. Sensors are used in heating, ventilation and air conditioning etc. Hundreds of sensors are used in these systems by using wires [1]. The cost of wiring can be a few hundred of dollars. The installation of these wires is more difficult for accessing conditions and their re-configurability. For reducing cost and provide easy reconfiguration, replace the wired sensors with wireless sensors. Wireless sensor nodes can improve the quality and coverage of sensor networks. To enhance the system capability, add more sensor nodes with multiple modalities. 802.11 is pre-existing so sensors could be deployed easily without modifying data distribution infrastructure [2]. So we can use sensors in remote locations, including outdoor environment. To add the new sensors and utilize higher data rate sensors is directly proportional to maximum data rate supported by the physical channel. Adaptive modulation is a method to provide balance between Bit Error Rate and spectral efficiency. It is possible to make more effective use of adaptive modulation in a slowly varying fading channel with the noise based on SNR estimation [3]. Phase of high gain of power or lower fading will improve the SNR which allow the higher modulation schemes to be worked with less probability of error [4]. On the other side phase of greater bet the fading will deteriorate the SNR and force us to work with lower modulation method in order to make transmission more effective. In wireless communication Adaptive modulation or Link Adaption indicates the identification of the coding modulation and signals and protocol parameters depends on the circumstances of radio link [5]. Adaptation Modulation and Coding (AMC) have offered a different link adaptation method that promises to raise the overall system capacity. AMC provides the flexibility to match the modulation coding method to the average channel conditions for each user. With Adaptation Modulation the power of the transmitted signal is held constant over a frame interval and the modulation and coding format is changed to match the current received signal quality or channel conditions [6]. In a system with AMC users close to the Node B are typically assigned higher order modulation with higher code rates (e.g. 64 QAM with R=3/4 turbo codes) but the modulation-order and/or code rate will decrease as the distance from Node B increases.

Literature Review

Katayoun Sohrabi, et.al (2011) presented in this paper [7] algorithms for wireless sensor network which is a self-organized networks, in this larger number of static nodes with highly constrained energy resources. In wireless sensor networks some protocols which supported the slow mobility by a subset of the nodes, energy efficient routing, and formation of sensor networks for carrying out cooperative signal processing functions among a set of the nodes. Wireless sensor networks used for such applications as surveillance, widespread environmental sampling, security and health monitoring.

Yu Cheng et al. (2012) presented in this paper [8] a theoretical analysis of the maximum throughput of a wireless mesh backhaul network that is achievable over a practical carrier sense multiple access with collision avoidance (CSMA/CA) medium access control (MAC) protocol. They resort to the multi commodity flow (MCF) formulation augmented with the conflict-graph constraints, a novel approach to take into account the collision overhead in the distributed CSMA/CAMAC. NS-2 simulation results are presented to demonstrate the tightness of the upper and lower bounds that are newly developed, compared to those based on the MCF formulation assuming a slotted system and centralized scheduling.

Ossama Younis et.al (2012) proposed in this paper [9] a distributed clustering approach for long-lived ad-hoc sensor

Secure Channel Establishment Algorithm for Isolation of Selective forwarding Attack in MANET

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Abstract: The mobile ad-hoc network is the decentralized type of network in which mobile nodes join together and start communicating with each other. To establish path from source to destination various type of routing protocol are used which are broadly classified into reactive, proactive and hybrid type of routing protocols. The AODV is the best performing routing protocol in terms of routing overhead etc. Due to self configuring nature of network malicious nodes enter the network which are responsible to trigger active and passive attacks. The selective forwarding attack is the active type of attack in which malicious node is present in the path which drop some of the packets and some packets are forwarded to destination. In this paper, novel technique has been proposed which detect and isolate malicious nodes from the network. The simulation of proposed technique is done in NS2 and it performs well in terms of various parameters

Keywords: AODV, MANETs, Active, Passive, Selective forwarding attack

I. INTRODUCTION

Wireless communication is the level at which the transfer of user data over a distance without the use of "wired" or electrical conductor. The term "wireless" referred to tele-communication. Communication between two or more device can be within the short range or may be thousands of kilometers range. Wireless Networks term is refers to a kind of networking that does not require cables to connect with devices during communication [1]. Radio waves are used for transmission at physical level.

The distributed (but wired) sensor network produces local observations using short-range sensors. While the system is temporally continuous, it is spatially sparse, and therefore cannot be used to sense phenomena at a greater resolution than several miles. MANET stands for Mobile Ad hoc Network. It is a robust infrastructure less wireless network. It can be composed either by mobile nodes or by both fine-tuned and mobile nodes. Nodes are arbitrarily connected with each other and composing arbitrary topology. They can act as both routers and hosts [2]. They have ability to self-configure makes this technology opportune for provisioning communication to, for example, disaster-hit areas where there is no communication infrastructure or in emergency search and rescue operations where a network connection is exigently required. In MANET routing protocols for both static and dynamic topology are utilized. To transfer the data between source and destination it follows a routing technique. A mobile host may not be communicate with the destination node directly in a single hop network design, in this view it should occur the multi hop scenario, where the packets can be sent through several nodes which acts as the intermediate between source and destination [3].

Routing protocol specifies how to communicate with the help of routers. It shares information among intermediate nodes then with the whole network. It helps to search shortest route from source to destination. There are a variety of attacks possible in MANET. The attacks can be classified as active or passive attacks, internal or external attacks, or different attacks classified on the basis of different protocols. A passive attack does not disrupt the normal operation of the network. The attacker only snoops the data exchanged in the network without altering it [4]. It includes Eavesdropping, jamming and traffic analysis and monitoring. In case of active attacks, the attacker attempts to alter or destroy the data being exchanged in the network. This attack disrupts the normal functioning of the network. Active attacks can be internal or external. External attacks are carried out by nodes that do not belong to the network. Internal attacks are from compromised nodes that are part of the network. Selective Packet drop attack is the type of denial of service attack [5].

Packet dropping attack is launched on the forward phase. So it is very complex and difficult to isolate. This attack is very easy to perform but very difficult to detect it. Selfish node also drop packet in their different ways. They drop packets only to save their resources not damage any other nodes. Selective forwarding attacks may damage some mission of applications. Selective Packet drop is only possible when jamming attack is unsuccessful [6]. Once the packet is expected by the compromised node, it can examine the packet headers, categorize the packet, and decide whether to forward it or not. This action is known as misbehaviour. Selective policy known as the Jellyfish attack which is a compromised node that is occasionally drops a small part of consecutive packets and can be efficiently reducing the throughput of a TCP flow to near zero.

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Evolving Fast Fourier Transform and Deoxyribonucleic Acid for security of RFID based authentication protocol

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Abstract - *RFID based applications used tagging and tracking of objects for tag and reader in IoT. RFID enables identification from distance, unlike earlier barcode technology. RFID system is vulnerable to various security threats and attacks. The aim of our paper is to make a hybrid technique by combining Fast Fourier Transform (FFT) and Deoxyribonucleic acid (DNA) sequence operations.Our proposed technique is different from existing technique in the sense that we are combining two encryption method techniques instead of concentrate on single technique. Our proposed hybrid technique is highly secure and it leads to performance gains when it compare to the existing technique experimentally.*

Key Words: RFID, Authentication protocol, Internet of things, FFT, DNA

1. INTRODUCTION

In a wireless network, during communication between two entities security is a major issue. While communicating, there is a secure connection between two entities when no third party interrupts communication and not even secretly listen the conversation. To protect this conversation between sender and receiver from being accessed by unauthorized users, cryptography method can be used. In cryptography, process of encryption occurs while scrambling of plain text into cipher text and then back again is decryption. The proposed hybrid FFT-DNA scheme is applied on RFID authentication protocol.

Radio Frequency Identification (RFID) is a wireless technology for the purposes of automatic identification of electronic tagsphysically attached to objects using an RFID reader [1]. Recently, RFID systems are widely employed in supply chain management, pharmacy management, library collection management, electronic payment systems, automatic toll collection, proximitycards, hospital patient care, containersearch within seaports and many more applications [2]. In general, RFID system composed of three main parts: tags, reader and backend server. A tag is a device which is physically attached to an object. Every tag has its own unique identification. Tags can be passive or active according to the power source [3]. Active tag has its inbuilt power supply, so it gets power from itself. While, reader produced electromagnetic field through which passive tag gets charged. A reader is a device that can recognize the presence of RFID tags and read the information supplied by them.

A server is a trusted entity. When the system is set up, all the information related to RFID tags identification is stored in server's database, through which mutual authentication is done. Using the stored identification information, the server could determine the validity of the tag. Usually, servers have high capability of computing as well as high memory capacity.

Recently, internet of things (IoT) is becoming as one of the most dominant communication model in the modern world. The basic idea of this concept is pervasive presence around us of a variety of things or objects such as Radio Frequency Identification (RFID) tags, sensors, actuators, and mobile phones etc. which, through unique addressing schemes, are able to interact with each other and cooperate with their neighbours to reach common goals [4]. There are some application of IoT include: connected cars, smart city, home automation, wearable, smart grid, smart retail, industrial internet andtelehealth. In general, the DNA sequence are used to represent or encode the original data and the properties and DNA nucleotides are used a security enhancing feature which also helps to perform encryption and decryption of DNA sequence representing data.

On the other hand, Fast Fourier Transform (FFT) is a compression and encryption tool and applies to quite a few areas such as optical encryption and audio coding. To solve the problem of the low-level security and the great amount of data transmitted, FFT andDNA arecombined. The benefits of the proposed scheme are as follows: (1) The experiment suggest FFT and DNA method can resist man-in-the-middle attack, replay attack and impersonation attack. (2) Compared to ECC it can provide more security because of two-level security. (3) Receiver receives secure data with fast transmission speed.

The rest of the paper is organized as follows. Section 2 gives the related work. Section 3 discussed Existing ECC technique. Section 4 proposes FFT and DNA based authentication protocol. Experiments are discussed in

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Study Of Various Routing Algorithm On Hybrid Routing Topology By Employing Different Applications

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Abstract - The main cause for the degradation of the network performance in internet is instability in routing, link failures and congestion in the networks [1]. It has been found that most of the disruptions occur during routing changes. Every routing protocol behaves different from each other performance wise. We have evaluated performance of each protocol for real time applications.

I. INTRODUCTION

Increase in large networks increases routed traffic and reduces the stability of the network. The major cause for the degradation of the service performance in internet is network congestion, link failures, and routing instabilities [1]. It has been found that most of the disruptions occur during routing changes. A few hundred milliseconds of disruption are enough to cause a disturbance in voice and video. A disruption lasting a few seconds is long enough for interrupting web transactions [2]. Hence, during routing convergence data packets are dropped, delayed, and received out-of-order at the destination resulting thus in a serious degradation in the network performance [1].

To effectively and efficiently distribute data, the choice of the routing protocol becomes very critical factor to define the success of the network over time. Three classes of routing protocols are common on IP networks as follows:

1) Interior gateway routing over link state routing protocols, such as OSPF.

2) Interior gateway routing over distance vector protocols, such as RIP, IGRP and EIGRP.

3) Exterior gateway routing, such as BGP v4 routing protocol.

The performance of each routing protocol is different from each other. Among all routing protocols, we have chosen RIP, OSPF and EIGRP routing protocols for doing performance evaluation in a simulation based

a. STANDARD APPLICATIONS

To configure a LAN or a workstation, we need to describe their behavior. A user's behavior or "profile" can be described by the applications used and how long and often the applications are used throughout the day. An application can be described in terms of its actions, which are referred to as tasks in OPNET. OPNET ships with pre-defined profiles and applications that may suit the behavior we wish to describe. We may, however, wish to modify the existing definitions to suit our needs or even create new application and profile definitions. [5]

The standard applications in OPNET include Database, E-Mail, FTP, HTTP, Print, Remote Login, Video Conferencing and Voice.

b. Technical Overview of Routing Protocols

In Internet Protocol networks, a routing protocol usually carries packets by transferring them between different nodes. The main idea for routing protocols is to establish the best path from the source to the destination. Routing protocols have the following objectives:

i) To communicate between routers
ii) To construct routing tables
iii) To make routing decisions
iv) To learn existing routes
v) To share information amongst neighbor's routers.

3.1 Classification of Routing Protocols

The classifications of routing protocols are:

i) Static and dynamic routing protocols.
ii) Distance Vector and Link State routing protocols.

3.2 Static Routing

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Design of Smiley Shaped Fractal Antenna for Multiband Applications Using HFSS

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ABSTRACT: The objective of this paper is to design and analyse a novel Smiley shaped fractal antenna and simulate proposed antenna for multiband applications. Designing an antenna of compact size for portable wireless devices is one of the challenges. This proposed novel design of SFA has some uniqueness, such as compact size, antenna design with basic circle geometry, low cost, nearly omnidirectional. The simulated and measured results of the proposed antenna are also analysed.The use of fractal geometries has meaningfully impacted many areas of science and engineering, one of which is antennas. Antennas using some of these geometries for numerous telecommunications applications are already obtainable commercially.
Keywords: Smiley shaped Fractal antenna (SFA), Fractal antenna (FA)

I. INTRODUCTION

Modern telecommunication systems involve antennas with wider bandwidths and smaller dimensions than predictably possible. This has originated antenna research in several directions, one of which is by consuming fractal shaped antenna elements. In recent years numerous fractal geometries have been introduced for antenna submissions with varying degrees of achievement in improving antenna characteristics. Yet no momentous progress has been made in corroborating fractal belongings of these geometries with appearances of antennas.These are low profile antennas with moderate gain and can be made functioning at multiple frequency bands and hence are multi-functional. In this work the multi-band feature of antenna designs are discovered further with special importance on recognizing fractal properties that impact antenna multi-band characteristics. Antennas with condensed size have been obtained using Hilbert curve fractal geometry. Furthermore, design equations for these antennas are attained in terms of its geometrical parameters such as fractal dimension. Antenna properties have also been associated to fractal dimension of the geometry.

1.1Fractal theory:

In recent wireless communication structures wider bandwidth, multiband and stumpy profile antennas are in excessive demand for both commercial and military solicitations. This has originated Antenna research in various guidelines; one of them is expending fractal shaped antenna elements. Conventionally, each antenna operates at a single or dual frequency bands, where different antennas are necessary for different applications. Fractal shaped antennas have previously been proved to have some exclusive appearances that are linked to the various geometry and possessions of fractals. Fractals have been applied in countless field like image compression, analysis of high altitude lightning singularities, and rapid studies are apply to generating new type of antennas.. Fractals are geometric forms that can be found in nature, being obtained after millions of years of evolution, assortment and optimization. There are many benefits when we functional these fractals to cultivate numerous antenna features [2].

1.2 Smiley Shaped Fractal Antenna:

This anticipated novel design of SFA has some individuality, such as compact size, antenna design with basic circle geometry, little cost, approximately omnidirectional, and it shields the complete UWB band frequency 3.1–10.6 GHz. N-notch and a ground slit have been familiarized in order to accomplish the desired UWB characteristics as defined by FCC[9]. The contamination pattern of our suggested antenna is omnidirectional, which makes this antenna a good applicant for UWB based wireless submissions. Need for introducing ground slit and N-notch is discussed. The simulated and dignified results of the proposed antenna are also investigated.

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Network Selection in Wireless Heterogeneous Environment by C-P-F Hybrid Algorithm

Kiran Ahuja, Brahmjit Singh & Rajesh Khanna

Wireless Personal Communications **98**, 2733–2751 (2018) | Cite this article

Abstract

Numerous wireless communication technologies have been employed to manage mobile users anywhere, any time and anyhow. Additionally, users are more and more fascinated by multimedia applications such as voice, audio and video, which require Quality of Service (QoS) support. To retain the user with Always Best Connected network in such restrictions is a challenging issue. A contemporary approach for efficient network selection in wireless heterogeneous networks is conferred. The approach composed of two criteria: the first is the cost function comprising of received signal strength, available bit rate, signal to noise ratio, throughput and bit error rate metrics. The metrics' respective weights are being optimized by Particle Swarm Optimization (PSO). The second criterion consists of fuzzy logic system fed with similar metrics as inputs and targeted towards same output. The final decision of network selection is taken by the blend of these two criteria. Simulation results indicated that the proposed scheme based on Cost function, PSO and Fuzzy system (C-P-F) provided better performance in terms of minimizing the unnecessary handoffs (network selection rate), utility degree and load balancing. The proposed algorithm (C-P-F) significantly reduces the network selection rate by 50% as compared to existing algorithm based on cost function and PSO. This reduction indicated higher probability of guaranteed session continuity and good quality of the currently running service, which resulted in high user satisfaction levels. It enhances user

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Performance Analysis of Real-Time Eye Blink Detector for Varying Lighting Conditions and User Distance from the Camera

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Abstract – This paper presents the performance analysis of a blink detector, which detects eye blink, right wink and left wink, under natural & controlled lighting conditions and for variable user distance from the camera. The blink detector has been implemented by using a webcam, a computer and MATLAB software with image processing and computer vision toolbox. It divides the whole process of blink detection into three parts: face and eyes pair localization, blink detection using pixels' motion analysis and classification of blinks as left wink, right wink and eye blink i.e. blinking both eyes simultaneously. The detection accuracy of the detector was measured under natural and controlled lighting conditions for different values of user distance from the camera. Average detection accuracy of the detector under controlled lighting conditions observed to be 96%, 92% and 88% for detection of eye blink, left wink and right wink, respectively. From the overall analysis it has been observed that the system gives significantly better performance under controlled lighting conditions than under natural lighting conditions, and when the user sits at a distance of about 0.5 meter from the camera.

Keywords - real-time eye blink detection, pixels' motion analysis, varying lighting conditions, distance of user from camera, human-computer interaction

I. INTRODUCTION

Eye blink detection plays a very important role in the field of human computer interaction. It is used in the applications like object selection [1], driver drowsiness detection [2], in cameras and smart phones [3], games [4] and wheelchair control [5]. Two widely used methods cited in the literature for measurement of eye blinks are using Electrooculography (EOG) and Videooculography (VOG) [6]. In EOG method, some electrodes are placed around the eyes of a user and the output of these electrodes is refined & blinks are detected by using signal conditioning electronics [7]. In VOG method, a user sits in front of a camera and the computer performs analysis over video frames for blink detection [8]. This method does not require any sensor/electrodes to be placed on the user's face and is hence convenient to use. Videooculography have been set to use in a wide field of technical research applications and is the most discussed topic of research. Two most important parameters which decide the performance of a VOG based blink detector are: environmental lighting conditions [9] and the distance of the user from the camera [10].

Generally, voluntary and involuntary blinks are distinguished based upon their time duration. Because, in case of involuntary eye blinks an eye closes for about 310±7.3ms [2]. So, to differentiate a voluntary eye blink from involuntary eye blink, its duration should be greater than about 320ms.

Eyes detection methods (using VOG) are classified as direct eyes detection methods and indirect eyes detection methods. In direct eyes detection, eyes are detected directly in the image or a video frame, while in indirect methods; face localization is performed before eyes detection process. Eyes can be directly detected in the input frame without the face detection step, but the two step detection enhances the confidence of eyes detection. Further, eyes detection methods are classified as: active methods and passive methods [11]. Passive eye detectors work on images taken in natural scenes, without any special illumination and therefore can be applied to movies, broadcast news, etc. Active eye-detection methods use special illumination and thus are applicable to real-time situations in controlled environments, such as eye-gaze tracking, iris recognition, and video conferencing [12].

Modified fitness-based swarm intelligence approach for routing in wireless sensor networks

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Abstract: Despite the continuous improvement in field of wireless sensor networks (WSNs), there still exist areas of improvement in terms of factors like limited processing, communication, latency, energy resources available to a sensor node. In this paper, we have presented a swarm intelligence (SI)-based approach which serves as an apt model on the grounds that they comprise of moderate, self-organising and cooperative behaviours to deliver long lasting adaptivity to changes in pervasive environments. In the field of wireless sensor networks (WSNs), various swarm-based routing protocols have been proposed and the fitness function provides the best possible routing paths. In this paper, we have proposed a modified multi-path routing approach using artificial bee colony (ABC). The modified approach is based on fitness function which includes distance vector, reward factor, energy factor and latency of the path to be traversed. Among the swarm-based routing protocols (FP-ant, EEABR, AODV, Beesensor), Beesensor provides the best results. On the basis of experimental results, it was found that the modified approach provides better results than Beesensor.

Keywords: wireless sensor networks; WSNs; artificial bee colony; ABC; distance factor; energy factor.

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Machinability and Wear of Aluminium based Metal Matrix Composites by MQL - A Review

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Abstract

Metal matrix composites have exhibited better mechanical properties in comparison with conventional metals over an extensive range of working conditions. This makes them an appealing alternative in substituting metals for different applications. This paper gives a survey report, on machining of Aluminium metal Matrix composites (AMMC), particularly the molecule strengthened Aluminium metal matrix composites. It is an endeavour to give brief record of latest work to anticipate cutting parameters and surface structures in AMMC. The machinability can be enhanced by the utilization of Minimum Quantity Lubrication (MQL) during the machining of AMMC.

Article History

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Keywords:

AMMC, MQL, Machining, Wear, Reinforcement.

Introduction

Aluminium Based Metal Matrix Composites (Al MMCs) are one of the latest Functional materials having the properties of high wear resistance, good specific strength, light weight and has capable to adjust the thermal expansion coefficient. Al MMCs composite materials are used in constructural, aircrafts and products used in automobiles like piston cylinder, cylinder liner, Brake disc and drum etc. During fabricated of Al MMCs, the Aluminium as a basic material, known as matrix, which is reinforced with ceramic hard particles like Titanium diboride (TiB_2), Boron Carbide (B_4C), Silicon Carbide (SiC) and Aluminium oxide (Al_2O_3). It can be used as high length fibres, particulates may be an irregular shape or spherical shape. The properties of the resulting material are controlled by three critical components: the matrix, the interface and the reinforcement[1]. However, the properties of a composite depend on the following parameters such as properties of the matrix, properties of the reinforcement, relative amounts, size, shape and distribution of the reinforcement etc. The composite prove advantageous over conventional metals and alloys based ontheir engineering application and quality, safety, fuel economy, emission, styling, performance, ride handling, comfort, recyclability etc.

Manufacture of aluminium MMCs can be ordered into: liquid state, semi-solid and powder metallurgy

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TECHNICAL PAPER

Application of a hybrid Taguchi-entropy weight-based GRA method to optimize and neural network approach to predict the machining responses in ultrasonic machining of Ti–6Al–4V

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Abstract The present study was carried out to perform predictive modelling of material removal rate (MRR) and tool wear rate (TWR) during ultrasonic machining (USM) of titanium (Ti) alloy (Ti–6Al–4V) by realizing an optimum artificial neural network (ANN) created by exploring the effect of two different learning algorithms with varied number of neurons in hidden layer. Experimental studies were carried out to explore the effect of various process parameters of ultrasonic machining on response variables MRR and TWR. The basic nature of USM makes these two variables a conflicting one and, therefore, an entropy weight-based grey relational method was used to optimize the process for the two response variables. It was found that the ANN-based predictive results were very closely related to actual experimental findings.

Keywords Ultrasonic machining · Titanium · Entropy weight-based GRA · Artificial neural network

1 Introduction

USM is a non-conventional method of manufacturing and involves material removal by mechanical action of abrasive particles, suspended in a fluidic media, on the workpiece. The process has inherent advantage over some of the other non-traditional processes such as electric discharge machining (EDM) and wire-cut electric discharge machining (WEDM) by virtue of its ability to machine materials irrespective of their electrical properties. Conducting as well as non-metallic materials preferably with lower ductility and relatively higher hardness are suitable for machining using USM [1].

Ti and its alloys have been some of the most sought after work materials for researchers in last few years due to their excellent mechanical properties such as superior strength to weight ratio, corrosion and oxidation resistance, superior properties at elevated temperatures and bio-compatibility thus leading to their increased use in aerospace industries, marine applications and as bio-materials for surgical implants among several other applications. However, problems associated with effective and efficient machining of these alloys, along with higher related costs, are the driving force behind trial of non-traditional machining methods such as EDM, USM and hybrid machining for these alloys.

The present study was carried out to model the process of USM for Ti alloy using artificial neural networks and optimize the response variables of MRR and TWR, together, for the best machining efficiency under the influence of selected process parameters related to machine, tool and slurry by GRA method based on weight generation using entropy measure. The use of these techniques in USM of titanium has not been found in the literature to the best of the knowledge of the authors. Additionally, cryogenic treatment to the tool and work material was also included in the process parameters. Cryogenic treatment is a complementary progression to the established techniques of heat treatment and is being used to enhance wear resistance and improve mechanical properties in tool steels. Cryogenic treatment of non-ferrous materials is, however, still

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Comparative evaluation of MQL and dry machining of C45 steel using uncoated w/c inserts

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Abstract
Globally, the methods by which the products are designed and manufactured are advancing at rapid pace. In the present scenario, the identity of the lubricants and the coolants are classified as the toxic fluids not only to operators but also degrade the environment. Industries and researchers are working for the new advancement to reduce or eliminate the use of cutting fluids, both for economic and ecological reasons. Minimum Quantity Lubrication (MQL), which minimizes the use of cutting fluid proved advantages comparative to Flood cooling reduces the quantity of the lubricant to much extent, had gained popularity as a new substitute for Flood Cooling. The use of MQL in machining not only results in increase tool life, controlled temperature at chip-tool interface but provides with a cleaner environment and much amount-effectual machining technology. This paper presents a parallel analysis into the effect of temperature, roughness and tool wear at different cutting speed during turning of C45 steel. Dry cutting and minimum quantity lubrication (MQL) results are also compared and conclusions are analyzed. The experimental outcome demonstrates that the cooling and lubricating conditions influence altogether the researched procedure and surface properties which depends to a substantial degree on the connected cutting parameters, in particular the cutting speed and feed rate.

Keywords: green manufacturing, dry machining, minimum quantity lubrication (MQL)

1. Introduction
Green manufacturing is one of the major research and development theme in the industrial science and manufacturing sector from past few years due to the challenges raised by increased environmental awareness, strict protection laws and health regulations for occupational safety. The machining operations, particularly in turning extreme friction comes into role due to contact between the tool and the workpiece, i.e on the apparatus (tool) rake face and paraphernalia (tool) flank [1]. Due to such processes, a lot of heat is generated which results in increase in temperature, tool wear, surface roughness and thus leads to shorter tool life. During such operations, heat is produced at the two zones of tool i.e primary zone and secondary zone. The extent of heat produced at the primary zone cannot be controlled, but can be controlled at secondary zone. At the interface between a cutting tool edge and a metallic workpiece, the temperature show increment from 200°C to more than 1,300°C [2]. At such temperatures, the metallic structure of softer metals such as aluminum distort. This quick temperature variation or the thermal shocks decreases the tool life by increasing tool wear [3]. During dry machining, the friction and the traction between the chip and tool have a tendency to be higher, which causes higher temperatures, higher wear rates and thus shorter tool lives [4]. The new technique, flood cooling has been proved to be useful but the issue exists that in flood cooling the excessive use of lubricant, degrades the environment and workers health hazard problems in metal cutting industry [5]. Cutting fluids are used to reduce cutting forces, temperature, coefficient of friction and power, increases tool life, improve surface finish, chip removal, reduces thermal distortion and subsurface damage [6, 7]. Inappropriate disposal of the metal cutting fluid pollutes the air, land, and water and disturbs the entire environment. In addition, cutting fluid liquid particles stay dangling in the environment for short time. To conquer the disadvantages of Flood cooling, tools are microtextured for elite cutting [8]. Tool coating is the most effective in enhancing the performance of a tool. Appropriately, the consolidation of the micro-textured surface and the surface encrustation (coating) seems to take collaborative effect on the consummation (performance) of cutting [9, 10]. Friction coefficient at the rake face lowers when surface texture was brought to bear to cutting tools. Utilization of the rake-face textured tools can fundamentally reduce cutting forces and cutting temperature in contemplate with the traditional tools. For the solution, the breakthrough approach is adopted known as Minimum Quantity Lubrication (MQL), also known as "Micro lubrication," and "Near-Dry Machining" (NDM) is the current approach of providing metal cutting fluid to the tool or the work interface [11]. Utilizing this innovative approach, cutting fluid, when wisely selected and used, have a generous effect in how adequately a tool performs. In MQL maybe, secondary qualities are essential. These assimilate their invulnerability properties, (human acquaintance and environment degradation) oxidation, biodegradability and storage stability. This is vital aspect of MQL because the cutting fluid or the lubricant could not affect the environment and can use for long term because of the low consumption.
According to the researchers Anuj Kumar Sharma [1] and others when performed the machining of AISI-4140 which is also known as molybdenum steel of the dimensions (70 mm x 300 mm) using uncoated carbide inserts as a cutting tool which is achieved on HMT lathe machine under contrasting machining aura like wet, dry, conventional cutting fluid. The

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RESEARCH PAPER

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An Energy Efficient Spectrum Sensing, Access and Handoff Concept using Look Up Table for Cognitive Radios Networks

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Abstract: Continues growth of high data rates specifically broadband network demanded by the subscribers 5G technology act as an driving trend under advanced long term evolution and it requires more spectrum as compared to technologies used now a days. Spectrum scarcity is an major issue in latest wireless technologies used now a days. Literature shows 70% of spectrum is either underutilized or not utilized at all. main process in determination of spectrum scarcity starts with Spectrum sensing in cognitive radio. We are using Look up Table (LUT) which hold the status of the current spectrum which is updated after every time slot (sensing and transmission process). Sensing should be reliable, fast and robust. This paper mainly focused on spectrum sensing, access and handoff using LUT based fuzzy selection switch to improve transmission time and avoid traffic congestion hence improve throughput keeping Cognitive radios system more energy efficient. We have achieved Energy consumption vs throughput coefficient significantly improved by 5-8%. Energy consumption vs delay coefficient significantly decreased by 5-15% with respect to existing methods.

*Keywords:*Cognitive Radio Networks (CRN), Look up table (LUT), channel assignment, Cooperative sensing, Spectrum Handoff, Energy Efficiency, Sensing Transmission tradeoff *Protocols*

1. INTRODUCTION

The Cognitive radio concept was originated by Joseph Mitola while attending a seminar at Royal Institute of Technology situated in Stockholm in 1998 and later published by him in an article [1]. Cognitive radio is a unique technique which is able to encourage efficient improvement of the spectrum deployment between primary and secondary transmission.

As per 2020 futuristic vision Industry faces a big challenge to develop new design so as to meet future extreme capacity and performance demands. To meet such conditions cognitive radios based 5G technology act as an driving trend under advanced long term evolution and it requires more spectrum as compared to technologies used now a days. Some of the CR systems, spectrum administration is facilitated through the action of analysis which is agitated out periodically [1]. In general, the Secondary User is not capable to perform the basic functions of spectrum sensing and utilize the vacant spectrum for transmission at the same time, due to which SUs faces the essential problem of indispensable substitution between best possible sensing and transmission. [1], [2]. As of now researcher did lot of works in this regards, in literature many researcher are keen in optimizing the sensing time so that time available for transmission will be maximizing by maintained the frame length remains same for the secondary users. [1], [2]. However, a lot of the analysis /strategies being implemented for sensing can be acclimated area either individual approach is available[2] or assorted maximum no of channels are sensed and accessed one afterwards another. [2]. As a result, the CR user can either address abstracts or waits after transmission, through the approach sensed earlier.

In wideband CRN spectrum with N number of narrowband channels accessible for sharing, the throughput of the SU can be decidedly added by applying a "spectrum handoff" [3], in which if a Secondary User faces problem due to interference from primary user transmission it will switch to another vacant channel with the help of fuzzy selection based Lookup Table(LUT) concept (LUT Fuzzy selection switch) explained in section 4, Secondary user will start its data transmission on another channel recently sensed through LUT fuzzy switch when secondary user sensed current channel as busy(SU's must have to leave the spectrum within 2sec as long as PU arrived as per FCC regulation) however this practice is not done excessively as it also consume high energy during spectrum handoff[4] Spectrum Handoff is not preferred where system is battery operated usually in Mobile CR systems (spectrum handoff concept is rarely used [4].

In Cognitive radios networks for accurate sensing Secondary Users (SU's) will have to coordinate with PU. For more efficient and accurate sensing SU's should be separated into clustered and each cluster will be having separate LUT for status update of spectrum as shown in figure 1which is explained in detail in system model (section 3) of this

Cooperative Sensing using LUT: A powerful method to overcome shadowing problem and maximizing throughput in CRN's

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Abstract : Spectrum scarcity is an major issue in latest wireless technologies used now a days. Literature shows 70% of spectrum is either underutilized or not utilized at all. The main process in determination of spectrum scarcity starts with Spectrum sensing in cognitive radio. Sensing through one Secondary Users (SU) node faces various issues (like hidden node, shadowing problem etc) which occurs due to channel impediments, or obstacles like buildings etc to overcome such problems cooperation based spectrum sensing is brought into existence. Although collaboration between multiple SU's improves the sensing performance, but cooperation between nodes is it an challenging issue. Concept of Look up Table (LUT) is widely as well as efficiently used in this paper to improve the efficiency of the system while doing cooperative sensing. Lookup Table will hold the status of the spectrum which is updated every time by multi node/Cooperative sensing process which makes sensing reliable, fast and robust. In this paper we are introducing an LUT based cooperative sensing method to improve transmission time and hence improve throughput of Cognitive radios system. We have achieved Probability of detection ($P_{D)}$ significantly improved by 8%, Probability of False alarm($P_{fa)}$ significantly decreased by 18% and achievable normalized throughput improved by 5% along with significant improvement in end to end delay with respect to traditional sensing method.

IndexTerms **- Cognitive Radio Cognitive Networks (CRCN), Look up table (LUT), channel assignment, Cooperative sensing, overlay access Spectrum Sensing (SS).**

I. INTRODUCTION

Cognitive radio (CR or SU) being a prototype ensures the efficient utilization of spectrum using spectrum sensing, spectrum sharing and spectrum management effortlessly and accurately between (Primary /Licensed Users) PU & SU [1]. Practically a Secondary User (SU) is unable to perform sensing and transmission operation at same time until unless very Complex and costly MRMF (Multi Radio- Multiple frequency) like hardware is not used simultaneously, which causes major problem of sensing and throughput tradeoff. Periodic sensing is generally used in Cognitive radio system [2]. The basic requirements for efficient spectrum sensing should be reliable, vigorous and fast detection of Primary users signal although if that signal is having low SNR (signal-to-noise ratio). More than two, but not a lots of signal processing techniques are being expended for SS. Most preferred techniques are Energy detection, Cyclostationary detection and matched filter [3]. Single node sensing is not preferred due to shadowing, multipath fading like issue due to obstacles like buildings ,due to which signals received is having uncertainty. To take the edge off these problems, cooperative or multiuser detecting procedures are being utilized [3–7]. Opportunistic spectrum sharing and access were comprehensively discussed in earlier period. In previous decade, Dynamic Spectrum allocation (DSA) technique is coming to picture very widely and Cognitive Radio offers a promising approach to enhance spectrum utilization and is identified as key enabler for DSA networks. Literature shows in few geographical areas most of the time licensed bands (especially TV bands) are either unutilized or underutilized. These frequency bands are called "white space" or "hole" (*"a bandwidth is considered as white space if it is wider than 1 MHz and remains unoccupied for at least 10 minutes"*)[7] and white space occupied by SU should be leaved after the arrival of PU within 2sec as per IEEE 802.22 standard.

In November/2004, we saw the development of the to characterize a the first ecumenical effort to define a novel wireless air interface1 standard predicated on Cognitive Radios (CRs): the IEEE 802.22 Working Group (WG)[1]. The IEEE 802.22 WG is sanctioned with the encroachment of a CR-WRAN (CR-Wireless Regional Area Network) PHY(Physical layer) and MAC(Medium Access Control) layers for use by permit excluded gadgets in the spectrum to facilitate at present dispensed to the Television (TV) band .Because of significant disadvantage of detecting throughput exchange off issue, part of important studies[2] embraced where major issues expressed ideal detecting/throughput exchange off is clarified.

II RELATED WORK

Ying-Chang Liang et al.[2007] explained fundamental tradeoff between sensing capability and achievable throughput of the secondary users[11]. Particularly, they studied energy detection sensing technique for the outline of detecting opening utilizing

Power Quality Improvement of Wind farm Connected with Grid Supply Using Intelligent Controlled UPQC

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***Abstract*— The emerging advancements in the modern electrical system has increased the consumption of the electrical power to a greater extent in the recent years than the few previous years. This increase in the demand of electrical power has encouraged the generation of electrical power by other non-conventional means like solar, wind, hydro, etc. These non-conventional sources of electrical power has enormous advantages over the conventional sources of electrical power but the quality of power coming from these non-conventional sources need to be monitored because of the fact that the input supply to these non-conventional power sources is never constant and varies continuously. These variations in the input supply of the sources along with the inverters and converters used in these electrical sources leads to the distortions and harmonics in the power system which deteriorates the power quality of the system. In this paper the power quality issue of the system consisting of a wind farm connected with the Grid network is studied and discussed. An effort has been made to improve the power quality of the system up to the desired level using an intelligent controlled Unified Power Quality Conditioner (UPQC). The performance of the intelligent controlled UPQC is compared with the conventional method of controlling i.e. Proportional Integral (PI) controlled UPQC and is found to have better results and improved performance. The results are verified using MATLAB/SIMULINK software.**

***Keywords*— Unified Power Quality Conditioner (UPQC), Proportional Integral controller (PI controller), Active power filters (APF), Insulated gate bipolar transistor (IGBT), Artificial neural network (ANN), Pulse width modulation (PWM), Phase locked loop (PLL)**

I. Introduction

The electrical power is one of the most beneficial, reliable and diversified source of power used now a days in our modern era thus the demand of electrical power is increasing very steeply. This has led to the increased generation of electrical power using various conventional sources like thermal power, nuclear power, etc. at a much larger rate than the previous time in the history. This has increased the consumption of the fossil fuels and had put a burden on the reserve of nature as well as the environment is also suffering the problem of pollution. With these problems, the non-conventional and renewable resources of power came into the existence for sharing the load of the conventional resources for power generation and for rehabilitation of environment. These resources includes wind power, solar power, hydro power, etc. which are available in nature in an infinite amount and also do not pollute the environment [1]. These resources if used for electrical power generation has a lot of advantage, which includes: Low generation cost, No pollution in generation, Long life span, etc. but also there are some limitations like the amount of power generated by these resources is limited and is dependent upon the nature itself, also because of the continuously variable input supply the quality of power from these resources is not up to the mark and need to be monitored continuously. These sources of electrical power like wind power plant, solar power plant, etc. when coupled with the existing power supply network, distorts the power supply of the network itself and introduce the harmonics in it, resulting into the poor power quality of the system [2]. The power quality issue of the wind farm when connected with the electrical grid is studied and discussed in this paper and an effort has been made to improve the power quality of the system consisting of the grid supply with interconnected wind farm and a load.

The wind turbine used in this system is a 9MW variable speed pitch controlled wind turbine with a doubly-fed induction generator (DFIG) which is connected to the Grid network of 33KV to feed the 3 phase RLC load of 10e3W active power, inductive reactive power 100var positive and capacitive reactive power 100var negative at the voltage of 575V. The DFIG is the perfect for the system with large scale power wind turbines because of the fact that the inverters required to be connected to induction generators for this load will be large and expensive [3]. The DFIG consists of the two-three phase windings, one stationary and one rotating. One winding is connected directly to the grid to produce 3 phase power at desired frequency and other winding is connected to

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Intelligent controlled UPQC for power quality improvement of grid supply connected with non-linear load

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ABSTRACT
The issue of power quality has gained popularity in the recent years because of the widespread use of power electronic devices, larger inter-connected load networks and widespread use of non-conventional source of electrical energy like wind power, solar power etc. in the power system. The deterioration of the power quality may cause unwanted losses in the system, poor efficiency, interference with the communication lines, and faulty operation of devices and even may cause fault in some devices. In this paper the power quality issue because of the presence of non-linear load connected to the electric grid is discussed and an effort has been made to improve the power quality of the system using a device known as Unified Power Quality Conditioner (UPQC). For this the intelligent controlled UPQC is developed and used with the Grid supply connected to the Non-linear load and percentage Total Harmonic Distortion (THD) of voltage and current waveforms is measured in order to determine the power quality at different locations in the system. The intelligent controlled method has been found to have superior performance over the conventional Proportional Integral (PI) controlled UPQC. The results obtained verified using MATLAB/SIMULINK software.

Keywords - Unified Power Quality Conditioner (UPQC), Proportional Integral controller (PI controller), Active power filters (APF), Insulated gate bipolar transistor (IGBT), Artificial neural network (ANN), Pulse width modulation (PWM), Phase locked loop (PLL)

I. INTRODUCTION

With the increasing advancement in the field of electronics and the introduction of electronic devices into the power system the concept of Power quality has become very popular worldwide. These electronic devices are very sensitive to the variations in the voltage and current like harmonics, flickering, sags and swells etc. thus the quality of power is needed to be maintained. Although these electronic devices are also one of the reasons for the reduction in the power quality of the system as these electronic devices behaves as nonlinear load and cause unwanted distortions in the power system. In this paper the device known as UPQC is used for the power quality of the system consisting of a grid supply connected to the nonlinear load. The control system of the UPQC is the major factor which decides the performance of the UPQC and its effectiveness in the system.

The control system plays the important role of determining the error signal from the reference signal and the measured signal. There are different controlling strategies present in the today's time which are well discussed in [1], these includes PI, PID, fuzzy-logic, sliding-mode, predictive, unified constant frequency (UFC) controllers etc., are discussed in [2]-[4]. The PID controller requires very accurate mathematical modelling similar to the conventional PI controller, thus it fails to perform satisfactorily under parameter variation of the nonlinearity load, disturbance, etc. The new unconventional controllers are being developed now a days which have improved performance and have replaced the conventional controllers. One such controller (intelligent controller) has been developed in this paper using the Artificial Neural Network (ANN) which has the ability to learn from the changes and adapt them to make decisions on their own to improve the performance of UPQC. A three feedforward type ANN based controller is developed to control the series inverter of the intelligent controlled UPQC. Various simulation results are presented in this paper which compare the performance of intelligent controller with the conventional PI controller. The section II of this system describes the configuration of the UPQC, while Sections III & IV discuss the PI and Intelligent

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PSO Algorithm based Loss Minimization Approach for Optimal Placement and Sizing of Renewable Energy Source

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Abstract: In this research paper, PSO is joint with Newton Raphson method of power flow to optimize optimal location along with size of renewable energy source. A NR method is used to measure the losses and find the voltage at each bus. The PSO is used to locate the best location as well as sizing of renewable energy source. The main aim is to reduce the losses and keep the voltage profile acceptable. IEEE 30 bus standard system is used for the observations. There is the comparison of results of system without renewable energy source and with renewable energy source by some methods of optimization. Wind farm is considered as the renewable energy source.

Keywords: PSO, Newton Raphson power flow,losses reduction,voltage profile, intermittent energy sources

I. INTRODUCTION

Setting up of renewable energy resources in power system arrangement can gives the better impacts like voltage profile improvement and reduction in losses[1].Renewable energy sources usage is increasing day by day fastly, due to its number of benefits like small size, few environmental causes, less cost[2].These non-conventional energy resources like wind, hydro, biomass, solar, ocean and geothermal energy are naturally spread in all over the world[3].Reducing the power system loss, minimizing the variation in voltage and infraction the limits of power flow are the main objectives of the optimal sizing and placement of renewable energy sources[4]. Also, these sources are intermittent in nature i.e there is variability present in some of the sources [5]. Therefore to overcome this problem, optimization techniques are used for optimal allocation of these sources[6].In this research paper, PSO technique advanced method is used for optimization to reduce the system losses and improve the profile of voltage with Newton Raphson power flow method. PSO is the basic technique inspired by the flocking and schooling patterns of birds and fishes. It is very simple algorithm. It can be used to find the best position and rating of any variable energy source by the iteration procedure [7]. In this research paper, wind is considered as renewable energy source, supposed to be an active power source. In this present work we make an effort, to find out the optimal sizing and placement of a wind energy source in an IEEE thirty test system bus by using the PSO technique which is combined with the Newton Raphson power flow method. With this motive, the whole work is divided as following, introduction, methodology with Newton Raphson method, Particle swarm optimization method with its flowchart. Then there is model of flow of power with wind energy is discussed and in the end diverse grades of simulation get achieved as well as examined. Further, the result gets compared with the outcome of Artificial Bee Colony (ABC) technique and seems to be cheering.

II. METHODOLOGY

In this research paper, PSO gets joint with Newton Raphson technique to discover best rating with location of renewable energy resources in large scale system[8]. The bus data and line data had altered with the cause of renewable energy sources. While renewable energy sources linked with a bus and the bus will supposed to be a generator bus [9]. Newton raphson method of power flow in some pattern volume is available [10].

4. *Newton Raphson Method*

It is one of the basic technique which is used to find the flow of power in scheme. This method is used to measure the voltage and losses on every bus in the power system [11].

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Watermark Image Enhancement from various Attacks by SWT Using Hybrid Meta-heuristics

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Abstract: ***Digital watermarking enables one to protect the document; it is the kind of material authentication. The major problem in hypermedia technology is attacks on digital watermarking.In digital watermarking single attack on a given watermark image has effective outcome but multiple attacks on a given watermarked image and other watermark scrambling need to be improved. This paper purposes a new watermarking technique using integrated approach of SWT with GA and PSO for watermarking scrambling is used. The proposed methodology enhances imperceptibility and robustness in the watermarked image which has result in improving the visual quality of watermark.***

Keywords: watermarking techniques, SWT, SVD, PSOGA**.**

1. Introduction

Watermarking is likewise a sub-order of data covering up. The watermarking procedure is by and large material to waveform sort of data sources. Computerized watermarking is a method, which allows a man to incorporate covered copyright sees, or other check messages to cutting edge sound, video or picture banners and records. Such a message is social event of bits depicting data identifying with the sign or to the maker of a sign. The technique takes its name from watermarking of paper or money as a security measure. Progressed watermarking can be a kind of stenography, in which data is concealed in the message without the end customer's learning. The watermarking method contains two phases the watermark embedding and watermark recovery.

2. Watermarking Techniques

2.1 Distinct Cosine Transform

The DCT turns or buttons a signal from spatial domain in to a frequency domain. DCT is real-valued and offers a better approximation of a signal with few coefficients. This technique reduces how big the standard equations by discarding higher size DCT coefficients. Crucial structural data is contained in the paid off size DCT coefficients. Thus, breaking up the high-frequency DCT coefficient and using the lighting advancement in the low–volume DCT coefficient, it'll acquire and cover the edge information from satellite images. The increased picture is reconstructed by utilizing inverse DCT and it is likely to be sharper with excellent contrast. DCT is popularly used within data force approaches these for case JPEG and also MPEG. The top great things about DCT consist of their massive electric power compaction buildings and also handiness so that we can promptly data to the working out regarding transform. The force compaction house from the DCT results within transform coefficients with only very few coefficients getting costs, as a result which makes it suitable for watermarking **[18]**.

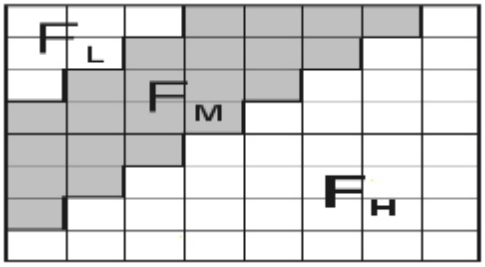

Figure 1: Discrete Cosine Transform regions [5]

2.2 Discrete Wavelet Transform

The DWT is only an arrangement of filters. You can discover two channels included, one could be the "wavelet channel", and the other could be the "scaling filter". The wavelet filtration is a high pass filtration, while the scaling filtration is a low pass channel. In the wake of utilizing a 1-level DWT on a photo, we have the estimate sub-band LL, the outside sub-band LH, the straight sub-band HL, and the corner to corner sub-band HH. Moreover, on the off chance that we need to utilize a 2-level DWT on the photo, we simply utilize yet another 1-level DWT on the estimation sub-band LL. Taking after utilizing a 2-phase DWT, we likewise have the estimation sub-band LL2, the outside sub-band LH2, the straight sub-band HL2, and the corner to corner sub-band HH2 of the guess sub-band LL other than sub-groups LH, HL, HH. Figure 1.7 shows Workflow of DWT. Favorable position of DWT over various changes is it permits great limitation both in time and spatial recurrence space. In light of these characteristic multi-determination natures, wavelet coding plans are exceptionally perfect for projects where versatility and average pulverization are essential. DWT is favored, since it gives both a parallel spatial confinement and a recurrence spread of the watermark inside the host picture. The progressive property of the DWT offers

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Improved Quality of watermark image by using integrated SWT with GA and PSO

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Abstract

Digital watermarking enables one to protect the document; it is the kind of material authentication. The major problem in hypermedia technology is attacks on digital watermarking.In digital watermarking single attack on a given watermark image has effective outcome but multiple attacks on a given watermarked image and other watermark scrambling need to be improved. This paper purposes a new watermarking technique using integrated approach of SWT with GA and PSO for watermarking scrambling is used. The proposed methodology enhances imperceptibility and robustness in the watermarked image which has result in improving the visual quality of watermark.

Keywords: Watermarking; Watermarking Techniques; DCT; SVD; ABC; SWT; GA; PSO

1. INTRODUCTION

With the quick worldwide extension of web, the development of computerized advances has turned into an essential requirement, and these innovations give various preferred standpoint to exchanging information over the web. The propelling universes of computerized interactive media confront issues connected to safety and legitimacy of computerized information. The data safety time period is portrayed as ensuring data or advanced information against any assault that might be performed by using distinctive assaulting advances, strategies and techniques. Digital watermarking

A Review on Various Optimized Image Watermarking Techniques

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ABSTRACT
This paper represents digital watermarking is a technique which allows an individual to add hidden copyright notices or other verification messages to digital audio, video, or image signals and documents. Two types of digital watermarks may be distinguished, depending upon if the watermark seems to be visible or even cannot be seen to the rare viewer. The complete goal of this paper is to explore the comparison of various techniques based on watermarking image and it also demonstrate that it provides the secured image watermarking with a decent capacity.

Keywords
Digital watermarking, Discrete Wavelet Transform (DWT).Watermarking techniques

1. INTRODUCTION
Watermarking plan top quality is usually made a decision putting on robustness, openness along with capacity. Openness usually means soon after installation of watermark the primary photograph really should not be distorted. Robustness pertains to attacks. If watermark treatment methods are tricky to diverse strikes such as turn, scaling, compression setting, noise next watermarking plan is usually robust. Total capacity usually means amount, which will are placed to pay for image. A lot more amount usually means it's possible to handle lots of files **[2].**Searching for watermark could possibly be obvious or invisible. An apparent watermark generally contains plainly obvious info or perhaps enterprise manufacturer exposing a usage from the image. Upon the next fretting hand, the invisibly watermarked impression appears just like the original. The existence of the invisible watermark can just simply be founded utilizing an suited watermark removals or acknowledgement algorithm. In this study most of us prohibit our own care about cannot be seen watermarks. A strong invisible watermarking approach, on the whole, consists of encoding approach and a decoding process. Watermarks involving varied quantity of coverage are extra with display mass media because amount of protection involving excellence, top quality, possession along with supplier **[3].**

1.1 Features of digital watermarking
Different top features of watermarking are as follows

1.1.1 Robustness
Robustness talks about how the watermark embedded in details offers the potential involving living adhering to many different control treatments and also attacks. Subsequently, the particular watermark should be solid intended for fundamental sign control function, geometric alteration and also damaging episode [4].

1.1.2 Imperceptibility
Watermark cannot be observed by simply observation or simply certainly not get noticed by simply individual scalp, just be found as a result of specific command or perhaps faithful circuits. It can be found by a state corporation only. Like watermarks are used by material or perhaps author accreditation and for stinking unauthorized copier.

1.1.3 Safety
The watermark practice is known as safeguarded, in the event the nuller can't remove the watermark without the need of total familiarity with embedding algorithm formula, detector in addition to arrangement involving watermark **[5].**Your watermark have to simply be readily available simply by licensed parties. That will need is considered as a burglar plus the watermark is mostly obtained simply by the application of cryptographic keys. Watermark data possesses the correct gauge to understand, the licensed men and women may possibly formally identify, find and even affect the watermark, and therefore control to obtain the aim involving hallmark protection.

1.1.4 Verifiability
Watermark ought to control to supply complete and trustworthy information for the possessing copyright-protected information and facts products. The item may be used to discover if thez item will likely be attached and keep an eye on disperse involving the info staying attached, discover the particular authenticity, and purchase a grasp with against the law plagiarizing [6].

1.1.5 Volume and knowledge payload
Amount with the watermarking plan pertains to the best quantity of information which can be jammed in the duvet work. The quantity of watermark sections within the electronic mail in know-how payload and also the many regularity of knowledge payload in an image could be the watermark capacity. With regards to the plan a number of watermarking tactics need a knowledge payload going above 10,000 bits. Any watermark often have huge know-how volume level nevertheless small know-how payload.

1.1.6 Computational charge
In an effort to lessen computational fee, some sort of watermarking tactic has to be less complex. Watermarking tactics using big complex algorithms is going to requirement much more request and also consumer electronics resources and therefore bear much more computational cost. A Computational ease is normally decided on in resource-limited ecosystem including cell devices.

1.1.7 Watermark recognition stability
In order to model highly effective watermarking in the trademark safety scenario, we could try a watermark in which

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Preparation of YZT a mixed conductor by microwave processing: A different mechanism in the solid state thermochemical reaction

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HIGHLIGHTS

- YZT of different compositions was prepared by microwave and conventional heating.
- The products prepared were characterized by SEM, XRD and Vickers hardness.
- The phase change in YZT with the change in the concentration of Ti was studied.
- The microstructure of YZT prepared by both the methods was compared.
- The Vickers hardness of YZT prepared by both the methods was compared.

ARTICLE INFO

Keywords:
SOFC
YSZ
YZT
SEM
XRD

ABSTRACT

The addition of TiO_2 to the 8YSZ system causes the formation of titania-doped YSZ, i.e., YZT and titania-doped YTZP also. The formation of cubic YZT and YTZP depends upon the concentration of TiO_2 added to the 8YSZ system. Also, the addition of TiO_2 after a critical concentration to 8YSZ system leads to the precipitation of $ZrTiO_4$ as an impure phase in YZT. In the present work, conventional and microwave sintering of YZT of composition $[(ZrO_2)_{0.92}(Y_2O_3)_{0.08}]_{(1-x)}(TiO_2)_x$ where x = 0.00, 0.03, 0.06, 0.09, 0.12 and 0.15, have been prepared. The products were characterized by XRD, SEM and micro Vickers indentation to examine phase composition, surface morphology and mechanical properties respectively. It was observed that during microwave processing stabilization of YSZ occurred after addition of 3% of TiO_2 at 1400 °C within 30 min while during conventional processing the stabilization of YSZ occurred after addition of 9% of TiO_2 at the same temperature in 10 h. Further, $ZrTiO_4$ an impurity precipitates during conventional processing while $ZrTiO_4$ does not precipitate in the YZT prepared by microwave processing.

1. Introduction

Mixed oxide ion–electronic conductors are explored for their applications such as fuel electrodes in solid oxide fuel cells, for electrocatalysis, as oxygen permeable membranes and as separators in oxygen gas sensors. In mixed conductors, both electronic and ionic defects are found in significant amounts, and their mobility is appreciable [1,6]. A promising mixed conducting material like YZT has been studied extensively by many researchers [2–5]. YZT acts as a mixed conductor as Ti ion gets reduced leading to an increase in electronic conductivity at high temperature. The mixed conductivity may be attributed to the transition of Ti^{4+} to Ti^{3+} under reducing atmospheres. The electrochemical properties of the (0.98-x) ZrO_2 0.02 Y_2O_3.xTiO_2 solid solution containing the different amount of TiO_2 (up to 60 mol %) have been investigated by the researchers [7]. They reported that the samples consisting of monoclinic and tetragonal zirconia (x = 0.64–0.130 mol fraction of TiO_2) appeared to be pure ionic conductors while the samples containing YZT as the main phase (0.40, 0.50 and 0.60 mol fraction

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Microwave and conventional processing of niobium and manganese doped lanthanum germanate based apatites

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HIGHLIGHTS

- In this paper, apatites have been prepared by microwave heating as well as conventional heating.
- The single phase of the apatite could be prepared at 1100 °C within 1 h by microwave heating.
- By the conventional heating, the single phase of the apatite could not be prepared at 1100 °C within 1 h.
- The grain growth in the microwave sintered products was more uniform than the conventionally sintered products.
- The density of the sintered products was as high as 96% of the theoretical density.

ARTICLE INFO

Keywords:
Apatite
Electrolyte
Microwave processing
XRD
SEM

ABSTRACT

The paper reported calcination and sintering of apatites of compositions $La_{9.5}Ge_{5.5}Nb_{0.5}O_{26.5}$ and $La_{9.5}Ge_{5.5}Mn_{0.5}O_{26}$ using microwave energy for the first time from the precursor prepared by the mixed oxide method. The calcination was done conventionally under an identical condition to compare the results. The single phase of $La_{9.5}Ge_{5.5}Nb_{0.5}O_{26.5}$ and $La_{9.5}Ge_{5.5}Mn_{0.5}O_{26}$ could be obtained by microwave processing at temperature 1100 °C within 1 h. But the single phase of aptites could not be prepared by conventional heating under the identical conditions. The calcined powder obtained by microwave heating was sintered by microwave heating as well as conventional heating. The products obtained were characterized by XRD and SEM. It was observed that the microwave sintered products had higher density and uniform microstructure compared to the sintered products obtained by the conventional heating.

1. Introduction

Yttria-stabilized zirconia (YSZ) exhibits high oxygen ion conductivity at high temperatures in the range of 850–1000 °C. Therefore, YSZ is used as an electrolyte in SOFC. Since YSZ shows appreciable conductivity only at elevated temperature consequently, the operation of SOFC causes problems related to the degradation of materials and mechanical and chemical compatibility in oxidizing and reducing atmospheres [1]. Many other oxide electrolytes are being studied to lower the operating temperature of the SOFC. Some of the oxide ion conductors are fluorite, perovskite, pyrochlore, brownmillerite, and apatite [2–7]. Lanthanum oxide, due to its multivalent valence state, is used as a catalyst, photocatalyst [8,9], and in the fabrication of supercapacitor [10]. Lanthanum has also attracted attention because lanthanum doped hydroxyapatite has improved performance as dental implants in osteoporotic cases [11]. Further, lanthanum-based apatite, $Ln_{10-x}Si_6O26 \pm y$ (Ln = La) (LSA), has found its application as an electrolyte in the intermediate temperature solid oxide fuel cell (IT-SOFC) because of its higher conductivity (of the order of 10^{-3} Scm^{-1}) at 500 °C which is higher than that of YSZ at an intermediate temperature [12–16]. Lanthanum silicate based apatite requires higher sintering temperature which is usually higher than 1700 °C and a long soaking time of more than 4 h before they can be used as an electrolyte in SOFCs [17]. The substitution of Si ions by Ge ions has been found to decrease sintering temperature and improve electrical conductivity [18,19] at the intermediate temperature. But during the preparation of lanthanum germanate based electrolyte, the GeO_2 gets evaporated at a higher temperature which changes the La/Ge stoichiometric ratio resulting in

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Comparative Analysis of Yttria Stabilized Zirconia (YSZ) and Titania Doped YSZ (YZT) Sintered by two Different Routes: Conventional and Microwave processing

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ABSTRACT

Besides YSZ (yttria stabilized zirconia) as an appropriate anode material, YZT (titania doped YSZ) is emerging as a material of interest. The undoped YSZ and the doped YSZ i.e. 5 mol % YZT, are synthesized by conventional as well as microwave processing techniques, from the precursors prepared by mixed oxide method and subsequently characterized for a comparative analysis by XRD, Raman spectroscopy, FTIR, SEM and Vickers hardness test to investigate the crystal structure, structural changes taking place during the processing, the surface morphology and the micro hardness of sintered products. Whereas earlier, others have processed the same compositions conventionally, in the present investigation, microwave energy has been exploited for sintering YZT composites. Notable density, phase stabilization, grain growth, hardness and density are observed for microwave sintered products.

Keywords: SOFC, YSZ, YZT, XRD, SEM, Micro-hardness.

INTRODUCTION

Yttria stabilized zirconia ceramics, mixed conducting oxides, find multiple applications in photo catalysis, opto-electronic devices, environmental purification, photo eletrochemical solar energy conversion, optical coatings, thermal barrier coatings, dental bio ceramics, Supercritical Water Cooled Reactor Insulator, load bearing implants, oxygen gas sensors, fuel cells etc.[1-6]

Solid oxide fuel cells (SOFCs) are efficient and environmental friendly energy conversion systems having an electrolyte, an anode, a cathode and the interconnect components.

Introducing yttria dopant to stabilize zirconia provides structural cell support to the electrode. To operate solid oxide fuel cells at high temperatures, single component electrodes have been used so far but mixed conducting ceramics have added

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Transversely Isotropic Magneto-Visco Thermoelastic Medium with Vacuum and without Energy Dissipation

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ABSTRACT

In the present investigation the disturbances in a homogeneous transversely isotropic magneto-Visco thermoelastic rotating medium with two temperature due to thermomechanical sources has been addressed. The thermoelasticity theories developed by Green-Naghdi (Type II and Type III) both with and without energy dissipation has been applied to the thermomechanical sources. The Laplace and Fourier transform techniques have been applied to solve the present problem. As an application, the bounding surface is subjected to concentrated and distributed sources (mechanical and thermal sources). The analytical expressions of displacement, stress components, temperature change and induced magnetic field are obtained in the transformed domain. Numerical inversion techniques have been applied to obtain the results in the physical domain. Numerical simulated results are depicted graphically to show the effect of viscosity on the resulting quantities. Some special cases of interest are also deduced from the present investigation.

Keywords: Transversely isotropic; Magneto-Visco thermoelastic; Laplace transform; Fourier transform; Concentrated and distributed sources; Rotation.

1 INTRODUCTION

DURING the past few decades, widespread attention has been given to thermoelasticity theories that admit a finite speed for the propagation of thermal signals. In contrast to the conventional theories based on parabolic-type heat equation, these theories are referred to as generalized theories. Because of the experimental evidence in support of the finiteness of the speed of propagation of a heat wave, generalized thermoelasticity theories are more realistic than conventional thermoelasticity theories in dealing with practical problems involving very short time intervals and high heat fluxes such as those occurring in laser units, energy channels, nuclear reactors, etc. The phenomenon of coupling between the thermomechanical behavior of materials and magnetic behavior of materials has been studied since the 19th century. Chen and Gurtin [7], Chen et al. [8] and Chen et al. [9] have formulated a theory of heat conduction in deformable bodies which depends upon two distinct temperatures, the conductive temperature φ and the thermo dynamical temperature T. In case of time independent situations, the difference between these two temperatures is proportional to the heat supply, and in absence of heat supply, the two

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Effect of pore connectivity on reflection amplitudes of an inhomogeneous wave in a composite porous solid saturated by two immiscible fluids

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Present paper aims to study the phenomenon of reflection and transmission when an inhomogeneous wave strikes some discontinuity in a composite porous medium saturated by two immiscible viscous fluids. The incident wave splits into six reflected and six transmitted waves at the interface. All reflected and transmitted waves are inhomogeneous in nature with different directions of propagation vector and attenuation vector. A dimensionless parameter $\varsigma \in [0, 1]$ is introduced to represent the extent of connection among the pores at the interface. Expression of Umov–Poynting vector is derived to obtain energy flux vector. Continuity of energy flux vector at the interface gives the required boundary conditions for the system. Connecting parameter ς is also employed in boundary conditions to model the partial connection of pores at the interstices of two media. For numerical discussion we consider a porous medium composed of sandstone and ice, saturated with oil and water. The effect of parameter ς and angle of incidence is determined numerically on the amplitude and the energy ratios of reflected and transmitted waves.

Keywords. Composite porous medium; reflection; transmission; inhomogeneous wave; pore connectivity; energy flux.

Nomenclature

$S_{\mathfrak{f}}$	Saturation of each fluid phase
$S_{s_{\mathfrak{f}}}$	Fraction of each solid in composite matrix
R_{11}, R_{22}	Coefficients related to viscous drag
A_{11}, A_{22}	Coefficients related to inertial drag of first solid
B_{11}, B_{22}	Coefficients related to inertial drag of second solid
A_{12}	Inertial coupling parameter connecting fluid phases
$G_{s_{\mathfrak{f}}}$	Shear modulus of each solid phase
k_β	Complex wave number of dilatational wave
k_l	Complex wave number of rotational wave
$w_i^{\mathfrak{f}}$,	Normal component of drainage velocity of pore fluids
$\hat{a}$	Unit normal vector to surface $\boldsymbol{S}$
F, F'	Time averaged energy flux along normal at interface in both half spaces
T_1, T_2	Surface flow impedance for both fluids
A_m	Attenuation vector of propagating waves
P_m	Propagation vector of propagating waves
A_o	Attenuation vector of incident wave
P_o	Propagation vector of incident wave
s	Slowness vector of a wave
s_x, s_z	Horizontal and vertical components of slowness

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Wiggler magnetic field assisted third harmonic generation in expanding clusters

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Abstract

A simple theoretical model is constructed to study the wiggler magnetic field assisted third harmonic generation of intense short pulse laser in a cluster in its expanding phase. The ponderomotive force of laser causes density perturbations in cluster electron density which couples with wiggler magnetic field to produce a nonlinear current that generates transverse third harmonic. An intense short pulse laser propagating through a gas embedded with atomic clusters, converts it into hot plasma balls via tunnel ionization. Initially, the electron plasma frequency inside the clusters $\omega_{pe} > \sqrt{3}\,\omega_1$ (with ω_1 being the frequency of the laser). As the cluster expands under Coulomb force and hydrodynamic pressure, ω_{pe} decreases to $\sqrt{3}\,\omega_1$. At this time, there is resonant enhancement in the efficiency of the third harmonic generation. The efficiency of third harmonic generation is enhanced due to cluster plasmon resonance and by phase matching due to wiggler magnetic field. The effect of cluster size on the expansion rate is studied to observe that the clusters of different radii would expand differently. The impact of laser intensity and wiggler magnetic field on the efficiency of third harmonic generation is also explored.

Keywords: expanding cluster, harmonic generation, wiggler magnetic field, phase matching

(Some figures may appear in colour only in the online journal)

1. Introduction

The interaction of ultra short highly intense laser pulse with clustered plasma has been a field of latest research for many researchers. The applications of this laser-cluster interaction have come up in the form of generation of energetic ions [1], electrons [2], efficient debris-free x-ray generation [3], extreme ultraviolet radiation [4] and pulsed neutron production [5]. Due to the dispersive nature of clustered plasma, the interaction of laser with it is much more efficient than any other homogenous medium [6]. The number of nonlinear physical phenomena arise as the consequences of this efficient laser-cluster interaction [1, 7, 8]. The harmonic generation of electromagnetic radiation is one of these nonlinear phenomena which is widely explored by many researchers and have number of potential applications [4, 9–11]. Although a number of research papers have been published on high-order harmonic generations in clusters [12, 13], but the third harmonic generation holds a unique place in the research related to laser cluster interactions. The third harmonic generation can be used as a diagnostic tool to detect the presence of clusters and for measurement of their size in cluster experiments. The harmonics are generated by the nonlinearity of the currents of cluster electrons subject to the laser field.

In order to realize the practical utilization of applications of harmonic generation, the main motive is to increase the conversion efficiency of the generated harmonics. Many efforts are being made by various researchers to achieve high conversion efficiency [14–19]. Fomytskyi *et al* [14] have presented a model for the nonlinear response of a small cluster to study the third harmonic of laser in cluster. They observed that the nonlinear response of the core is due to non uniformity in the ion background density, which could be due to some intrinsic non uniformity or may arise naturally in the process of cluster expansion. Particle in cell simulations are carried out by the authors to reveal that the third harmonic is resonantly enhanced when the laser frequency is close to one third of the core eigen frequency. Shim *et al* [15] have reported the enhanced third harmonic generation from expanding cluster of Argon gas in 2007. They performed pump-probe experiment, in which the pump heated the gas jet to generate clustered plasma and initiated the cluster

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Effect of Dopants and Sintering Method on the Properties of Ceria-Based Electrolytes for IT-SOFCs Applications

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Doped and co-doped ceria ceramics are used as electrolyte materials in solid oxide fuel cells. In this work, ceria-based oxides, $Ce_{0.90}Gd_{0.06}Y_{0.02}M_{0.02}O_{2-\delta}$ (M = Ca, Fe, La, and Sr) were prepared by conventional as well as microwave processing from the precursors prepared by the mixed oxide method. The consolidated calcined powders in pellet form were sintered in microwave energy at 1400°C for 20 min and in an electric furnace of IR radiation at 1400°C for 6 h. The x-ray diffraction analysis confirmed that all the compositions were crystallized into a cubic fluorite structure. Surface morphology of the sintered products was studied using scanning electron microscopy and the microhardness was investigated using the Vickers hardness test. The comparative results analysis shows that the microwave-sintered samples have uniform grain growth, higher density and higher microhardness than the corresponding conventionally sintered products. The microwave-sintered sample of composition $Ce_{0.90}Gd_{0.06}Y_{0.02}Sr_{0.02}O_{2-\delta}$ was found to have the highest microhardness among the four compositions due to its high density and smallest grain size.

INTRODUCTION

Microwave sintering is an advanced technique for material processing in which microwave energy is transferred to materials through molecular interaction with the electromagnetic field. This technique of energy transfer can result in many possible advantages of using microwaves for processing of materials. Microwaves penetrate the material and generate heat throughout its volume.[1,2] This non-conventional heating method can modify the sintering mechanism, which affects the microstructure and phase composition of the materials. It also significantly reduces the processing time and energy consumption. Intensive research work has been reported in microwave processing of ceramics, as they inculcate improved properties by coupling with microwave energy at room temperature. However, at elevated temperatures, enhancement in diffusion rate has been observed with non-thermal effects. The non-thermal effects, also termed microwave effects, are the result of interactions between high-strength microwave fields and ceramic materials.[3–9]

Solid oxide fuel cells (SOFCs) are electrochemical devices that can convert the chemical energy of a fuel into electricity with high efficiency and easily sequestrable carbon dioxide by-products. The basic structure of an SOFC includes a solid ceramic electrolyte sandwiched between cathode and anode, combined with interconnectors and sealants.[10] The electrolyte of an SOFC must be dense and should have high ionic conductivity along with minimum electronic conductivity. Further, it should have good mechanical and thermal properties at operating temperatures.[11] Ceria-based materials have found potential applications as electrolyte materials for intermediate-temperature SOFCs (IT-SOFCd) (500–750°C) because cerium oxide has an open structure which leads to high ionic conductivity in this range of temperature. Moreover, unlike other rare earth oxides, cerium oxide tends to consist of non-stoichiometric compounds with + 4 and + 3 oxidation states of cerium, which creates a lot of oxygen ion vacancies and leads to a very high ionic conductivity of ceria-based electrolytes as compared to stabilized zirconia electrolytes.[12,13]

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Effect of fuel/nitrate molar ratio on the properties of Nio-YSZ nanocomposites as anode material for solid oxide fuel cell synthesised by combustion method

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Abstract: In the present work, nickel oxide and ytttria stabilised zirconia (NiO– YSZ) nanocomposites, a precursor of the anode of solid oxide fuel cell, was synthesised by combustion method, using glycine as fuel. In this preparation, nitrate solutions of respective metals were taken in their stoichiometric ratios. Five different concentrations of glycine were added to the nitrate solutions in order to vary fuel (glycine)/nitrate molar ratio. The fuel/nitrate molar ratio was kept to be 0.8, 0.9, 1.0, 1.1 and 1.2. The combustion of these five solutions resulted in five samples of composite powder with composition mNiO-(1–m) $Zr_{0\cdot9}Y_{0\cdot1}O_{1\cdot95}$ (m = 0.4). The composite powders obtained were then characterised by FTIR, XRD, TGA-DTA and SEM to determine its properties such as decomposition temperature, crystalline size, lattice constant and microstructure. The influence of different fuel/nitrate molar ratios on the characteristic of precursor nanocomposites was also analysed. It has been observed that the presence of monoclinic phase decreases with increase of fuel ratio used in the combustion process.

Keywords: NiO-YSZ; combustion synthesis; XRD; TGA-DTA; FTIR; scanning electron microscope; SEM.

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Comprehensive Review of Open Source Tools and Cross Layer Approach for Fast Growing Android Market

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Abstract:- Talking about the operating system, most of the people around the world are using Macintosh or windowsoperating system then why to bother about LINUX? Which is very less known and used, but these operating systems could not exist without LINUX and its ancestor UNIX. Its superior functionality and the security make it unique from the other operating systems that exist in this world. Actually, internet is the producer of LINUX[1]. The need of high security and better performancewithout rebooting it often made it the best operating system for the use of internet. Linux kernel also make its way to enter in the handheld devices and provides an environment to run various application simultaneously. In the proliferation era of android OS surpassed many changes to assess the maturity level. One in this account is hybrid design of application intended a mix of both native and web based technologies that leveraged to deliver capabilities from both native and web based application. This paper highlights the major rolled played by open source tool and cross-layer approach for growing market opportunity.

LINUX is a UNIX-based operating system which was created by Finnish student named Linus Torvalds in 1991. Linus Torvalds Design the Linux kernel as anopen source as non-enterprise,after then he arguablymake original non-free license to the GPLv2.

It is'open source' software which means it can be easily available to download and use. User can make changes in it according to their use. Due to this reason it has become a very powerful OS that is gaining popularity worldwide, especially among those seeking an alternative to Windows. It is free to use and install, and is more reliable than almost all other systems and it can run for many months and even years without the need of rebooting.

*****

I. INTRODUCTION

One of the significant benefits of LINUX is that it has no owner therefore it can be debugged without the permission of a license owner. LINUX a multiuser operating system which means on a single computer many users can use the resources and work together. Most of the supercomputers having LINUX in their core system.

LINUXhold immense grip on many different kinds of electronic devices to operate, also nourish much faster than any other operating in era today. This environment include global connectivity frameworklikemany application browser, e-mail client, allowing users to work on the Internet without having to boot all the way into their device's primary operating system even if that operating system is Windows.

Also LINUX is showing up on mobile Internet devices. In this category embedded devices such as Smartphone's and notebook devices are having LINUX in their core. That features

the core functionality of their larger counterparts in a smaller, more energy-efficient package.Cloud computing now a day is more reliable on Linux than any other operating system. Like cloud services of Amazon's A3 works superior with LINUX. Thus we cannot neglect the advantages of Linux over the other existing OS's and also its great impact on the computer world through.

Statistics of different operating system used all over the world

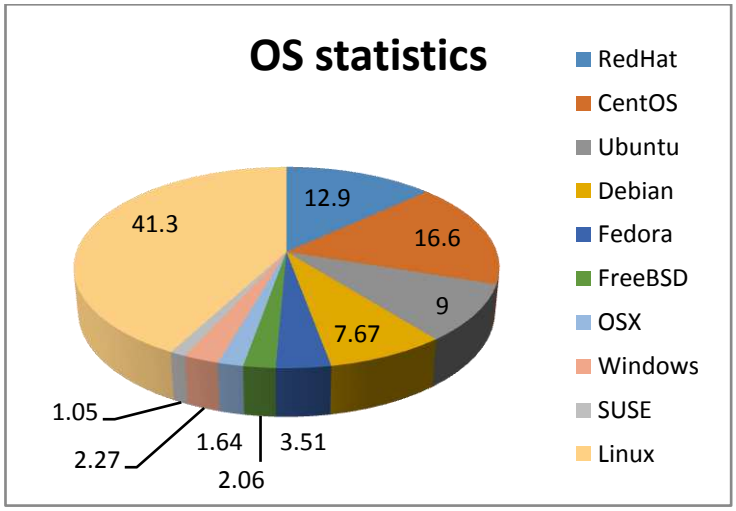

Figure 1

II. FILE SYSTEM

In computing, a **file system**[2] is used to control how data is stored, retrieved or access. A file system organizes data in an efficient manner and is tuned to the specific characteristics of the device. In Linux, everything is configuring as a file. This includes not only text files, folders, images and executables programs, but also directories, device drivers and partitions.

Each file system contains a control block which holds the information about that filesystem. Another block in the file system is inodes, which contains the information about files, and blocks.

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A Comprehensive Survey of Location Based Routing in Vehicular Networks

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Abstract

Vehicular network is the real time network formed by the highly dynamic nodes. This environment of VANET along with the fixed geographical mapping of roads slows down the delivery of the message in case of unicast and broadcast. When unicast is applied then the latency increases significantly as hop count increases. While broadcast make use of the network resources which degrades the performance by decreasing the efficiency of the network. However, multicast is proposed as the parameter to enhance the performance by introducing multicasting trees. This strategy is applied for maintaining the vehicular nodes in a multicast tree manner which will provide single path between two vehicles in the tree. Further, in case of the link failures, tree partitions and reconfiguration is needed this induces to have very low latency and reduces packet overhead. Various location based routing protocols are discussed which reveals different aspects and applications of variety of routing protocols relying on the location information.

Index Terms: LAR, Multicasting, VANET, Location based routing.

1. Introduction

Vehicular networks are the adhoc environment having various vehicles and the roadside units. This network comprises no prior setup of infrastructure and the roadside units as well as the vehicles contact with each other in order to receive and send the warnings of the current traffic. Such messages transferring become significant in development of innovative safety technologies over different modes of transportation and traffic management applications. However, Intelligent Transportation System (ITS) makes safer and smarter use of the transportation by enabling users to be more informed and more coordinated. The technology is named as

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Microwave and conventional processing of niobium and manganese doped lanthanum germanate based apatites

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HIGHLIGHTS

- In this paper, apatites have been prepared by microwave heating as well as conventional heating.
- The single phase of the apatite could be prepared at 1100 °C within 1 h by microwave heating.
- By the conventional heating, the single phase of the apatite could not be prepared at 1100 °C within 1 h.
- The grain growth in the microwave sintered products was more uniform than the conventionally sintered products.
- The density of the sintered products was as high as 96% of the theoretical density.

ARTICLE INFO

Keywords:
Apatite
Electrolyte
Microwave processing
XRD
SEM

ABSTRACT

The paper reported calcination and sintering of apatites of compositions $La_{9.5}Ge_{5.5}Nb_{0.5}O_{26.5}$ and $La_{9.5}Ge_{5.5}Mn_{0.5}O_{26}$ using microwave energy for the first time from the precursor prepared by the mixed oxide method. The calcination was done conventionally under an identical condition to compare the results. The single phase of $La_{9.5}Ge_{5.5}Nb_{0.5}O_{26.5}$ and $La_{9.5}Ge_{5.5}Mn_{0.5}O_{26}$ could be obtained by microwave processing at temperature 1100 °C within 1 h. But the single phase of aptites could not be prepared by conventional heating under the identical conditions. The calcined powder obtained by microwave heating was sintered by microwave heating as well as conventional heating. The products obtained were characterized by XRD and SEM. It was observed that the microwave sintered products had higher density and uniform microstructure compared to the sintered products obtained by the conventional heating.

1. Introduction

Yttria-stabilized zirconia (YSZ) exhibits high oxygen ion conductivity at high temperatures in the range of 850–1000 °C. Therefore, YSZ is used as an electrolyte in SOFC. Since YSZ shows appreciable conductivity only at elevated temperature consequently, the operation of SOFC causes problems related to the degradation of materials and mechanical and chemical compatibility in oxidizing and reducing atmospheres [1]. Many other oxide electrolytes are being studied to lower the operating temperature of the SOFC. Some of the oxide ion conductors are fluorite, perovskite, pyrochlore, brownmillerite, and apatite [2–7]. Lanthanum oxide, due to its multivalent valence state, is used as a catalyst, photocatalyst [8,9], and in the fabrication of supercapacitor [10]. Lanthanum has also attracted attention because lanthanum doped hydroxyapatite has improved performance as dental implants in osteoporotic cases [11]. Further, lanthanum-based apatite, $Ln_{10}Si_6O26 \pm y$ (Ln = La) (LSA), has found its application as an electrolyte in the intermediate temperature solid oxide fuel cell (IT-SOFC) because of its higher conductivity (of the order of 10^{-3} Scm^{-1}) at 500 °C which is higher than that of YSZ at an intermediate temperature [12–16]. Lanthanum silicate based apatite requires higher sintering temperature which is usually higher than 1700 °C and a long soaking time of more than 4 h before they can be used as an electrolyte in SOFCs [17]. The substitution of Si ions by Ge ions has been found to decrease sintering temperature and improve electrical conductivity [18,19] at the intermediate temperature. But during the preparation of lanthanum germanate based electrolyte, the GeO_2 gets evaporated at a higher temperature which changes the La/Ge stoichiometric ratio resulting in

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Influence of microwave processing and sintering temperature on the structure and properties of Sr/Zr doped hydroxyapatite

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HIGHLIGHTS

- Sr-Zr hydroxyapatite has been sintered by microwave and conventional methods.
- The lattice parameters increase with temperature during conventional sintering.
- Reverse trend for lattice parameters is observed during microwave sintering.
- Microwave sintered products have higher density and hardness.
- Microwave sintered product at 1100 °C has a less percentage of secondary phase.

ARTICLE INFO

Keywords:
Calcium hydroxyapatite
Microwave sintering
Conventional sintering
X-ray diffraction

ABSTRACT

Among the different cations that are substituted to modify the properties of calcium hydroxyapatite, Sr and Zr have gained interest because of their effect on bone formation and mechanical properties, respectively. In the present work, Sr and Zr substituted hydroxyapatite, $Ca_{9.39}Zr_{0.11}Sr_{0.5}(PO_4)_6(OH)_2$ are synthesized by conventional and microwave sintering at different temperatures. The effect of different sintering techniques and temperatures are investigated on the structural and morphological properties of as-synthesized samples. The X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FT-IR) is used to study the variation in structural properties and scanning electron microscopy (SEM) is used to investigate the morphology with the variation in sintering conditions. The changes in lattice parameters clearly show that Sr and Zr are incorporated into hydroxyapatite lattice. Microwave sintered samples retain the higher amount of hydroxyapatite and experience higher density levels as compared to conventional sintering. As compared to conventional sintering, the grain size is more uniform and low percentage of secondary phase is observed in microwave sintered sample.

1. Introduction

Increasing number of accidents, trauma, arthritis, and tumors have increased the interest of the scientific community to find new biomaterials [1–3]. Many research groups are working for the development and evaluation of new synthetic biomaterials for bone grafting. The main challenge in biomaterial engineering is the quest to find a material which has good biocompatibility, resorbability and mechanical strength [4–6]. Many materials are tried and tested, but they are found inappropriate regarding the above-mentioned properties. The most appropriate material to date is calcium hydroxyapatite (HA) [7–9]. HA is considered as a better option as compared to other calcium phosphates due to its biocompatibility and osteoconductive properties. It also exhibits excellent chemical and biological affinity with the bone tissue [10]. HA is basically calcium hydroxyapatite which makes most of the mineral part of bone and tooth enamel. But its stability *in vivo* and low mechanical strength as compared to bone has limited its use in load-bearing applications [11,12]. To improve its mechanical properties, many approaches like the addition of dopants and different synthesizing routes have been investigated [13]. The best structural aspect of HA is its ability to accommodate a great variety of cations and anions while retaining its hexagonal structure. These substitutions can alter the thermal stability, surface reactivity and biological properties of HA [14–16].

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Original research article

Influence of exponential density ramp on second harmonic generation by a short pulse laser in magnetized plasma

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ABSTRACT

Second harmonic generation (SHG) of a chirped pulse laser propagating through magnetized-plasma has been examined by taking into consideration the exponential plasma density ramp profile. Highly intense laser beam propagating under the effect of transverse magnetic field through homogeneous plasma is studied and noticed that the transverse current density starts oscillating with a frequency almost double of the laser field. One may observe that the exponential plasma density ramp plays a key role in the enhancement of SHG. It is due to the fact that the exponential plasma density ramp helps in making the self-focusing of pump laser stronger which leads to enhanced SHG in plasma. Also, it is noticed that with the increase in the value of the positive chirp parameter and magnetic field, the enhancement in the conversion efficiency of the harmonic generation of second order remarkably observed. Our results reveal that the conversion efficiency of SHG enhances significantly in the presence of exponential plasma density ramp.

1. Introduction

In the last few decades with the advantage of ultra-high power lasers, laser propagation based on the technique of chirped-pulse amplification in under-dense plasma has been broadly studied leading to several applications comprising harmonic generation [1,2], X-ray laser [3,4], laser particle acceleration in plasma [5–7] and laser-driven fusion [8] etc. Such unique applications inspire the investigators to study the basic physics phenomenon occurring during the intense laser-plasma interaction. Also it is analyzed that highly intense electromagnetic and quasi static magnetic fields are produced as ultra-short laser pulse propagates through underdense plasma, due to its interaction with plasma.

Harmonic generation by short pulse laser in plasma has been a more extensive area of research for last few years [9–17]. It is reported by most of the researchers that vibrational motion of the electron is induced by the short pulse laser through a density gradient. It in turn delivers perturbation in the electron density comparable to the laser frequency and hence coherent harmonic generation is produced. Highly intense laser beam propagating through homogeneous plasma in the presence of transverse magnetic field is studied and noticed the current density oscillations of frequency almost double of the laser frequency [18]. A substantial increment in the conversion efficiency of SHG was reported by them.

Density transition in plasma plays a crucial role in the strong resonant SHG [19]. Experimental demonstration of essential wave number and amplitude increases the importance of density ripple. Also, the effect of plasma density ramp on ponderomotive self-focusing of a short pulse laser was reported [20]. It was found that with plasma density ramp of upward nature the laser beam attains

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चतुर्गुणी गौसयन लेजर बीम की मेग्नेटोप्लाजमा में स्व-प्रक्रया

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जालंधर (पंजाब)

सार:

इस पत्र में चतुर्गुणी गौ सयन लेजर बीम की संघट्टरहित मैग्नेटोप्लाज्मा में स्व-केंद्रित प्र क्रया का अध्ययन कया गया है। चतुर्गुणी सगौ सयन लेजर बीम चार समान गौ सयन लेजर बीमों को मला कर बनती है जिनका अक्ष z अक्ष के समानांतर होता है और z अक्ष से की दूरी से स्थानांतरित कया जाता है। लेजर बीम की गैर-यूनिफॉर्म तीव्रता के कारण चालात्मक बल उत्पन होता है जो लेजर बीम की स्व-केंद्रित प्र क्रया में सहायक होता है। बाहरी चुंबकीय क्षेत्र की उपस्थिति में उपक्षीय करण सन्निकटन (paraxial ray approximation) को उपयोग करते हुए परावैद्युतांक (dielectric permittivity) का उ चत व्यंजक वक सत कया गया है। इस वश्लेषण में चुंबकीय क्षेत्र के बीम की स्व-केंद्रित प्र क्रया की तीव्रता पर क्या प्रभाव पड़ता है उसका अध्ययन कया गया है।

वशेष संकेत : स्व-केंद्रित प्र क्रया, चतुर्गुणी गौ सयन लेजर बीम, मग्नेटोप्लाजमा, पोंडेरोमोटीव चालात्मक बल

परिचय:

प्लाज्मा के साथ तीव्र वद्युत चुम्बकीय तरंगों की अन्योन्य क्रया महत्वपूर्ण है, क्यों क इसके कई अनुप्रयोग हैं, जैसे, प्लाज्मा आधारित बीट तरंग त्वरक (beat-wave accelerators) [1], जड़त्वीय संसीमन संलयन (inertial confinement fusion) [2], आयनमंडली आशोधन (ionospheric modification),लेजर आवेशी कण त्वरक(laser charge particle accelerator) [3] औरएक्स-रे लेजर। उपरोक्त अन्योन्य क्रया के कारण कई अरै खक (-) क्रयाऐं उत्पन्न होती हैं जैसे क फलामेंटेशन, स्व फेज माडुलन(self phase modulation), समूह वेग परिक्षेपण (group velocity dispersion)और चालात्मक स्व केंद्रित प्र क्रया। स्व केंद्रित प्र क्रया एक गैर-रै खक ऑप्टिकल घटना हैजो की वद्युत चुम्बकीय करण के कसी माध्यम से पारस्परिक मेल से उस माध्यम के अपवर्तक सूचकांक (refrective index) में बदलाव के कारण उत्पन होती है। स्व फोक सत प्र क्रया के लेजर प्रेरित फ्यूजन काफ़ी महत्वपूर्ण होने के कारण पछले कुछ दशकों से शोधकर्ताओं ने दुनिया भर में इस प्र क्रया पर अपना ध्यान केंद्रित कया है। चालात्मक बल और सापेक्षतावादी (relativistic) प्रभाव से होने वाली स्व-केंद्रित प्र क्रया को मग्नेटोप्लाजमा में कई शोधकर्ताओं द्वारा सैद्धांतिक रूप से और प्रयोगात्मक रूप से लंबे समय से व्यापक रूप से अध्ययन कया गया है और शोध पत्र में सू चत कया गया है [4-7]।

स्व केंद्रित प्र क्रया में ज्यादा शोध स लंडरिक गौ सयन लेज़र बीम को लेकर कए गए है। कुछ अध्ययनों में अण्डाकार गौ सयन बीम [8], खोखले अण्डाकार गौ सयन बीम [9], ह र्मट गौ सयन बीम [10], ह र्मट-काश-गौ सयन बीम [11] और सुपर गौ सयन बीम [12] में स्व-केंद्रित प्र क्रया को सू चत कया गया है। गल एट अल द्वारा हाल ही में अनुप्रस्थ चुंबकीय क्षेत्र में सुपर गाऊसी लेजर बीम के ध्यान केंद्रित सापेक्षतावादी अध्ययन का सैद्धांतिक अध्ययन कया गया है [13]। हमारे अध्ययनों से हमने देखा है क, इन दिनों लक्ष्य पर उच्च शक्ति घनत्व को प्राप्त करने के लए कई बीम संयोजन की एक नई तकनीक का अध्ययन करने में रु च बढ़ रही है। इसके संदर्भ में, सोधा और पालमबो [14] ने एक गैर-रेखीय प्लाज्मा में फैली कई समतल

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Quadruple Gaussian Laser Beam Profile Dynamics in Collisionless Magnetized Plasma

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Abstract *This paper presents an investigation of self-focusing of a quadruple Gaussian laser beam in collisionless magnetized plasma. The nonlinearity due to ponderomotive force which arises on account of nonuniform intensity distribution of the laser beam is considered. The nonlinear partial differential equation governing the evaluation of complex envelope in the slowly varying envelope approximation is solved using a paraxial formalism. The self-focusing mechanism in magnetized plasma, in the presence of self-compression mechanism will be analyzed in contrast to the case in which it is absent. It can be observed that, in case of ponderomotive nonlinearity, the self-compression mechanism obstructs the pulse self-focusing above a certain intensity value. The effect of an external magnetic field is to generate pulses with smaller spot size and shorter compression length. The lateral separation parameter and the initial intensity of the laser beam play a crucial role on focusing and compression parameters. Also, the three-dimensional analysis of pulse propagation is presented by coupling the self-focusing equation with the self-compression one.*

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Key words: self-focusing, quadruple Gaussian beam, magnetoplasma, spatiotemporal, ponderomotive force

1 Introduction

The interaction of intense electromagnetic waves with plasma has been of considerable interest due to its significance in number of applications such as plasma based beat-wave accelerators,[1] plasma-based accelerators,[2] inertial confinement fusion,[3−4] ionospheric modification,[5−7] laser charge particle accelerator,[8−9] and X-ray lasers.[10] The success of these applications depends on propagation of laser over several Rayleigh lengths while maintaining the efficient interaction with plasma. Pulse focusing and pulse compression have been proved to be an effective way of guiding a laser pulse in the medium over many Rayleigh lengths and to increase radiation power and intensity while retaining its energy. Therefore the dynamics of self-focusing and self-compression of laser beam in plasma have been studied both theoretically and experimentally by many investigators extensively since long and have been reported in a number of investigations.[11−16] The effect of self-compression mechanism on the self-focusing of a Gaussian laser beam in an unmagnetized plasma has already been investigated by Bokaei and Niknam.[17] They have shown in their work that in the presence of ponderomotive nonlinearity the self-focusing mechanism is obstructed by the self-compression one. Shibu *et al.*[14] have investigated the self-compression of Gaussian laser beam due to the relativistic mass nonlinearity and have observed that the self-focusing mechanism interferes strongly with the non-linear self-compression process. Recently Bokaei *et al.*[18] have studied the effect of external magnetic field and plasma inhomogeneity on simultaneous self-focusing and self-compression of a Gaussian laser beam through the plasma. Their results showed that the simultaneous use of both external magnetic field and density ramp leads to generate highly focused and compressed pulses.

Most of the theoretical study on self-focusing and self-compression is devoted to cylindrically symmetric Gaussian laser beams.[19−20] Few studies of self-focusing have been reported on elliptical Gaussian beam,[21−23] cosh Gaussian beams,[24] Hermite Gaussian beams,[25] Hermite-Cosh-Gaussian beams[26] and super Gaussian beams.[27] From our studies, we have observed that, presently, there is an increase in interest in exploring a new technique of combining multiple beams to achieve high power densities at the target.[28−31] However combining identical four beams is mathematically simpler than combining two beams. This is because the intensity distribution of the beam formed by combining four identical beams is symmetrical in x- and y-directions, hence only one beam width parameter is required to describe the whole beam dynamics.

In the present investigation, we have focused on the self-focusing of a quadruple Gaussian laser beam comprising four coherent Gaussian laser beams propagating along the z-direction, but having intensity maxima in the x-y plane at $(-x_o, 0)$, $(x_o, 0)$, $(0, -x_o)$, $(0, x_o)$, in a collisionless magnetized plasma. However, in most plasma fusion experiments, the externally applied or self generated magnetic fields play an important role in laser beam propagation.[32−33] Therefore, it is justified to in-

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Implementation of SEPP for Space, Time & Frequency based 3-dimensional crime analysis

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Abstract: **The urban areas are observed under the higher crime influence than the rural areas in the continuous studies for several years. Hence, the crime prediction is an important task to analyze the possibility of the future crimes on particular locations in the urban areas. The crime prediction practices are performed to help the police department to efficiently deploy the force, which eventually alleviates the hiring of more employees. This helps to reduce the crime as well as the cost of security implementation in the police department. In this paper, the SEPP (self extracting point process) based time, space and intensity based model is proposed, which can combine the multiple features of the crime records to accurately and vastly predict the high dimensional data. This may be used to prepare the security policies, police force deployment, installation of the surveillance devices, etc for the police department. The proposed model is intended to improve the accuracy and detail of prediction of crime data, which enables its use up to a higher extent than the previous models.**

Keywords: **Self extracting point process, Crime Prediction, 3-D analysis, spatial analysis, temporal analysis.**

Introduction

Data collected under the crime database is unstructured and fuzzy in nature. In everyday life, there are several kinds of crimes are happened, for what different types of the information sets are provided. Such information can be directly applied under the data mining and predictive analysis models. So, analyzing and extracting information patterns from such data sets are more complex. A significant amount of research has already been carried out to categorize data/sentence into various categories based on the different kinds of crimes. Most of the crime that has been worked upon either less of more dangerous, hence, classified on the basis of the intensity of the crime. As the crime datasets are becoming larger, and are keeping the data of several past years, these are making the crime prediction quite possible. Becoming the need of real time crime prediction application, so is the interaction/discussions of people through social media has also increased.

SELF EXTRACTING POINT PROCESS (SEPP) FOR CRIME PREDCITION

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ABSTRACT— Nowadays, the predictive models are designed for the crime analysis and prediction in the time series data obtained from the historical crime database. The SEPP algorithm is utilized for the prediction of the crimes in the geo-location aware system. The proposed algorithm offers the node degree based evaluation of the intensity of future crimes based upon the historical crime data in the particular regions. The SEPP algorithm doesn't create the network structure of the data entities, which doesn't convert the data into connected entity relationship diagram for the chain analysis, which becomes mandatory in the time-series analytics. The existing model works on the space and time concept, which computes the possibility of the crimes on the given time in the given region. The time limit has been taken as a standard at 1 year, which is very low density data and can produce many false results when applied to the large scale database, which can be overcome by using the historical analysis of nearly 2-5 years or above. Also, the system performance is further improved by using the multiple factor analysis, which can include the other factors than the space and time based density evaluation to improve the accuracy for the crime prediction. The projected improvement in the existing model is directed to real Deep Heinous SEPP (DH-SEPP) model for detailed analysis. The accuracy based results justify the significance of the proposed model in comparison with the proposed crime prediction model.

KEYWORDS—Crime analytics, predictive analysis, supervised data modeling, data visualization.

1. INTRODUCTION

Data collected under the crime database is unstructured and fuzzy in nature. In everyday life, there are several kinds of crimes are happened, for what different types of the information sets are provided. Such information can be directly applied under the data mining and predictive analysis models. So, analyzing and extracting information patterns from such data sets are more complex. A significant amount of research has already been carried out to categorize data/sentence into various categories based on the different kinds of crimes. Most of the crime that has been worked upon either less of more dangerous, hence, classified on the basis of the intensity of the crime. As the crime datasets are becoming larger, and are keeping the data of several past years, these are making the crime prediction quite possible. Becoming the need of real time crime prediction application, so is the interaction/discussions of people through social media has also increased.

Digital trade, often called E-commerce/ecommerce, will be trading inside offerings using pc communities, such as Net. Digital trade attracts on technology such as cellular trade, automated funds transport, source cycle supervision, and Affiliate marketing, on-line deal finalizing, automated files interchange (EDI), stock supervision techniques and also automatic files series techniques.

E-commerce provides improved the facial skin on most organization capabilities inside competitive corporations. World-wide-web technology possess faultlessly automated software processes among clients in addition to stores, stores in addition to suppliers,suppliers in addition to plant life, in addition to plant life in addition to his or her assortment companies. Data mining provides while the principal purpose, this era involving non-obvious yet beneficial data pertaining to conclusion makers coming from large sources. The various parts with this era contain abstractions, aggregations, summarizations, along with characterizations involving files.

Nowadays E-Commerce market keeps growing in numerous sizes. It is thought to be most effective growing

Article

Effect of La-Na Doping in Co-Ti Substituted Barium Hexaferrite on Electrical and X-Band Microwave Absorption Properties

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Project: Microwave Engineering

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Citations (9) References (88)

Abstract

Lanthanum and sodium co-substituted barium hexaferrite Ba(1−2x)Lax Nax Fe10CoTiO19 (x = 0.00, 0.05, 0.10, 0.15, 0.20 and 0.25) samples were prepared using a conventional solid state reaction route. Structural, morphological, electrical and microwave absorption properties of synthesized hexaferrites were investigated using various instruments including x-ray diffractometer (XRD), scanning electron microscope (SEM), impedance analyzer and vector network analyzer. Single phase formation was confirmed by XRD analysis. Unit cell volume decreased with increase in concentration. Average grain size as estimated from SEM micrographs lies in 0.73–1.15 µm range. The DC resistivity decreased with increase in La-Na concentration. The dielectric parameters were measured in the 10 kHz–1 MHz frequency range. At lower frequencies, dielectric constant (ε′) and tangent loss (tan δ) values were high, which decreased with increases in frequency. Electromagnetic and microwave absorption properties were evaluated theoretically in the X-band (8.2–12.4 GHz) for different

Article | Publisher preview available

Investigation of electrical, dielectric and microwave properties of double substituted M-type Ba(1−2x)LaxNaxFe10Co0.5TiMn0.5O19 hexaferrite

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Project: Microwave Engineering

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Abstract and Figures

M-type Barium Hexaferrite Ba(1−2x)LaxNaxFe10Co0.5TiMn0.5O19 (x = 0.00–0.25 in steps of 0.05) samples have been synthesized by means of solid state reaction technique. The average crystallite size was depicted in 60.8–81.9 nm range from XRD analysis. High precision impedance analyzer was used in 10 kHz–1 MHz depicts an increase in AC conductivity and increase in dielectric parameters (ε′ and ε″) of the samples with an increase in the frequency of the applied signal as well as substitution amount (x). Vector Network Analyzer (VNA) measurement in X-band frequencies give the dielectric constant values in 5.5–7.1 and dielectric loss values in 0.01–1.2 range. The values of magnetic permeability and magnetic loss lies in 1.08–1.5 and 0.0–0.5 range respectively. The occurrence of peaks in reflection loss (RL) plots is observed at those frequencies where there exists an impedance matching between free space and sample material. The reflection loss of the sample Ba0.9La0.05Na0.05Fe10Co0.5TiMn0.5O19 is observed to be maximum amongst all the samples with a value of − 35.43 dB and − 10 dB bandwidth of 1.092 GHz. The large RL suggests that the composition Ba0.9La0.05Na0.05Fe10Co0.5TiMn0.5O19 could be a potential contender for microwave absorbing material.

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ORIGINAL PAPER

Investigation of Magnetic and Microwave Absorption Properties of $Ba_{(1-2x)}La_xNa_xFe_{10}CoTiO_{19}$ Hexaferrites in 18.0–26.5 GHz Band

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Received: 30 July 2018 / Accepted: 22 October 2018

Abstract
A series of $Ba_{(1-2x)}La_xNa_xFe_{10}CoTiO_{19}$ hexaferrite samples with $x = 0.00–0.25$ (step size 0.05) were prepared by using conventional solid-state reaction technique. The magnetic properties of the hexaferrites have been investigated at room temperature by employing a vibrating sample magnetometer. There is an overall decrease in saturation magnetization from 70.64 to 57.83 emu/g with an increase in doping concentration from $x = 0.00–0.25$. The microwave measurements were done utilizing vector network analyzer in the k-band (18.0–26.5 GHz) frequency range. The electromagnetic measurements revealed that the gross tangent loss is maximum for $x = 0.10$ sample. The microwave absorption measurements show that sample $x = 0.10$ with 1.4 mm thickness exhibits a reflection loss of − 26.59 dB (99.78% signal absorption) and 7.65 GHz bandwidth. Thus, it is considered for thin single-layer broadband microwave absorber applications in 18.0–26.5 GHz frequency range.

Keywords Hexaferrite · Magnetic properties · Reflection loss · Complex permittivity · Complex permeability · Microwave absorption

1 Introduction

The GHz frequency band is rapidly developing with the increase in a number of applications in microwave communication, national defense, satellite communication, aeronautical industry, and so on. Due to this development, there arises a serious issue called as electromagnetic interference (EMI) which hinders the proper working of electronic devices [1–4]. To reduce the effect of electromagnetic interference, special attention is paid to the development of microwave absorbing materials. Hexagonal ferrites are well-known materials, which can be used for various applications like microwave absorbing materials, magnetic recording, and permanent magnets [5]. In hexagonal ferrites, the dielectric and ferromagnetic resonance both exist simultaneously, so they are proved to be the best microwave signal absorbers for EMI applications [3, 6]. $BaFe_{12}O_{19}$ is a type of hexagonal ferrite having excellent dielectric and magnetic properties, which can be altered according to the requirement of the application. In pure $BaFe_{12}O_{19}$, the desired reflection loss (RL) exists but its absorption bandwidth is too narrow to be utilized as a high frequency absorbing material. The bandwidth and reflection loss can be improved considerably by the cationic substitution for Barium (Ba) and Iron (Fe) ions. The cationic substitution modifies the magnetic and dielectric properties of the parent hexaferrite material, hence improving its microwave absorption characteristics [6]. Several researchers have reported the microwave absorption studies of barium hexaferrite by the doping of different cations. Ba^{2+} ion substitution by Lanthanides or rare earth ions and substitution of Fe^{3+} ions by transition metals such as Co^{2+}, Ni^{2+}, Sn^{4+}, Zn^{2+}, Zr^{4+}, Mn^{2+}, and Ti^{4+} have been investigated in various studies [7–11].

Literature reports that the doping of Barium hexaferrite with Co-Ti has presented better microwave absorption properties [12–15]. Also, in our previous study on Co-Zr-doped Barium hexaferrite, the addition of La-Na has remarkably improved the electromagnetic characteristics in terms of increased microwave absorption bandwidth of the parent hexaferrite material [16]. Therefore, we have

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Importance of Smart Metering in Diverse Fields of Smart Cities

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Abstract

The system infrastructure of modern electric power distribution is integrated with information and communication technologies (ICTs) in smart cities. By employing wireless sensor networks, both utilities and consumers are capable to convey, observe, forecast, and manage energy usage effectively and efficiently. In this paper, smart meters (SMs) deployment in diverse applications (such as water system, transport system, intelligent home/building's demand response system, zero energy buildings, industry automation, renewable energy system, street lighting system, smart HVAC systems, carbon management system, utilization of SMs in production of gas) have been conferred to measure precise energy usage and collect data to improve the overall system, while maintaining green environment as per the emergent need of the day. However, with deployment of SMs by employing wireless sensor networks have been acquainted with new security challenges, mainly related to confidentiality, connectivity, and protection management. These may cause unexpected expenditure and adversity to both utilities and consumers. The various deployment issues faced by utilities and consumers are identified for prosperous solutions. Emerging smart metering solutions are conversed to facilitate number of utilities and consumers for tracking of their energy usage, which will help better energy conservation in future.

Keywords: *Smart meter, Smart grid, Smart cities, IoT, ICT, AMR*

1. Introduction

Two third of the world's people will be living in cities by 2045 [1]. However, the rapidly increasing urban populace will continually raise load on infrastructure, transport, healthcare, housing and employment. It's high time to convert cities into more livable, workable, manageable Smart Cities (SCs). SCs are supposed to equip with high speed internet connectivity, smart transport networks, smarter energy system *etc*. Appropriate energy system is the basic need of every city. If electricity is not available for a momentary period of time, then all the functions will ultimately cease. The huge hurdle in establishment SCs in near future is need of smart energy system. The new initiatives are required to gear up power and manage

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PERFORMANCE COMPARISON OF OBJECT ACQUISITION USING AUTOMATIC SCANNING AND FACIAL FEATURE TRACKING

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Abstract: This paper presents a comparison of object acquisition in an HCI system using two different techniques: automatic scanning and facial feature tracking. In automatic scanning the focus moves from one object to next object automatically after a predefined time period called scanning time. Automatic scanning has been implemented by using MATLAB algorithm which virtually activates the tab key after each scanning time and the focus moves from object to object. The user activates a selection trigger for selection of the object when the focus comes over the object of interest. Whereas, in facial feature tracking approach the mouse cursor is moved in proportion to the movement of user's face. To implement this technique Camera Mouse has been used which requires a simple webcam. It continuously takes facial images of the user and finds the mouse cursor position from the face coordinates. The two techniques are compared based upon accuracy and acquisition time for acquisition of text and graphic objects.

Keywords: Object acquisition; HCI systems; automatic scanning; face tracking.

1. INTRODUCTION

A user controls computer with the help of an interface called as human computer interaction (HCI) system. The two important functions performed by an HCI system are object acquisition and object selection. Object acquisition refers to the movement of focus/cursor over the object to be selected and object selection means activation of a selection trigger when the focus/cursor comes over the desired object. Some of the techniques used for object acquisition are: eye gaze tracking [1], [2], face tracking [3], [4], facial feature tracking [5], scanning [6]–[9], and tongue movement [10]. Object selection can be performed by using key trigger [11], eye blinking [12], [13], dwell time trigger [14], [15], anti-saccades, gaze gestures, on-off screen buttons, dashers, pEYEs [16], mouth opening click [17], tooth clicker [2], brows up clicker [8], EMG clicking [18], and clicking with smiling [19]. The major deciding factors for selection of a combination of object acquisition and selection techniques are: physical condition of a user, cost, performance, and ease of use.

This paper presents a comparison of performance of automatic scanning and face tracking techniques for object acquisition. From the overall comparison it is observed that

2. METHODOLOGY

For testing of performance of automatic scanning and facial feature tracking techniques an experiment was conducted for acquisition of text and graphic objects using both the techniques. The automatic scanning technique does not require any hardware whereas face tracking technique needs a webcam for acquisition of user facial images.

A. Implementation of automatic scanning technique for focus movement

In automatic scanning a MATLAB algorithm activates the tab key to move focus over objects placed on computer screen. The time taken by the algorithm to move focus from one object to next object is called as scanning time. The process of moving focus over objects using this technique is shown in figure 1 in the form of a flow chart. The scanning of objects starts from very first object placed in the file and reaches to the last object after scanning all the objects placed in between. The user activates a selection trigger, which is eye blink in this research, if the object having focus is the object to be selected; otherwise, the focus is transferred to the next object. In this way, the object of interest is selected with very less physical efforts and the user has to just blink his/her

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Artifacts reduction based on separate modes in compressed images

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Abstract. With the higher compression ratio, the decoded image produces annoying compression artifacts near block boundaries, ringing artifacts near original edges and corner outliers at block corner. These coding artifacts are caused by quantization and transformation process of discrete cosine transform (DCT). This paper proposes a novel deblocking algorithm that removes block discontinuities by taking into account the ringing, blurring and corner outlier artifacts. The proposed deblocking technique consists of two frequency related modes (smooth and detailed region mode) and corner outlier mode have been proposed and then applied median filter. The proposed technique has been applied to a number of reconstructed images and their performance is compared with conventional methods on the basis of standard metrics such a PSNR-B, BBM and MOS. Experimental simulation results illustrate that proposed technique improves the perceptual quality of reconstructed images and thus outperforms the all existing methods.

Keywords: Deblocking filter, post-processing, blocking artifacts, corner outlier, image compression

1. Introduction

Block transform coding of an image with DCT, has been proved to be a simple as well as efficient technique of an image compression. Several implementations of this approach have found widespread acceptance through different standards (JPEG and MPEG) for images as well as videos compression [1]. The main objective of 8×8 BDCT approach is to pack information into few DCT coefficients [2]. The primary drawback of BDCT compression schemes are that it may be results in observable compression artifacts near the horizontal as well as vertical block boundaries. However, these blocking artifacts become more noticeable with increasing compression rates. As the compression increases, the correlation of adjoining pixels of adjacent block decreases because the reconstruction of more pixels becomes poorer due to independent processing. As a result of this, an artificial discontinuity appears along with the vertical as well as horizontal block boundary called blocking artifacts which becomes more severe as compression ratio increases. Such artifacts are very disturbing to the viewer as it severely reduces the image quality. Thus, it becomes essential to remove blocking artifacts from the transform coded images especially at low bit rate. In other words, discontinuity generally exists in block boundaries of 8×8 block, since the transform coding i.e. DCT and quantization procedure is implemented to each 8×8 block separately. In general, post-processing technique provides superior results as it does not need any existing standards to be modified. Block based compression suffers from flickering, blocking

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Journal of Material & Metallurgical Engineering

Selection and Mechanism of using active gas in GTAW Process – A review

Gurveen SINGH

Abstract

Gas tungsten arc welding process is known for its good quality welds. However, the lack of penetration of the process leads to low productivity. Many techniques have been implemented in the past to improve the joint penetration and thereby the productivity of GTAW process. In one of the technique, active gas like Carbon dioxide, Nitrogen or Oxygen is used in some proportion along with the inert gas. This addition of active gas can reverse the Marangoni induced surface tension flow to improve the weld bead penetration. This paper presents the brief report of work done by researchers to improve the GTAW productivity by using active gas in GTAW process. The effect of Active gas on weld bead geometry, metallurgical behavior, mechanical properties has been discussed herewith.

Keywords

GTAW, active gas, Marangoni convection, Productivity

Full Text:

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Effect of Oxide Powders on Austenitic Stainless-Steel Welding by Active GTAW Process

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Abstract

This paper enunciates the effect of six different oxide powders (SiO_2, ZnO, SeO_2, CdO_2, Fe_2O_3 and CuO) applied as a surface active element to austenitic stainless steel SS-304 grade welded by Gas Tungsten arc welding (GTAW) process. Weld bead geometry, Microstructure, Ferrite content, Microhardness, and Arc column shape, X-Ray diffraction were analyzed for the different oxide powders in GTAW process. As Oxygen is known to be a surface active element for austenitic stainless steels, its presence in the weld region can increase the weld bead depth and alter other metallurgical and mechanical properties of fusion zone. Experiment results corroborated that the oxide powders can drastically increase the weld bead penetration. Microstructure and ferrite content varies for the welded austenitic stainless steel with different oxide flux powders. Arc column becomes constricted in the presence of oxide powders leads to increase in weld bead penetration. Micro-hardness of the weldments also increases in most of the oxide powders thereby improving mechanical properties.

Keywords- Surface active flux, Weld bead geometry, Arc Constriction, Marangoni convection, GTAW Process, Austenitic stainless steel.

Introduction

Gas tungsten arc welding (GTAW) uses a non-consumable tungsten electrode to produce the electric arc for heat required to fuse the materials together. The process is also termed as Tungsten inert gas (TIG) welding process. The electrode is covered with a concentric layer of inert gas flowing surrounding it to protect it from atmospheric contamination at high temperature. Autogenous welds can be made with GTAW process wherein the joint is made without using any filler wire (Tseng, 2013). It is a well-known process for high-quality joining of mild steel, stainless steel, aluminum, magnesium and their alloys with a huge application in the fabrication industry (Kuo, 2011). However while welding thick ferrous materials, due to the lack of penetration of the process, multi-pass welds are to be made for complete fusion of joint (Lu, 2004). V-Grooves are generally prepared in the material before welding to ensure full depth fusion for thick ferrous materials. This preparation of V-grooves and thereby multi-pass welding procedure leads to reduced productivity. There is a need for penetration improvement in the process so that thick materials can be welded in a single pass (Vidyarthy, 2016).

Several techniques have been implemented in past to improve the productivity of TIG welding. Active Flux assistance in GTAW process is one of the technique which can lead to increase in penetration and thereby increase the productivity of the process (Dhandha, 2015). Paton Welding Institute, Ukraine was first to propose the application of active flux (Modenesi, 2015). In this process, a flux powder containing oxide, chloride or fluoride is mixed with some thinner like acetone or ethanol and applied on the work-piece before welding as shown in Figure 1 (Tseng, 2012). The presence of flux compounds in the weld area can increase the penetration by reversing the Marangoni convection or surface tension driven flow of molten pool as illustrated in Figure 2 (Lu, 2009b). Previous works (Sambherao, 2013) had confirmed the increase in weld bead penetration based on Marangoni convection flow

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Haz Formation And Analysis In Flux Assisted Gtaw

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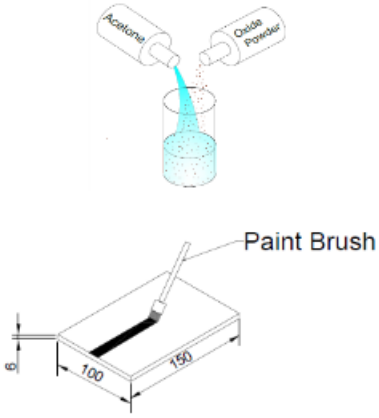
ABSTRACT

The effect of Silicon dioxide (SiO_2) powder on weld bead geometry, Heat affected zone (HAZ), and micro-hardness of SS304 grade Austenitic stainless steel weld was investigated. SiO_2 improves the weld bead penetration with a simultaneous reduction in bead width. The improvement in penetration results from arc constriction and reversal of Marangoni flow. The results demonstrate SiO_2 flux can increase the heat density by arc constriction and Marangoni convection. The temperature in HAZ reaches above the recrystallization temperature and consequently leads to the formation of new grains. The new grains formed in HAZ are of a very large size as compared to parent metal grains. Due to Larger grains, the micro-hardness in HAZ area was found to be less than weld metal and base metal zone. Increased heat density by using SiO_2 flux increased the size of Heat Affected Zone.

Keywords- Active TIG, Marangoni convection, arc constriction, HAZ

INTRODUCTION - Gas Tungsten arc welding (GTAW) process or Tungsten Inert Gas (TIG) Welding Process uses a non-consumable tungsten electrode to generate an electric arc for fusion of work-pieces[1]. The electrode is protected with inert gas generally argon or helium to prevent oxidation at high temperature. This process is highly used for good quality welds of stainless steel, alloy steels, magnesium and aluminum alloys[2]. However, the process lacks in achieving penetration greater than 3mm. Full fusion joints are made by V-Groove edge preparations and multi-pass welding procedures which reduce the productivity of process[3]. There was a definite need to improve the penetration of process. The problem of poor penetration and thereby low productivity was overcome by using activated flux.

Paton Institute in the 1960s developed the activated flux for improving weld bead penetration[4]. This technique gained the interest of researchers from the year 2000 onwards to improve weld bead geometry [5]. In this technique, active flux made of oxide powders is mixed with a thinner like acetone or ethanol to have a paint-like consistency. It is applied to the base metal before welding as shown in Fig-1. At high temperature during welding, oxygen decomposes from the oxide powders[6]. Oxygen being a surface active element reverses the Marangoni flow to improve weld bead geometry [7].



a) Mixing b) Coating

Fig -1 Application of Active flux

Several researchers had worked on using active flux made of oxide powders like SiO_2, ZnO, TiO_2, Fe_2O_3 and

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Dynamic Genetic Algorithm based WSN Clustering

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***Abstract*— The wireless sensor networks (WSNs) are the ad-hoc networks constructed of variety of sensor nodes, which are predominantly deployed for data collection. The WSNs are used in number of applications, which involves the military, weather, water and flood, snow and avalanche, and activity monitoring applications. The ad-hoc networks are known to form the inter-nodal paths to reach the destination node, which is primarily known as base station or sink node. The sensor nodes suffer from various problems, out of which energy consumption is one the principal cause. The sensor networks needed to be divided in smaller zones to break the broadcast domain between multiple network segments. This procedure is known as clustering, which divides the nodes in multiple groups according to their geo-location after randomly selecting the cluster centre nodes. In this paper, the genetic algorithm (GA), also known as genetic programming is used to determine the geo-location and neighbouring compatibility to divide the clusters, unlike the random selection of cluster centres. In the proposed model, the genetic programming is used to determine the clustering decisions for each node in the given network. The proposed cluster model based on genetic programming is used to improve the clustering performance, which is determined by the performance parameters of localization rate and error, and node density analysis. The proposed model outperforms the existing clustering model by marginal difference with localization error at 9.2% (mean) and 9.5% (median).**

***Keywords*—WSN clustering, WSN localization, Leaf node observation, Localization error, Genetic algorithm.**

I. INTRODUCTION

Over the last half a century, computers have exponentially increased in processing power and at the same time decreased in both size and price. These rapid advancements led to a very fast market in which computers would participate in more and more of our society's daily activities. In recent years, one such revolution has been taking place, where computers are becoming so small and so cheap, that single-purpose computers with embedded sensors are almost practical from both economical and theoretical points of view. Wireless sensor networks are beginning to become a reality, and therefore some of the long overlooked limitations have become an important area of research. In latest research on WSN, the researchers attempt to find out and overcome limitations of the wireless sensor networks such as: limited energy resources, varying energy consumption based on location, high cost of transmission, and limited processing capabilities.

All of these characteristics of wireless sensor networks are complete opposites of their wired network counterparts, in which energy consumption is not an issue, transmission cost is relatively cheap, and the network nodes have plenty of processing capabilities. Routing approaches that have worked so well in traditional networks for over twenty years will not suffice for this new generation of networks.

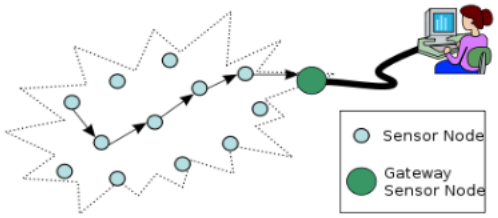

Fig. 1: Wireless Sensor Network Architecture

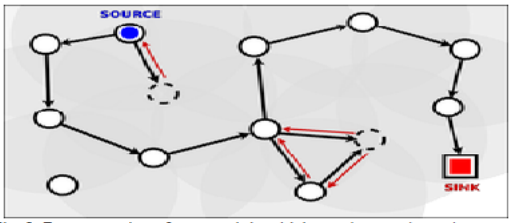

Fig. 2: Representation of a network in which a node goes down due out of battery and a different path is chosen with a Single-path algorithm

Besides maximizing the lifetime of the sensor nodes, it is preferable to distribute the energy dissipated throughout the wireless sensor network in order to minimize maintenance and maximize overall system performance. Any communication protocol that involves synchronization between peer nodes incurs some overhead of setting up the communication. WSN routing or clustering protocols determine whether the benefits of more complex routing algorithms overshadow the extra control messages each node needs to communicate. Each node could make the most informed decision regarding its communication options if they had complete knowledge of the entire network topology and power levels of all the nodes in the network. This indeed proves to yield the best performance if the synchronization messages are not taken into account. However, since all the nodes would always need to have global knowledge, the cost of the synchronization messages would ultimately be very expensive. For both the diffusion and clustering algorithms, we will analyze both realistic and

MITIGATION OF BLACK HOLE ATTACK IN AODV USING ANN AND BFO OPTIMIZATION

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Abstract

MANET (Mobile Ad-hoc Network) is generally an integration of mobile nodes. It is associated in a dynamic manner to vary according to the topology because of the centralized node lacking. The nodes can move freely randomly that leads as complex tasks for route maintenance. The nodes in the network usually communicate via routing protocols in the network. Therefore, it is mandatory to find which routing protocol can execute best for routing in MANET. Because of MANET dynamic nature and nodes mobility, number of attacks is increasing. Black hole attack is considered as one of those security threats. In this paper, the detection and mitigation of black hole attack is proposed with AODV routing protocol. AODV routing protocol has been considered with classification algorithm, NN (neural network) for the detection. For the optimization of the work, BFO (Bacterial foraging optimization) algorithm has been used. Various QoS parameters are considered to check the performance and have been compared.

Keywords: MANET, Black hole attack, AODV routing protocol, ANN, BFO, QoS

1. Introduction

MANET (Mobile ad hoc network) is considered as a multi hop system with mobile wireless nodes. The two nodes from the straight communication range require intermediate nodes for forwarding the messages for securing the communication [1]. Because of the routing environment, MANET is acceptable to attacks by malicious nodes like black hole attack that drop the chosen packets. Encrypting mechanism gives safe routing protocols that have been developed for ensuring properties like integrity and confidentiality. Though, those protocols need a centralized system from a trusted party. Additionally, secure routing protocols cannot avoid compromised or malicious nodes being the authorized members to the network from some, misbehavior from some node [2].

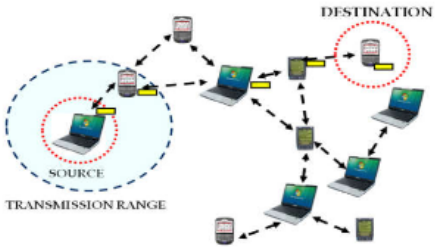

Figure 1: MANET (Mobile ad hoc network)

In this paper detection and mitigation of black hole attack in MANET is performed. AODV routing protocol has been considered with classification algorithm, NN (neural network) for the detection. For the optimization of the work, BFO (Bacterial foraging optimization) algorithm has been used. The explanation for methods is given in below section.

2. Proposed methodology

Initially, in this research work, a trust model has been implemented that has prevented the system from finding any additional cost for a suitable data transfer node . for this purpose, AODV routing protocol with NN and BFO algorithm has been used.

2.1 Protocol description

AODV is a reactive routing protocol, also known as on-demand routing protocol. In this type of protocol, routing is discovered whenever a node needs to route data [5]. The route discovery process is initiated by the source node to discover the route. The routing protocol consists of two parts, called route discovery and route maintenance. During the route discovery process, a RREQ request is initiated to find the route. The RREQ message is forwarded within the network until it discovers the intermediate node with the most recent routing information of the destination [6].

HYBRID APPROACH USING BUTTERFLY AND ABC FOR NODE LOCALIZATION IN ACOUSTIC SENSOR NETWORKS

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ABSTRACT:

The underwater acoustic network is the type of network which is deployed under the deep sea to sense ocean conditions like pressure, temperature etc. The networks are deployed underwater for providing communication such that the important information can be easily transmitted across the regions. Due to the presence of limited bandwidth, higher multi-path, higher fading, huge time-variations as well as Doppler shifts, it is difficult to perform highspeed communication within underwater acoustic channels. For terrestrial sensor networks radio waves are highly used for long distance communication. Within the sea water the propagation of the radio waves is very poor as they suffer from high attenuation due to which high transmission power and large sized antennas are required. Optical waves are responsible for high data transmission rate, but they are affected by the scattering and absorption issues within the water. So, acoustic waves are preferred among others and play a vital role for communication in underwater sensor networks. Originally for the terrestrial wired and wireless channels, various nature inspired metaheuristic techniques were designed. Thus, in order to make them appropriate for underwater channels, there is a need to modify these techniques. In the previous research, the Butterfly Algorithm (BOA) is applied for the node localization in terrestrial wireless sensor network. The BOA is a static algorithm which runs for a specific number of iterations to calculate the optimal value. The existing technique focuses on the localization accuracy without considering the convergence time and cost. In this research work, nature inspired metaheuristic techniques Butterfly Optimization Algorithm (BOA) and Artificial Bee Colony (ABC) are hybridized for node localization in underwater acoustic sensor network (UWAN). Range based distance estimation technique is applied for estimating the position of the nodes. Further, existing Butterfly Algorithm has been hybridized with Artificial Bee Colony (ABC) to obtain the optimal value of the objective function. The proposed and existing algorithms are implemented in MATLAB. The simulation results show that the accuracy and convergence speed of the proposed algorithm is better than the existing algorithm.

Keywords*:* Butterfly Optimization Algorithm (BOA), Artificial Bee Colony (ABC), Underwater acoustic sensor network (UWAN), Wireless sensor network (WSN), Mean Square Error (MSE).

By admin | October 9th, 2018 | General, Issue IX, Publications | 0 Comments

SECURITY METHODS AGAINST TCP SYN FLOODING DDOS ATTACKS IN WIRELESS NETWORKS- A SURVEY

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ABSTRACT

TCP SYN flooding is a type of DoS (Denial of Services) attack which utilizes the vulnerabilities in Connection establishment phase of TCP. In this attack some sources send a large number of TCP SYN packets, without completing the third handshake step to quickly exhaust connection resources of the victim machine and make the server unavailable for its legitimate users. This paper considers attacks on Wireless sensor networks. Wireless Networks is collection of large number of nodes which are of limited capabilities to collect sensitive information. With the advancement in technology, Security is one of the major concerns these days. There are so many attacks possible on wireless networks, in Distributed-Denial of Service (DDOS) attacks, malicious nodes adapts many attacks such as flooding attack, to halt the overall functioning of network. Due to the continuous evolution of new attacks worldwide, many DDoS attack defense methods have been proposed. This paper presents the recent trends and incidents of attacks, challenges in Wireless Networks, comprehensive review of TCP SYN Flooding DDoS attacks methods, description of SYN Flooding attack, advantages and disadvantages of attack defense methods with the General comparison of the SYN Flooding defense methods.

INDEX TERMS: TCP SYN Flooding Attack, Edge Router, Packet Flow, Swarm Intelligence, Denial of Services (DoS)

I. INTRODUCTION

DDoS is a Distributed Denial of Service attack where one system is attacked by the number of compromised systems, which are infected with the Trojan, causing DoS (Denial of Service) attack. A DoS attack which is large-scale cooperative and social attack, launched from an infected host causing server unavailable for the legitimate users. The frequency of DDoS attacks is also increasing. Last year, 44 percent witnessed more than 51 attacks per month. This year, that proportion has risen to 53 percent [1]. DDoS attacks shows about growing threats to businesses and Internet providers around the world. While many techniques have been proposed to detect these attacks, they are either not efficient or not effective enough. Even though lots of efforts have been made to provide defense from these attacks but still they are serious problems on the internet yet. Traditionally, DoS attacks aim at degrading the availability and quality of services, by consuming the service resources to make it unavailable. Nowadays, the work of most of the important and vital services dependent on fast development of the technologies and their operation is almost inconceivable without Internet usage, so any interruption in the operation of the Internet can be very inconvenient. Considering the fact that the internet was actually designed for openness and scalability without much worry about security, it is clear that the mischievous users can use the design weaknesses of the Internet to break havoc in the operation of most of services. According to the last investigation, cybercrime and

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Vulnerability Assessment of Routing Protocols in MANET

Kakkar Parveen; Sharma Pooja; Saluja Krishan

Security is a weak link of network systems. The malicious usage and attacks have caused tremendous loss by impairing the functionalities of the computer networks. Among all network attacks, Denial of Service (DoS) and Distributed DoS (DDoS) attacks are two of the most harmful threats to network functionality. Mobile Ad Hoc networks are even more vulnerable to these attacks. Existing MANET routing protocols, such as Ad Hoc On-Demand Distance Vector Routing Protocol (AODV), do not provide enough security defense capacity. AODV is inherently vulnerable to many attacks viz. authentication, availability, integrity & confidentiality attacks. Major research efforts have been taken to solve this problem. But most of the proposed solutions are not feasible or practical for the operating MANETs.

Preview

Files (299.3 kB)

Name	Size

Modified ACO model for Regression Testing Using Automated slicing

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Abstract : ***The Regression testing is the testing which is applied to test the software when some changes are done in the already developed project. The test case prioritization is the technique of regression testing which prioritizes the test cases according to the changes which are done in the developed project. This work is based on automated and manual test case prioritization techniques. In the existing technique the manual test case prioritization is been implemented to detect faults from the project. In the manual test case prioritization two parameters are considered which are, number of times function encountered and number of functions associated with the particular function. On the basis of these two parameters the importance of each function is calculated which are prioritized by calculating FTV value. The FTV value is calculated according to the changes which are defined in the developed project. To increase the fault detection rate of the test case prioritization, automated test case prioritization is being implemented in this work. In the first step of the algorithm, the population values are taken as input which is the number of times function encountered and number of functions associated with a particular function. In the second step, the algorithm will start traversing the population values and error is calculated after every iteration. The iteration at which the error is maximum at that point the mutation value is calculated as the best mutation value of the function. The function mutation value will be the function importance from where the test cases are prioritized according to the defined changes. In the last step of the algorithm the function importance values are accessed according to the defined changes and best fitness value is calculated which will be the final percentage of faults detected from the project after the particular change.***

IndexTerms - Regression Testing, ACO, Test case prioritization, Automated slicing ,FTV(function traversal value).

I. INTRODUCTION

1.1Software Testing

Software testing is a procedure of testing or comparing the actual outcome with the expected outcome. Testing of the software is done in order to check the correct functionality of the system or project. If the testing will not be performed then system may lead to catastrophic or improper results in the field. So it's better to check or test the system earlier, so that the excellent results can be produced.

1.2Types of Software Testing

- **Black-Box Testing**

Black-box testing is also known as functional testing. This testing ignores the internal mechanism of the system. It is a testing which is based upon the output and having no knowledge of internal code. It is attesting in which its working is not understood by its user. It has no knowledge of processing of code but only concentrate upon the output.

- **Integration Testing**

This testing is done when two or more modules are combined together into a larger module. It verifies the functionality of the module after integration. It is done at the interfaces of the both the structure and component module. This type of testing is done in distributed or client/server modules.

- **System Testing**

It is also known as end-to-end testing. It tests the complete application of environments. It is based upon the specification and requirement of the system. It checks the entire systems. It is for high level design and comes under the black-box testing .It also checks non-functional requirements also.

- **Load Testing**

Load Testing is done to determine whether the system is able to handle given no. of users or not. It is done only to check the performance of the system is it working well or not. It checks the behavior under heavy loads and inputs. In web application testing it is used to check where the performance of the system degrade and at which point it fails.

- **Grey-Box Testing**

It is a combination of both white box and black box testing. It contains the knowledge of internal structure of code more than black box testing and less than white box testing. It comes under the correctness testing. It also includes reverse engineering concepts also.

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ACO for Regression Testing By the Process Automated Slicing

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Abstract- The Regression testing is used to retest the component of a system that verifies that after modifications. The test case prioritization is the technique of regression testing which prioritizes the test cases according to the changes which are done in the developed project. This work is based on automated and manual test case prioritization To test the new version of software test case prioritization is applied which prioritize the test cases according to changes and generate maximum number of faults. In this work, technique is been proposed which will traverse the DFD of the project and calculate the function importance which is calculated automated slicing. The functional importance values are given as input to hill climbing algorithm which prioritizes the test cases in the ascending or descending order according to function importance. The algorithm is performed in MATLAB and it is detect more faults in less time period.

Keywords: Regression Testing, Test Case Prioritization, m-ACO, Automated slicing, FTV(function traversal value).

I. INTRODUCTION

Software testing is a procedure of testing or comparing the actual outcome with the expected outcome. Testing of the software is being done in order to check the correct functionality of the system or project. If the testing will not be performed then system may lead to catastrophic or improper results in the field. So it's better to check or test the system earlier, so that the excellent results can be produced.

1.1. Regression Testing

It is a software testing that refers to section of the test cycle in which programs are being tested to make sure that changes do not affect features that are not believed to be affected. The process of verifying the customized software in the maintenance phase is commonly known as Regression testing. Time and budget constraints are the major disadvantage due to its complex process. Regression testing is basically the re-execution of a number of subset of test that has been previously conducted. In regression testing as integration testing takings, number of regression tests increases and it is not practical approach and ineffective to re-execute every test for each program function if once change occurs. It is quite an expensive testing process that is being used to detect regression faults. Research has been shown that at least 50% of the total software cost is comprised of testing activities [1].

1.2. Techniques for Regression Testing

1.2.1. Retest All

It is one of the methods for regression testing in which all the tests that are present in the existing test bucket or suite has been re-executed. This is very expensive as it requires huge time and resources.

1.2.2. Regression Test Selection (RTS)

Due to expensive nature of "retest all" technique, Regression Test Selection is being performed. In this technique instead of rerunning the whole test suite we must select a certain part of test suite to rerun if the cost of selecting a certain part of test suite is less than the cost of running the tests that RTS allows us to omit [2].

1.2.2. Test Case Prioritization

A mechanism is needed for arranging a test case in an appropriate order to increase their effectiveness in order to meet some performance goal and rate of fault detection such mechanism is commonly known as test case prioritization. Test case prioritization is a method to prioritize and schedule test cases in an appropriate order. Test cases that are having higher priority must be run before than the lower priority test case in order to minimize time, cost and effort during software testing phase. Various performance goals such as rate of fault detection which is a measure of how quickly the fault is being detected so that during testing faster feedback can provide about system under testing and allow the software tester to correct the software at earlier phase as possible [3].

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EVOLUTIONARY METAHEURISTIC ALGORITHMS FOR FEATURE SELECTION: A SURVEY

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ABSTRACT

The advancement of high-throughput technologies has resulted in exponential growth of high dimensional data. It has been a challenge to efficiently find patterns and discover knowledge using data mining and machine learning techniques from the collected data. However, this data contains redundancy and irrelevant features. Therefore, dimensionality reduction techniques such as feature extraction and feature selection are applied to deal with the data that is associated with noise. There are several feature selection techniques that minimize redundancy. However, more promising results can be attained using metaheuristics algorithms that are based on natural evolution. Through this paper, we overview and highlight the importance of metaheuristics and surveys existing feature selection algorithm for data mining.

Keywords: *Feature Selection, Particle Swarm Optimization, Genetic Algorithm, Ant Colony Optimization.*

I. INTRODUCTION

Feature Selection is a major research topic for the development of classification methods. FS (subset selection or attribute selection) is the automatic selection of attributes in dataset that are most relevant for application of a learning algorithm[18] . The best subset is selected that contains least number of dimensions contributing well to the accuracy of the learning classifier. Hence, rest of the features and irrelevant dimensions are discarded and only best ones are kept. FS is usually done in the pre-processing stage and is very efficient technique to deal with noisy and redundant features and tend to keep only those features which are best suited for the classifier. There are basically two methods by which FS can be carried out:

1. Forward Selection: In this type of selection, initially there are no variables and variables are added gradually at each step so as the error is decreased. This process halts when further addition does not decrease the error rate.
2. Backward Selection: This is contrasting to the prior one. In this case, the selection starts with considering all the variables and removing one by one at each step until any further removal increases the error considerably.

A typical feature selection process consists of four basic steps as shown in Figure 1. The first step is subset generation which is a search procedure that produces candidate feature subsets for evaluation. After that, each candidate subset is evaluated and compared with the previous best subset according to a certain evaluation criterion. If the new subset is found to be better than the previous one, previous best subset is replaced. The process of subset generation and evaluation continues repeating until a given stopping criterion is satisfied. Finally, result is validated by prior knowledge[16] . Feature selection has successfully been applied in many fields such as classification, clustering, association rules and regressions. FS algorithms broadly fall into three main categories: the filter approach, the wrapper approach and the hybrid approach. In the filter approach [17] , feature subsets are selected and evaluated without requiring any classifier. In case of wrapper approach [8] , one predetermined classifier's performance is used as evaluation criterion. In this approach, features are selected in such a way that subset

COMPARISON OF IMAGE SEGMENTATION TECHNIQUES: A REVIEW

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ABSTRACT:

In recent area there is need of advancement in different strategic and commercial applications that results in increase use of image processing tools and techniques. In a given image identification of homogeneous pixel elements is done using image segmentation that is further used for object classification or identification purpose. Number of researchers has worked on image segmentation techniques to get more efficient results. The use of image segmentation gives more meaningful information as area of image gets highlighted by the use of it. In this paper some of the existing techniques are given such as threshold based segmentation method, compression based, clustering based, splits or merge technique and histogram based segmentation. This review work can act as a guide to the researchers of this domain. A brief review of merits and demerits of image segmentation technique is also covered under this. So, this work helps them in choosing best or suitable technique as per the application area.

Keywords: Image enhancements, Image segmentation, Histogram Equalization, Edge Detection

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Geotechnical Properties of Pond Ash Mixed with Cement Kiln Dust and Polypropylene Fiber

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Abstract: Pond ash (PA) and cement kiln dust (CKD) are major dust products from thermal power stations and cement manufacturing industries and pose disposal difficulties. This research work focuses on the geotechnical properties of pond ash mixed with cement dust and polypropylene (PP) fiber. Various experimental tests, including standard Proctor test, California bearing ratio (CBR) test, direct shear test, and triaxial shear tests, were performed. Pond ash was mixed with 10, 15, 20, 25, and 30% of CKD and 0.5, 1, and 1.5% polypropylene fiber. Standard Proctor tests were carried out on various proposed proportions in order to obtain the effective mix. Original pond ash maximum dry density and optimum moisture contents are 1.45 g/cm^3 and 23%, respectively. The mix of 75% PA, 25% CKD, and 1% PP fiber produced the maximum dry density. The CBR values increased gradually up to 80% for up to 25% CKD and 1% PP fiber. The shear strength parameters were determined using direct shear testing. The shear strength parameters of cohesion (c) and angle of internal friction (ϕ) obtained for the mix of 75% PA, 25% CKD, and 1% PP fiber were 5 kN/m^2 and 39.45°. The same composition was tested in triaxial shear tests under consolidated drained conditions, and shear strength parameters varied slightly. The mix of pond ash, cement kiln dust, and PP fiber can be used for highway embankment construction to strengthen its layers, low land area reclamation, as a structural fill in reinforced earth walls, and backfill material for conventional retaining walls. **DOI: 10.1061/(ASCE)MT.1943-5533.0002334.** © *2018 American Society of Civil Engineers.*

Author keywords: Pond ash; Cement kiln dust; Polypropylene (PP) fiber; Compaction; California bearing ratio (CBR); Shear strength parameters.

Introduction

Extensive infrastructure development is under construction in India. A few road projects have been made to use lime, cement, fly ash, pond ash (PA), slag, paper pulp, and other industrial waste or by-products. These supplementary cementation (SCM) or waste materials become a solution to conventional construction material. Fly ash, pond ash, and cement kiln dust are major waste products from thermal power stations and cement manufacturing industries that pose disposal difficulties. Pond ash is the by product of thermal power plants, which is the incombustible residual part of the incinerated waste. In India, most thermal power plants adopt the wet method of ash disposal. Pond ash is collected from the bottom of the thermal power plant, and it contains significant amount of relatively coarser particles (150 μm–2.36 mm). Pond ash utilization in highway development helps reduce the consumption of natural resources like sand and silt. A number of research studies on pond ash have been carried out through compaction tests, California bearing ratio (CBR) tests, direct shear tests, and triaxial tests, among others (Kim et al. 2005; Bera et al. 2007; Sarkar et al. 2012; Patil and Patil 2013; Thanikella et al. 2016).

Research has been carried out to investigate the use of cement kiln dust as a stabilizing material in soil improvement. Such waste poses health problems, environmental problems, and land reclamation issues. Consuming such industrial waste in engineering works would help to solve some such problems, and recycling of such material is both profitable and ecologically friendly. Cement kiln dust has a pozzolanic property that makes it an effective binder, so that it could improve the engineering properties of soil (Sudheer and Janewoo 2016; Oduola 2010; Wang et al. 2007; Sariosseiri et al. 2011; Edeh et al. 2012; Ebrahimi et al. 2012; Solanki et al. 2009; Freer-Hewish et al 1999; Kang et al. 2014; Peethamparan and Olek 2008).

Polypropylene fiber (PPF) has been used to impart tensile strength to a material. Addition of fiber accounts for a significant alteration and rectification in the engineering properties of materials. Several research studies on fiber-reinforced soils have recently been carried out through triaxial tests, unconfined compression strength (UCS) tests, CBR tests, direct shear test (DST), and tensile and flexural strength testing (Kumar and Gupta 2016; Sarkar et al. 2012; Babu and Vasudevan 2008; Tang et al. 2016; Muntohar and Widianti 2013; Onyejekwe and Ghataora 2014).

This paper studies the geotechnical properties of pond ash mixed with cement kiln dust and polypropylene fiber. It examines the influence of cement kiln dust and polypropylene fiber to improve the engineering properties of pond ash. The properties being evaluated are dry density, shear strength, and California bearing ratio of the mix. The proposed research mix can be used in highway embankments, as a structural fill in reinforced earth walls, low land reclamation, and backfill in a conventional retaining wall.

Material and Experimental Methodology

The materials used in present study are briefly described in the subsequent subsections.

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Civil Engineering

Use of modified hybrid PSOGSA for optimum design of RC frame

Sonia Chutani & Jagbir Singh

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ABSTRACT

A realistic and optimum design of reinforced concrete structural frame, by hybridizing enhanced versions of standard particle swarm optimization (PSO) and standard gravitational search algorithm (GSA) is presented in this paper. PSO has been democratized by considering all good and bad experiences of the particles, whereas GSA has been made self-adaptive by considering a specific range for certain parameters like 'gravitational constant' and 'set of agents with best fitness value.' Optimal size and reinforcement of the members have been found by employing the technique in a computer-aided environment. Use of self-adaptive GSA together with democratic PSO technique has been found to provide two distinct advantages over standard PSO and GSA, namely better capability to escape from local optima and faster convergence rate. The entire formulation for optimal cost design of frame includes the cost of beams and columns. In this approach, variables of each element of structural frame have been considered as continuous functions and rounded off appropriately to imbibe practical relevance to the study. An example has been considered to emphasize the validity of this optimum design procedure and results have been compared with earlier

2018

A FUZZY-BASED COMBINED MPPT TECHNIQUE FOR WIND AND SOLAR SYSTEM

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ABSTRACT

Maximum Power Point Tracking has been using to enhance the capability of the power generation systems. There are two different power generation systems such as solar and wind which have been used by several researchers. Alternatively, in this paper, hybridization of these systems is done which are controlled by the fuzzy logic. It has combined with the system to make a decision about the participation of MPPT in the model. The simulation analysis has performed using the MATLAB Simulink model where wind and solar both systems are operated. From the results analysis, it has shown that the proposed system concludes fewer fluctuations as well as less distortion in the system.

Key words: Maximum Power Point Tracking, Solar energy, Wind energy, Total Harmonic Distortion.

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AUTOMATIC SWITCHING CONTROL OF A HYBRID SOLAR-WIND SYSTEM USING FUZZY LOGIC

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ABSTRACT

Modeling of hybrid system that utilizes both solar and wind energy source to provide power without any kind of disturbances is a powerful system. Considering, a hybrid approach has been introduced in this paper that makes use of both energy sources and drive accordingly depending upon the requirement. For the switching of one source to another or vice-versa, Fuzzy Logic Algorithm has been initiated. Fuzzy Logic utilizes the defined rules based upon which a particular energy source either wind or PV has selected and switch turns on or Off. The experimental analysis has performed using MATLAB simulink model to authenticate the performance of the

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INTERLINE UPQC CONNECTED WITH PV ARRAY FOR BETTER POWER QUALITY

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ABSTRACT

UPQC can be considered as the most encouraging answer for the power quality issues. The UPQC can't make up for the long voltage intrusion since it has no energy storage in the DC interface. The above impediment can be abstained from utilizing solar energy (PV cluster).The UPQC (FACTS) gadgets are skilled to manage the power stream of a solitary line just, thus to manage the power stream of multiline or a sub arrange multi converter (FACTS) devices, like interline power-flow controller (IPFC) and therefore the generalized unified power-flow controller (GUPFC) area unit were presented .In this paper another brought together power quality framework for all the while remuneration of multibus /multi feeder system referred to as MCUPQC has been produced. A PV is associated to the ordinarily based DC connect, we are enhancing the peak power and maximum voltage using PID controller and this PV module enhances the substantial voltage interference and hang /swell .The execution of PV based MCUPQC and consequently the adjusted management algorithmic program is represented by simulation.

Keywords: Multi converter unified power quality converter, Power quality, Proportional integral derivative, total harmonic distortion (THD), and voltage sag/swell

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Long term load forecasting using K-mean clustering and ANN approach

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ABSTRACT

This study implements the K-mean+ANN based Load forecasting technique to predict the load of Amritsar and Pathankot station. Artificial Neural Network (ANN) is one of the emerging methods used for forecasting the load. This method shown good results in different power station problems included planning, protection, designing, control & security analysis and fault diagnosing. In this paper, it is illustrated that from last few years the load forecasting has been widely adopted and this is due to increase in the demand for electric power and this had also resulted in an increase of generating sources expenditure. In most of the cases, it had been implemented in utilizes to determine the number of resources required to fulfill the demands of the project. The major focus area of the research was load prediction of two different stations for 9 upcoming years. In this study work past 18 years load information was collected and different years were select as base years and after that, the author had implemented the k-mean clustering and ANN method to predict load for upcoming nine years.

Keywords: *Load forecasting, Load data set of Amritsar-Pathankot station, ANN classification, K-means clustering*

1. INTRODUCTION

Forecasting is one of the needs for all industries that play the vital role in the growth. Electric utilities are taken as one of the most complex systems designed on earth in order to run the power grid that delivers the electricity to billions of people around the globe [1]. After turning on the switch we expect that light must turn on. But the system from generating the power to deliver that to the electrical appliances is not that simple. As in other industries, the product and services are stored in some kind of inventory, but this is not possible for the electrical power industry by using the currently present technology [2,3,4]. This is the reason electrical energy is delivered and consumed as soon as it is generated. Or it can be said that the supply and demand of electrical utility are needed to be balanced at every moment [5,6].

Load forecasting mainly concentrates on forecasting the demand for electricity that is used in different electrical power industry segments, that includes the transmission, generation, distribution, and retail [7]. Load forecasting application includes the planning of power supply, transmission, and distribution, management at demand side [8], operation and maintenance. The role of Load forecasting is important in order to plan [9], operate and control the power system. Forecasting means active load estimation for different load busses that is connected to the actual load occurrence. In a good forecasting model, some of the important features such as climate, weather, economy, human activities, and interaction are captured [10]. Certain lead time was required for the planning and operational application of the load forecasting and is known as the forecasting interval. This forecasting can become handy for analyzing support of strengthening and also for the expansion of the existing infrastructure, maintenance scheduling, controlling voltage and development of the infrastructure [11].

2. TYPES OF LOAD FORECASTING

On the basis of the time period, load forecasting technique can be classified into three categories:-

1) Short-Term Load Forecasting (STLF)
2) Medium Term Load Forecasting (MTLF)
3) Long-Term Load Forecasting (LTLF)

2.1 Short Term Load Forecasting (STLF)

In the STLF, daily or hourly values were covered for giving the necessary information of the system management in order to achieve the daily operations. This information was used for allocating the spinning reserve, planning the operation, committing the units and for scheduling the maintenance.

2.2 Medium Term Load Forecasting (MTLF)

In this type for forecasting, data from few days or few weeks was covered. That forecasting data was generally used for the fuel supply and unit maintenance scheduling. It is less time consuming than the long-term forecasting and consumes more time than the short term load forecasting. The basic application of the MTLF is to plan the seasonal peak load in the winter and summer seasons [12].

A Review on Fault Awareness & Historical information based TCP Approaches

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Abstract—. Regression testing is the approach which ensures the software quality according to the need of the customer. Moreover the one of the regression testing technique that is prioritization of the test cases focuses on early revealing of faults and minimization of cost. Many researchers have studied various TCP techniques. Fault based prioritization of test cases and history based orioritization of test case are the two techniques which help in early knowledge of faults as compared to the other technoiques. This review paper discusses these two techniques of prioritization for test cases. Fault based techniques are the approaches which schedule the test cases according to the fault awareness, exposing potential, fault location etc. on the other hand history based test case prioritization uses the historical data and information to prioritize the test cases.

Index Terms— Regression Testing,fault awareness, Fault localization, History based TCP.

1 Introduction

TEST case prioritization is the approach that re-schedule the test case order . The ultimate goal of this approach is to identify the faults at a possible earlier stage.. This is necessary as a software evolves the test cases get accumulated and this is not possible to perform all the test cases in such a short time span. Various prioritization methods are proposed by researchers to increase the fault detection rate, to minimize the cost, to maximize the coverage and the objectives can be many more according to the scenario of testing. Unlike the other two techniques of regression testing i.e., RTS and TSM , test case prioritization does not support any kind of rejection of test cases. Thus this is much adopted by the testers. If the test case which have the higher ability to detect the fault is not prioritize in a better way it may lead to the increase in cost time and effort, on the other hand if the suspectible test cases are handle earlier then they may result in early detection of fault leading to the effectiveness and efficiency in terms of time, cost and effort. Thus test cases must be prioritized according to the need of the program to be tested.

2 Review

This section contains a study on Fault based and Historical information based techniques that the various researchers have discussed.

2.1 Fault Aware Test Case Prioritization

Before adopting a path to a destination, if we are aware of the obstacles that may be present over there, then either we will take the precautionary measures or we will change the path, or we will try to handle those obstacle in a planned way. Similarly in regression testing if we will be aware of the faults that may lie in the test suite then we will handle them accordingly and try to make the system fault free by adopting the proper techniques. These predictions can be made according to the detailed features of the test case and also according to the historical information about the test cases or test suites. The primary goal of regression testing is to detect the faults and provide the feedback to the system so that the faults can be removed. While describing the coverage based TCPs, FEP i.e., Fault Exposing Potential techniques were also introduced. Fault Exposing Potential is the capacity of a test case to reveal the fault. Mutation analysis is used to define the FEP. Mutation score is calculated as the ratio of mutants of statements exposed by a test case and the total mutants of that statement. The test cases are then prioritizing on the bases of the mutation score. As the coverage based prioritization are extended by the additional approaches. FEP also has an extended version as Additional FEP [Rothermel et. al., 1999]. However it is more expensive than the coverage based techniques.

Test Suite minimization of the other hand is a technique which reduces the test suite size, but with the drawback of elimination of test cases. Thus retaining the test cases and using them for prioritization is always recommended by the developers. But it is more time consuming to consider all the test cases for evaluation and this is expensive too. Jeffey and Gupta proposed a technique for enhancing the fault detection capability, by reducing the size of test suite efficiently. This technique was, to select the test case in to smaller test suite based on a criteria C_1. C_2 is used to add the additional test cases. Property of elimination of redundancy is taken care. Set of test cases T is prepared along with the corresponding testing conditions that each test meets for at least two specific testing criteria (C_1, C_2). This will result in reduced test suite satisfying all the testing requirements of complete original test suite. This technique is about test suite reduction rather than for prioritization [Jeffrey & Gupta, 2007].

In 2010, a new Fault Aware TCP approach was proposed.It technique suggests that the rate of fault detection can be enhanced by incorporating the coverage based test case prioritization along with Fault Localization which is an automatic debugging technique that provides information regarding location of faults. In this approach TA-

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MIGRATION OF YOUNG PEOPLE: A PROBLEM OF BRAIN DRAIN IN INDIA

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INTRODUCTION

Migration means the movement of persons from one place to another, one country to another country. Migration is not a new phenomenon; it was prevalent in the ancient times. People migrate due to economic, political, commercial and social factors. But migrations now days have become a big problem for developing countries like India. The term 'Brain-drain' has recently come into vogue for describing the flight of talent from our country to another. Often, it is loosely employed to describe all migration of educated and talented persons to countries abroad in search of better careers even though their services may be badly needed in their native land, and thus, this exodus of talent, depletes a country's intellectual resources. This paper analyses the factors responsible for migration, effects of migration on the Indian economy and suggested measures to control migration.

"The more one moves, the more difficult it becomes to reconnect with the realities of one's home country. Home, as it were, becomes a state of mind and a function of place and time."

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RESEARCH ARTICLE

Cognitive Dissonance amongst Youth of Jalandhar City for Purchase of Online Apparels

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ABSTRACT:
Cognitive dissonance as a state which comes into existence when a person gets confused between two cognitions (thoughts), which cannot exist together and hence create tension for him, Festinger, 1957. In this paper an attempt has been made by the researcher to find out the factors affecting cognitive dissonance amongst youth for purchase of apparels. Along with an attempt has also been made to analyze the relation between gender and dissonance in online purchase of apparels amongst youth. It has been found that there is no significant association between Gender and Customer Satisfaction. After applying the factor analysis, nine factors titled 'Timely Delivery, Value, Psychological Cost, Easeness for Search, Impulsive Buying, User Friendliness, Reasonable Price, Convenience and Reliability' have been extracted. The study has been done on 100 respondents of age group between 18-24 years of Jalandhar city.

KEYWORDS: Impulsive buying, Cognitive dissonance, Apparels, Consumer behaviour, Gender.

INTRODUCTION:

Cognitive Dissonance is an integral part of the Consumer Behaviour. As per Festinger, 1957, describes cognitive dissonance as a psychological phenomenon that occurs when there exists a discrepancy between what a person believes in and the outcome which questions a person's belief. Sweeney, Hausknecht and Soutar, 2000 describes that a consumer is bound to be dissonant if there is a discrepancy between the satisfaction levels he had expected from a product and between the satisfactions; he actually received from the product. It has also been argued that cognitive dissonance not only comprises of cognitive elements but emotional elements as well. Elliot and Devine, 1994 "many researchers have argued that cognitive dissonance is mainly experienced through psychological discomfort".

This study is about cognitive dissonance amongst youth in online purchase of apparels and various variables like quality, price, impulsive buying, personality of an individual, friends and family influences have been discussed in this paper.

LITERATURE REVIEW:

Jessica Santos J. and Boote J. (2003) in their paper named "A theoretical exploration and model of consumer expectations, post-purchase affective states and affective behaviour" presented a theoretical model exploring the interrelationship between expectations, affective post-purchase states and affective behaviour.

Awa H. O. and Nwuche C.A. (2010) in their paper titled "Cognitive Consistency in Purchase Behaviour: Theoretical and Empirical Analyses" analysed and synthesized the major theoretical and empirical body of knowledge of the three theories with a view to proffering a tripartite approach (involving the consumers, the organizations and the governments) to solving

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ORIGINAL ARTICLE

Covert information sharing with novel fuzzy adaptive edge detection

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Abstract

The secure communication systems should provide covert, stealth, or unauthorized detection of critical information. Covert communication systems not only shield the secure information enclosed in the cover data from being decoded but also avoid the opponent from perceiving the transmission. In this paper, we propose adaptive Fuzzy Edge detection-based covert communication. The proposed system is capable of locating the accurate edge zones of a cover picture to shield the secure information. Experimental outcomes show that the proposed strategy has accomplished good imperceptibility compared with the other analogous strategies.

Energy efficient cognitive body area network (CBAN) using lookup table and energy harvesting

Cite

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Abstract: With the advancements in cognitive radio network procedures, such as blind sensing, sensing transmission trade-off, energy aware protocols etc, effectively overcomes the power constraint issues of CBAN. In present work, such primary issues have been addressed with the help of look-up table incorporated with energy harvesting (EH). It delivers maximum achievable throughput with minimum energy consumption to obtain self-sustainable pervasive wireless networks. The experimental work has been carried out in three different scenarios (Echelon 1, 2 and 3). The key components such as look-up table and energy harvesting have also been investigated on different system parameters (like energy consumption, normalized throughput, saved and residual energy). The simulation is done with NS-2 and results are shown in Matlab for clarity. Results depict that proposed model consumes less energy and also provides a better normalised achievable throughput as compared to the conventional model.

Keywords: Cognitive radios body area network (CBAN), look-up table (LUT), energy harvesting, ultra-wide band (UWB), cooperative sensing

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PERFORMANCE INVESTIGATION OF A NOVEL UWB ANTENNA INCORPORATED WITH DEFECTS IN THE GROUND STRUCTURE TO MINIATURIZE THE SIZE OF ANTENNA

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Abstract: In this paper a novel and compact ultra wide band antenna is proposed having modified hexagon shaped patch with slots etched on the patch and step size slots truncated in the ground plane for attaining wide impedance and minimal return loss characteristics. The proposed antenna is designed and stimulated using HFSS, which is a high frequency structure stimulator, based on Finite Element Method. The proposed antenna can operate from 3 GHz to 30 GHz for VSWR < 2. The minimal return loss characteristic of -15.40 db is obtained at 19 GHz and exhibits good radiation performance over the entire frequency range.

Index Terms **–Antenna, Ultra wide band, WPAN, DGS, Wireless and Mobile Communication**

I. Introduction

The contemporaneous spurt of wireless applications and with high level of miniaturization, the world is already moving with 4G networks and very soon we will be entering into a world of 5G networks. With such revolution in wireless technology, seen within a short span of time, has definitely increased the interest in designing high performance antenna types for various applications. On February 14, 2002 FCC (Federal Communications Commission) has approved a band of 3.1GHz - 10.6GHz for UWB wireless communication technology applying to civil and personal communication system.

Over the last few years of research, it is evident now that a wide variety of proposed 'UWB' antennas, have proved as potential techniques for improving the spectrum efficiency of cellular radio systems. There are a growing number of applications, which involve the radiation or reception of electromagnetic signals over ultra-wide frequency bandwidth [1]. Therefore, the demand has swiftly raised, for compact and cheap antennas that can provide satisfactory performance in both time and frequency domains in the entire UWB Range. In addition, the trend in modern wireless communication systems, including UWB based systems, are to build on small, low-profile integrated circuits in order to be compatible with the portable electronic devices. This resulted in numerous studies on UWB microstrip antenna, which specifically focused on the optimization techniques for designing antennas radiating in the UWB Range [2] - [5].

In the planar structure, the antenna can be easily and conveniently printed onto a piece of printed circuit board which easily satisfies the requirements for small UWB antennas and can be used for portable applications. Due to this advantage, industry and academia have been putting enormous efforts on researches to study, design and develop planar antennas for UWB communication system.

Basically a printed antenna consists of a planar radiator and ground plane etched oppositely onto the dielectric substrate of the PCBs. The radiators can be fed by a microstrip line or coaxial cable depending upon the convenience. The electric currents in these antennas are distributed both on the radiating element and on the ground plane, and the radiation from the ground plane is unavoidable, which also need to be managed by doing modifications in the geometry. Therefore, the performance of the printed UWB antenna is considerably affected by the size and shape of the ground plane in terms of operating bandwidth, gain, directivity and radiation patterns.

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Covert communication integrates into wavelet packet transform OFDM system over Rayleigh fading channel

Sanjeev Kumar, Amarpal Singh & Manoj Kumar

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Abstract

Information security and privacy are crucial in a modern-day communication system. Extensively used cryptography based security in communication prevent unauthorized decoding, but it does not ensure the concealment of information. However, covert communication provides secure transmission of secret information over the unsecured channel. This paper proposes the covert communication integrate into wavelet packet transform Orthogonal Frequency Division Multiplexing (OFDM) system. Bit Error Rate and Quality assessment of covert communication in conventional OFDM and proposed covert communication are evaluated. Also, the comparative performance evaluation of proposed covert communication under divergent digital modulation levels is presented. Experimental results reveal a significant improvement in BER for a given SNR with the proposed covert communication system.

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Information hiding with adaptive steganography based on novel fuzzy edge identification

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ABSTRACT

The evolution in communication techniques has created wide threats for crucial information transfer through a communication channel. Covert communication with steganography is a skill of concealing secret information within cover object and hence shields the data theft over rapidly growing network. Recently, diverse steganography techniques using edge identification have been proposed in literature. Numerous methods however utilize certain pixels in the cover image for inserting edge information, resulting in significant deformation. The conventional edge detection method limits the deployment of edge detection in steganography as concealing the information would introduce some variations to the cover image. Hence inserting data in pixel areas recognized by existing conventional edge detection techniques like canny cannot ensure the recognition of the exact edge locations for the cover and stego images. In this paper, an Adaptive steganography method based on novel fuzzy edge identification is proposed. The method proposed is proficient of estimating the precise edge areas of a cover image and also ensures the exact edge location after embedding the secret message. Experimental results reveal that the technique has attained good imperceptibility compared to the Hayat Al-Dmour and Ahmed Al-Ani Edge XOR method in spatial domain.

1. Introduction

The protection of information for any organization is the prime concern and hence prompted to the research in the area of information security. Usually, cryptography has been employed for a reliable and secure transmission. The encrypted data however evoke suspicion from illicit attackers. Recently, adaptive steganography [1] is devised to defeat this weakness by imperceptibly inserting confidential information into a cover media without drawing any special attention from adversary. This property of concealment differentiates steganography from cryptography. It ensures that hidden secret data appears to be completely imperceptible to the eavesdropper. These steganographic techniques for covert communication are explored to shield the privacy of data from surveillance and intellectual property from reproduction. The main applications include covert communication, fingerprinting, digital signature, and access control system [2]. The three prime factors for image steganography technique are capacity, imperceptibility and robustness. The capacity, imperceptibility and robustness together constitute the magic triangle which was proposed by Johnson et al. [3]. Hidden capacity or payload signifies the amount of data concealed in the cover image. Robustness signifies the defense against attack or any manipulation by the eavesdropper whereas imperceptibility is used to measure the image quality by measuring the peak-signal-to-noise (PSNR).

Image steganography techniques can be classified into two categories: spatial domain and frequency domain techniques. In the spatial domain, the secret information is inserted directly in the intensity of the image pixels, while in the latter case, cover images are transformed to frequency domain and the secret data is inserted in the transform coefficients. A Classical Spatial domain technique is Least Significant Bit insertion [4] provide high payload and low computational complexity. However, this technique does not resist statistical attacks. Transform domain techniques like Wavelet Transform (DWT) [5] and Discrete Cosine Transform (DCT) [6] are intended for higher robustness against attacks and manipulation by eavesdroppers. Adaptive steganography [7] is an exceptional case

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EFFICIENT FEATURE EXTRACTION WITH NEURO FUZZY CLASSIFICATION APPROACH FOR OBJECT DETECTION

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ABSTRACT

Images are used in many applications, where the decision is done on the basis of the scanned images. In such applications, first of all the image processing techniques are applied to enhance the quality of the image. Object segmentation is also a part of image enhancement process. There are multiple object segmentation technique. This study also introduces a novel object segmentation technique. The proposed ANFIS based object segmentation technique is developed with an objective to differentiate multiple objects with similar color and shape in an image. For this purpose, Gabor Wavelet technique is applied for extracting the objects. The proposed work is simulated on various types of images such as face images, image of leaves, image of hands. The proposed work is simulated in MATLAB and it is observed that it outperforms the traditional technique in terms of accuracy, stability, precision and recall.

Keywords: *Image segmentation, object Segmentation, Artificial Neural network, Fuzzy Inference System, Gabor Wavelet, Laplacian Pyramid.*

I. INTRODUCTION

Object segmentation plays important role in various domain where the decision making process relies upon the observations that are derived from images [1]. Medical image diagnosis is best example of this where the disease of the patient is assured on the basis of the images such a MRI, CT Scan, X Rays. The process of extracting the features from images is done by using various image processing techniques. The object segmentation is also a part of the image processing or enhancement [2]. This study develops an algorithm Gabor-ANFIS for object segmentation in images. The motive of this development is to differentiate between the two different objects in the image which have similar features [3].

II. TECHNIQUES USED

In order to achieve the best suitable or reliable results, the present study considers the following defined mechanism:

2.1 Fuzzy Logics

The Fuzzy logic concept firstly was given by LoftiZadeh and they presented the fuzzy logic not as a control methodology but they represented the data as a membership function. Zadeh told the people about the adaptability of this logic that it does not need exact numerical information as a input as it is capable of adaptive control [4].

On the whole, we can say that fuzzy logic is a problem solving technique that range from simple embedded system to multi network workstations. Moreover it can be planted in software as well as in hardware or both [5]. Fuzzy logic gives a definite output in respect of the input whether it is noisy or missing. It gives the exact conclusions which are based on vagueness. Following figure 1 explains the working process of fuzzy system in brief. Firstly a

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AN IMPROVED AND SECURE ROUTING USING EC-ANTSEC FRAMEWORK IN MOBILE AD-HOC NETWORK

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Abstract— **Mobile ad hoc network comes in the category of wireless networks that do not require any fixed infrastructure or any base station. It is established by wireless mobile nodes. The topology of MANETs is dynamic in nature since the nodes can move randomly in any direction. Hence, due to this topology MANETs has to face various security challenges during routing and data transmission. In this paper EC-ANTSEC (Enhanced cluster based ANTSEC) framework is proposed that includes features like AODV+AntHocNet protocol, symmetric keys and clustering. Key management is an important part of any secure communication. So, in this paper a third party which is a certification Authority will generates symmetric keys using digital certificates to provide authentication check for network's nodes. This proposed work provides security to the data packets by injecting immunity packets thereby improving the packet delivery ratio, and throughput of the network and reduces the delay of the network. The main focus of this paper is to accommodate the large amount of traffic by using LmC clustering algorithm.**

Keywords— **Security, LmC, Routing, AntSec, Symmetric keys.**

I. INTRODUCTION

Previously there was a mainframe computer which is centrally located with terminals for various clients, as of now there is one or more than one computer for every individual. In Ubiquitous Computing, every individual will have numerous gadgets accessible in his or her surroundings (i.e., personal digital assistants, handheld digital devices, laptops or cell phones etc) and where power of computation will be accessible all over the place. The quality of devices of communication and ubiquitous computing makes remote systems a key answer for their collaboration. Consequently, the arena of wireless communication is developing to meet distinctive difficulties. Without a doubt, the most requested administration by versatile clients is connections of network and relating information administrations. The majority of the current associations among these devices which are wireless are based on infrastructure gave by private networks or providers of service. [1]

The popularity of wireless network in computing industry is increasing day by day. There are two types of mobile networks the one is infrastructure based network and other is infrastructure less network. In Infrastructure based network the mobile nodes will communicate with each other by using the base stations. The base stations acts as a bridge of the network. Office WLAN is one of the examples of such network. The infrastructure less network is also known as Ad-Hoc network with no fixed routers. In such network the movement and connections of the mobile nodes are random in nature. The nodes act as router that performs the functions of discovering and maintenance of route. Ad-Hoc network is useful in case if the cost of communication infrastructure is high or it is impossible to install a communication infrastructure. The Ad Hoc network is a collection of mobile nodes that form a network without the support of any central administration or pre-existing infrastructure. The nodes in such network can randomly move in any direction and organise themselves accordingly and makes the network dynamic in nature [2]. As the topology of MANETS changes rapidly that leads to various kind of security threats. In order to protect the network from such security threats various Secure Routing protocols has been invented but still sometime it becomes a challenging task to protect an open and

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Letter

Generation of terahertz (THz) radiation by p-polarised lasers beating in hot plasma with surface density ripple

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Abstract

The present communication deals with a scheme to generate terahertz (THz) radiation by electromagnetic Gaussian beams beating in a hot collisionless plasma having a density ripple on its surface, parallel to the z-axis. These p-polarised laser beams propagate in the x-z plane, incident obliquely to the density ripple on the plasma surface, and exert a ponderomotive force on electrons. The plasma electrons start oscillating because the plasma neutrality disturbed by the nonlinearity arises due to the ponderomotive force. This oscillatory velocity beats with the density ripple; as a result, an irrotational current density $\vec{J}^{NL}$ arises at the beating frequency $\omega_1 - \omega_2$ (with $\vec{\nabla} \times \vec{J}^{NL} \neq 0$). This nonlinear current density urges a wave whose frequency is in the THz range. Our results show that, for a set of laser and plasma parameters, the power of emitted THz radiation scales as the square of the density ripple amplitude, as well as the amplitude of the emitted THz wave, decreases with the THz frequency and increases with the incidence angle up to an optimum value. In our case, the maximum normalised amplitude of emitted THz radiation is reached up to 0.038 at laser intensity ~7×10^{14} W cm^{-2}, $\theta = 30°$ and electron temperature ~5 keV with 30% density ripple.

Keywords: THz radiation, laser, hot plasma, density ripple, oblique incidence

(Some figures may appear in colour only in the online journal)

1. Introduction

The interaction of an intense laser beam with plasma offers various wide-ranging prospective applications of terahertz (THz) in science and technology. The potential outcomes of utilizing THz radiation in environmental monitoring, security, communications technology, food and material sciences, THz imaging and spectroscopy, remote identification of explosive and dangerous chemicals, etc are actively studied by various researchers [1–4]. Non-ionizing THz radiation can be broadly used in biological and medical applications. Radiation reflected and transmitted through biological objects carries important information for analysis [5]. A promising technique for generating THz radiation is utilizing a short laser pulse [6]. In contrast with photoconductive antennas or optical rectification, laser coupling with the plasma gives an intense and broadband THz pulse. Researchers have both experimentally [7–10] and theoretically [11–19] proposed several techniques for efficient THz generation by considering plasma as a medium.

On the basis of a fluid model, coherent THz radiation was generated by the interaction of bunched relativistic electron beams with a helical wiggler pump [11]. By numerical analysis they showed that the presence of the ion channel can play

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PAPER

Generation of terahertz radiation by beating of two color lasers in hot clustered plasma with step density profile

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Keywords: terahertz radiation, clustered plasma, step density profile

Abstract

A theoretical model of terahertz generation is presented using nonlinear mixing of two lasers in clustered plasma with step density profile. The cluster is used as a target to enhance the optical to THz conversion efficiency. The lasers are incident obliquely to the clustered plasma surface and exert a ponderomotive force on cluster and plasma electrons. The ponderomotive force has a transverse component that drives nonlinear current and produces THz radiation in the reflected component. The enhancement in the efficiency of THz radiation generation occurs due to cluster plasmon resonance and by coupling between plasma and THz wave. The amplitude of generated THz wave is maximum when the plasma frequency approaches to THz frequency and laser frequency is equal to $\omega_{pe}/\sqrt{3}$, where ω_{pe} is cluster plasma frequency. Also, the amplitude is enhanced at an optimum angle of incidence. The dependence of efficiency of THz radiation generation on laser intensity, cluster radius and electron thermal velocity is also studied. We report the normalized THz wave amplitude ~0.044 from Ar cluster at 0.89 μm and 0.44 μm wavelengths of incident lasers with intensity $= 7 \times 10^{14}$ W cm^{-2}.

1. Introduction

The terahertz region of electromagnetic radiation spectrum has been an important area of research for the last two decades. THz radiation sources have a number of applications in remote sensing, biological and chemical imaging [1, 2], non destructive testing, high-field condensed-matter studies [3], short distance wireless communications and sensing [4], explosives detections [5] etc. In view of above mentioned applications, a variety of new schemes are proposed by various researchers to generate THz radiation. Laser based THz emitters involve wide band gap semiconductors, electro-optic crystals and photoconductive antennas [6–9]. However, all these media have the limitation of material breakdown and can not handle very high potential gradients. To overcome this limitation, plasma can be used as an interactive medium, which being in ionized state can handle very high potential gradients. Hence, plasma based THz radiation sources have the great potential for generating the broadband high-power THz pulses and have become the topic of attention for many researchers [10–19]. Bhasin and Tripathi [17] have presented a model of THz generation via optical rectification of a short pulse laser in rippled density plasma in the presence of an external magnetic field. They observed the power conversion efficiency of 0.04% of a laser of intensity 3×10^{15} W cm^{-2} in a 0.01% of critical density plasma with 30 kG. Kumar and Tripathi [18] have theoretically studied the process of THz generation by nonlinear mixing of two laser pulses propagating in a plasma at an angle to the density ripple wave vector. They observed the direct dependence of THz amplitude on the ripple orientation angle. Kumar *et al* [19] have reported THz radiation generation by beating of two laser pulses in a hot plasma with step density profile. The amplitude of generated THz radiation is increased due to coupling with plasma wave. They reported THz power of the order of 90MW with a laser of intensity 3×10^{16} W cm^{-2}, wavelength 1 μm and beam radius 100 μm.

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Effect of Titania Doping on Structural and Mechanical Properties of NiO/YSZ Anode Materials Sintered by Using Microwave Energy

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The current article presents first-hand work on the synthesis of nickel oxide–titania-doped yttria-stabilized zirconia (NiO-YZT) composites of composition $0.40NiO\text{-}0.60\{[(ZrO_2)_{0.92}(Y_2O_3)_{0.08}]_{1-x}(TiO_2)_x\}$ with $x = 0.00$, 0.03, 0.06, 0.09, 0.12 and 0.15 using microwave processing. The composites are prepared by mixed oxide method by taking yttria (Y_2O_3), titania (TiO_2) and monoclinic zirconia (ZrO_2) in their stoichiometric ratio and sintered by using conventional and microwave processing techniques. The investigation of prepared composites has been carried out by x-ray diffractometer, scanning electron microscope and Vickers hardness technique to probe the crystal structure, microstructure and mechanical properties. Also, the results obtained are compared for both the conventionally and microwave-sintering routes. It was inferred that the microwave-sintered NiO-YZT showed better results than the conventional samples in terms of greater density, uniform microstructure and better microhardness.

INTRODUCTION

Nickel-doped yttria-stabilized zirconia (Ni-YSZ) is a preferred material for solid oxide fuel cells (SOFC). It upgrades the performance of SOFCs owing to sufficient electronic conductivity, practical ionic conductivity and enhanced catalytic action required.[1] However, the major hindrances to its use are its sulfur intolerance and Ni agglomeration causing the long-term degradation of the catalytic action.[2] Raising the temperature of the electrode–electrolyte system can improve the physical contact, but may cause problems such as dimensional intolerance due to super-plastic deformation at high temperatures and the plausible reduction in mechanical strength under reducing conditions. A strengthened yttria-stabilized zirconia (YSZ) network is indispensable for the anode as the superior mechanical properties are the essential requirements for the SOFC anode.[3]

For the use of carbon-containing fuels, mixed electronic–oxygen ion-conducting ceramics such as titania-doped YSZ, i.e., YZT, are emerging rapidly.[4–11] The ionic conductivity of YSZ decreases on titania inclusion, whereas the electronic conductivity of the system improves with increasing titania (TiO_2) content. The decreasing ionic conductivity may be correlated to increasing tetragonality on titania addition. Another way of looking at it is that the titanium (Ti) ions are able to block oxygen ions and fewer sites are accessible to hopping of ions.[3,8,12] The valence change of ions from Ti^{4+} to Ti^{3+} and electronic n-type conductivity may be responsible for the total electronic conductivity.[12] The maximal solubility limit of titania (18–20 mol.%) cannot provide the required electronic conductivity to improve the long-term stability of the anode. Therefore, nickel (Ni) could be added to YZT to generate cermets of nickel and titania-doped YSZ (Ni-YZT) for this purpose.[2,13,14] It has been reported that Ni is an excellent catalyst, a current collector and fairly economical.[3,15] There are two conduction mechanisms possible for a cermet: one is ionic among the YSZ framework and the other is electronic among the nickel particles. For smaller Ni amounts < 30 vol.%, the former mechanism works, i.e., ionic, whereas for greater amounts, it is mainly an electronic pathway.[16]

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Effect of microwave and conventional processing techniques on mechanical properties of Strontium substituted hydroxyapatite

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ABSTRACT

The effect of different sintering routes: conventional and microwave sintering along with different sintering temperatures has been studied on Sr-doped hydroxyapatite bioceramics. The physical and mechanical properties of different samples synthesized at different sintering temperatures and sintering techniques have been evaluated by X-ray diffraction (XRD), Raman spectroscopy, Fourier transform infrared spectroscopy (FT-IR), scanning electron microscopy and microhardness. X-ray diffraction studies showed that microwave sintering suppresses the formation of secondary phases. The density, grain size along with microhardness was higher for samples sintered by microwave processing as compared to samples sintered by conventional technique. The results from different characterization techniques show that microwave sintering technique is not only efficient in terms of energy-saving and time reduction but also improves the formation of phases and mechanical properties.

1. Introduction

Biomaterials are those materials which are meant to interact with biological systems and are used in medical devices [1]. Advancements in biomaterials have significantly increased the lifetime of patients suffering from trauma, injuries, large bone defects, and osteoporosis. But, still, enhancements are required to improve the physicochemical and biological properties of biomaterials to mimic the natural bone [2,3].

For implantation and other orthopedic issues, Bioceramics are widely accepted due to their useful properties like non-toxicity and excellent biocompatibility [4]. Among different bioceramics, calcium phosphate-based bioceramics constitute a great promise for bone tissue engineering as they resemble the mammalian bone and teeth [5]. Single-phase hydroxyapatite (HA) or biphasic calcium phosphate (BCP) comprising β-tricalcium phosphate (TCP) is an interesting candidate for synthetic bone substitution applications [6,7]. Hydroxyapatite provides a scaffold for osteoconduction and β- TCP oversaturates the local environment with Ca^{2+} and PO_4^{3-} ions to speed up the new bone formation [8]. HA/β-TCP ratio predicts the extent and rate in vivo resorption of biphasic calcium phosphate, higher β-TCP content allows rapid and substantial resorption [9]. However, the solubility of HAp is poor as compared to other bioceramics which affect the rate of biodegradation in vivo and increases patient's rehabilitation time [10]. The solubility of bioceramics is affected by chemical composition, crystallinity, particle size, surface area, pore size, density/porosity and extent of ionic substitution in HAp lattice [11–13]. To improve the mentioned properties, several methods like variation of sintering techniques and temperature, granule size, and electrical polarity have been proposed [14]. Besides these methods, ionic substitution is also considered to improve the solubility of HAp and hence osteoconductivity [15].

The biological apatite contains trace ions like Na^+, Sr^{2+}, Mg^{2+}, Zn^{2+}, SiO_4^{4-}, SO_4^{2-}, F^- etc. and is non –stoichiometric [16]. These ions play a vital role in bone metabolism. But, synthetic hydroxyapatite is stoichiometric and deficient of these ions which make it a poor bone repair material [17]. But, the properties of synthetic hydroxyapatite can be improved by ionic substitution. After ionic substitution, HAp more closely mimics the biological HAp [18]. From the above-mentioned ions, Sr^{2+} ion helps to maintain the balance between the bone formation and resorption process in vivo and low dosage of Sr^{2+} helps in increasing bone mass and volume. It also accelerates the osteogenic differentiation of mesenchymal stem cells and enhances the functionality of osteoblasts [19].

Synthesis of hydroxyapatite has been reported by several different

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A novel bi-parametric sixth order iterative scheme for solving nonlinear systems and its dynamics☆

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ABSTRACT

In this paper, we propose a general bi-parametric family of sixth order iterative methods to solve systems of nonlinear equations. The presented scheme contains some well known existing methods as special cases. The stability of the proposed class, presented as an appendix, is used for selecting the most stable members of the family with optimum numerical performance. From the comparison with some existing methods of similar nature, it is observed that the presented methods show robust and efficient character.

1. Introduction

Constructing fixed point methods for solving nonlinear equations and systems of nonlinear equations is one of the most attractive topics in the theory of numerical analysis, with wide applications in science and engineering. A great importance of this topic has led to the development of many numerical methods, most frequently of iterative nature (see [1–5]). With the advancement of computer hardware and software, the problem of solving nonlinear equations by numerical methods has gained an additional importance.

In this paper, we consider the problem of finding solution of the system of nonlinear equations

$$\mathbf{F}(\mathbf{x}) = \mathbf{0},$$

by iterative methods of a high order of convergence. This problem can be precisely stated as to find a vector $\mathbf{r} = (r_1, r_2, \ldots, r_n)^T$ such that $\mathbf{F}(\mathbf{r}) = \mathbf{0}$, where $\mathbf{F} : D \subseteq \mathbb{R}^n \to \mathbb{R}^n$ is the given nonlinear vector function $\mathbf{F}(\mathbf{x}) = (f_1(\mathbf{x}), f_2(\mathbf{x}), \ldots, f_n(\mathbf{x}))^T$ and $\mathbf{x} = (x_1, x_2, \ldots, x_n)^T$. The solution vector $\mathbf{r}$ of $\mathbf{F}(\mathbf{x}) = \mathbf{0}$ can be obtained as a fixed point of some function $\Phi : \mathbb{R}^n \to \mathbb{R}^n$ by means of the fixed point iteration

$$\mathbf{x}^{(k+1)} = \Phi(\mathbf{x}^{(k)}), \quad k = 0, 1, 2, \ldots$$

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A SEVENTH ORDER TRANSFORMATION METHOD FOR MULTIPLE ROOTS AND ITS BASINS OF ATTRACTION

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Abstract In this contribution, a novel seventh-order transformation method is proposed and analyzed for finding multiple roots of nonlinear equations, when the multiplicity of the root is not known explicitly. The proposed method does not require the evaluation of second derivative. The basins of attraction of the proposed method are also presented in comparison to existing transformation methods in the literature.

Keywords: Nonlinear equations· Iterative method· Multiple root· Order of convergence· Basins of Attraction.

Mathematics Subject Classifications (2010): 65B99, 65H05.

1 Introduction

In this study, we apply iterative methods to find a multiple root α of multiplicity $m > 1$, i.e. $f^{(j)}(\alpha) = 0$, $j = 0, 1, ...m-1$ and $f^{(m)}(\alpha) \neq 0$, of a nonlinear equation $f(x) = 0$, where $f(x)$ be the continuously differentiable real or complex function. Modified Newton method [1] is an important and basic method for finding multiple roots

$$x_{k+1} = x_k - m\frac{f(x_k)}{f'(x_k)}, \tag{1}$$

which converges quadratically and requires the knowledge of multiplicity m of root α.
In order to improve the order of convergence of (1), several higher-order methods have been proposed in the literature with known multiplicity m, for example, [2–28]. On the other hand, if multiplicity m is not known explicitly, Traub [29] suggested a simple transformation:

$$F(x) = \begin{cases} \dfrac{f(x)}{f'(x)} & \text{if } f(x) \neq 0\ , \\ \\ 0 & \text{if } f(x) = 0, \end{cases} \tag{2}$$

to find a multiple root of $f(x) = 0$, thereby reducing the task of finding a multiple root to that of solving a simple root of the transformed equation $F(x) = 0$. Thus any iterative method can be used to preserve the original order of convergence. However, with this transformation, we get second order transformed Newton method given by

$$x_{k+1} = x_k - \frac{f(x_k)f'(x_k)}{f'(x_k)^2 - f(x_k)f''(x_k)}, \tag{3}$$

which requires the use of $f'(x)$ and $f''(x)$. In order to avoid the calculations of these derivatives, King [30] proposed the secant method, with unknown multiplicity for finding multiple roots of nonlinear equation, which used another transformation:

$$F(x) = \frac{-f^2(x)}{f(x - f(x)) - f(x)}. \tag{4}$$

The secant method thus obtained has order of convergence 1.618.
Using the same transformation (4), Iyengar and Jain [31] developed two iterative methods of order three and four for finding multiple roots of nonlinear equations. The third order method is given as:

$$x_{k+1} = x_k - l_1 - l_2, \tag{5}$$

where

$$\begin{aligned} l_1 &= \frac{F(x_k)}{G(x_k)}, \quad l_2 = \frac{F(x_k - l_1)}{G(x_k)}, \\ G(x_k) &= \frac{F(x_k + \beta F(x_k)) - F(x_k)}{\beta F(x_k)}. \end{aligned} \tag{6}$$

and fourth order method is expressed as:

$$x_{k+1} = x_k - l_1 - l_2 - l_3, \tag{7}$$

where l_1 and l_2 are as defined in (6) and $l_3 = \dfrac{F(x_k - l_1 - l_2)}{G(x_k)}$.

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A two dimensional problem on laser pulse heating in thermoelastic microelongated solid

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Abstract In the present discussion, the plane strain deformation due to laser pulse heating in a thermoelastic microelongated solid has been discussed. The analytic expressions for displacement component, force stress, temperature distribution and micro-elongation have been derived. The effect of pulse rise time and micro-elongation on the derived components have been depicted graphically.

Keywords: Laser pulse; Thermoelasticity; Normal mode; Microelongation

1 Introduction

In modern engineering and science, laser heating has become a very prominent aspect of surface modification. Laser finds a wide application in material deformation and geological treatments of particles. Consequently, the laser is an exceptionally flexible device for carrying out the change in the surfaces of materials, with the depth of material which is affected may

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Cross-focusing of a quadruple Gaussian laser beam in plasma in the relativistic regime

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Abstract

The present study explores the phenomenon of cross-focusing of two quadruple Gaussian laser beams, each comprising four identical Gaussian beams whose axes are in the z-direction but shifted from the z-axis by a distance x_o along positive and negative x- and y-axes in an underdense plasma. The nonlinearity arising due to the relativistic mass effect is taken into consideration. Nonlinear partial differential coupled equations governing the dynamics of two beams are solved using the paraxial ray approximation. The nonlinearity of the medium depends upon the intensities of both beams, leading to the cross-focusing effect. The effect of the initial laser intensity on the cross-focusing mechanism is analyzed. The focusing of the beam is observed to be enhanced in the presence of the cross-focusing mechanism.

Keywords: quadruple Gaussian laser beam, cross-focusing, relativistic nonlinearity

(Some figures may appear in colour only in the online journal)

1. Introduction

Various researchers have explored the different nonlinear phenomena that arise in laser–plasma interactions, such as soliton formation, harmonic generation, self-phase modulation, group velocity dispersion, self-focusing and cross-focusing of electromagnetic waves [1–4]. Among these, cross-focusing of electromagnetic waves in plasma has been extensively studied due to its importance in plasma wave excitation and particle acceleration [5, 6]. Sodha *et al* [7] have studied the cross-focusing of two coaxial Gaussian laser beams in magnetoplasma with ponderomotive nonlinearity. The effect of relativistic nonlinearity on the cross-focusing of two Gaussian laser beams in plasma has been explored by Esarey *et al* [8] and Kumar *et al* [9]. Gupta *et al* [10] have investigated the cross-focusing of two high-power laser beams in plasma and studied the effect of their coupling on the power of electron plasma waves. They showed in their results that the maximum power flux of the generated electron plasma wave is of the order of 6×10^{17} W cm^{-2} with the powers of incident beams being 3.6×10^{18} W cm^{-2} and 3.2×10^{18} W cm^{-2}. Cross-focusing of multiple Gaussian beams considering the nonlinearity arising due to ohmic heating of the electrons in fully ionized magnetoplasma was studied by Sodha *et al* [11]. They observed that, due to ionic thermal conduction, the extent of the cross-focusing decreases at high magnetic field values and increases at the low magnetic field values. The effect of external magnetic field on the cross-focusing of circularly polarized Gaussian laser beams when the extraordinary and ordinary modes are present simultaneously was studied by Asthana *et al* [12]. They found that the nonlinearity arising due to relativistic variation of the electron mass leads to the mutual coupling of the two modes, with mutual support for self-focusing.

In the last few years, many researchers have studied the techniques of combining multiple beams in order to obtain a very high power density at the target [13, 14]. A quadruple Gaussian laser beam is one of the outcomes of these studies [15]. A quadruple Gaussian laser beam is formed by combining four coherent Gaussian laser beams propagating along the

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Relativistic Self-Focusing of Hermite-cosh-Gaussian Laser Beam in Magnetoplasma with Exponential Plasma Density Ramp

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Abstract *In the present manuscript, we analyse the effect of exponential plasma density ramp for relativistic self-focusing of Hermite-cosh-Gaussian laser pulse in magnetoplasma. The exponential plasma density ramp is found to be more prominent in achieving the stronger self-focusing of Hermite-cosh-Gaussian laser beam in comparison to the tangential plasma density ramp. We propose a theoretical model for propagation of Hermite-cosh-Gaussian laser pulse in magnetoplasma with exponential density ramp. The nonlinearity in the medium arises because of the relativistic motion of electrons, being responsible for relativistic self-focusing. Equation of the beam width parameter is set up by taking the expression for the dielectric function and following Wentzel-Kramers-Brillouin (WKB) with paraxial ray approximations for mode indices $m = 0$, 1 and 2. Effect of decentered parameter is also analysed, which results in stronger self-focusing of the Hermite-cosh-Gaussian laser beam. Stronger self-focusing of laser beam is more pronounced in high density plasma with higher magnetic field.*

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Key words: self-focusing, decentered parameter, exponential density ramp, Hermite-cosh-Gaussian beam

1 Introduction

In the last few years, interaction of the laser beam with plasma has been world widely studied because of its unique applications, which include inertial confinement fusion,[1−3] the laser electron acceleration,[4−6] self-focusing, harmonic generation[7] etc. Among these nonlinear effects one of the most important effects is self-focusing, which has been very fascinating area of research for past few years. Whenever high power laser beam penetrates through plasma, dielectric function of the plasma is modified due to the oscillatory velocity of electrons and hence results in relativistic self-focusing. Focusing and defocusing of the first six TEM_{0p} Hermite-cosh-Gaussian laser beam in collisionless plasma was studied by Takale *et al.*[8] and it was observed that, the modes with the odd p-values defocuses whereas, with even p-values show oscillatory along with defocusing behavior of the beam.

"Gaussian beam" normally implies radiation confined to the fundamental (TEM_{00}) mode, is a of monochromatic light having transverse magnetic and amplitude given by the Gaussian function. However, in case of Hermite cosh Gaussian (HchG) beam, paraxial solutions of the Helmoltz equation as Hermite-sinusoidal-Gaussian beams, which was given by Casperson and Tovar.[9] Special case of the Hermite-sinusoidal Gaussian beams is the distribution at $z = 0$ is known as HchG beam. Hermite-cosh-Gaussian beam can be obtained in the laboratory by the superposition of two decentered Hermite-Gaussian beams as cosh-Gaussian ones. Propagation of such HchG beam in plasmas was studied theoretically by Belafhal and Ibnchaikh[10] and Patil *et al.*[11]

A theoretical model was presented to produce THz radiation by two cross-focused copropagating Gaussian laser beams in a density rippled magnetized plasma.[12] They concluded that with the increase in magnetic field, amplitude of the THz radiation generation increases significantly. Optimization of the laser-plasma parameters gives the radiated normalized THz power of the order of 10 kW. Also, it was observed that circularly or elliptically polarized THz radiation can be generated when a static magnetic field is imposed on a gas target along the propagation direction of a two-color laser driver.[13] Fujioka *et al.*[14] observed the kilo Tesla (kT) magnetic fields using a capacitor-coil target, in which two nickel disks are connected by a U-turn coil. A magnetic flux density of 1.5 kT was measured during the Faraday effect 650 μm away from the coil, when the capacitor was driven by two beams from the GEKKO-XII laser. Wang *et al.*[15] investigated the fast ignition via integrated particle-in-cell simulation including both generation and transport of fast electrons. With this scheme it is demonstrated that two counter propagating, 6 ps, 6 kJ lasers along the magnetic field transfer 12% of their energy to the core, which is then heated to 3 keV.

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Effect of cross-focusing of two Laser beams on THz radiation in graphite nanoparticles with density ripple

Shivani Vij

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The Influence of Various Dopants and Sintering Techniques on the Properties of the Yttria-Ceria-Zirconia System As an Electrolyte for Solid Oxide Fuel Cells

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Zirconia-based ceramic oxides $Zr_{0.90}Y_{0.06}Ce_{0.02}X_{0.02}O_{2-\delta}$ (X = Ca, Fe, La, Sr, and Mg) were prepared by conventional and microwave processing. The precursors of $Zr_{0.90}Y_{0.06}Ce_{0.02}X_{0.02}O_{2-\delta}$ (X = Ca, Fe, La, Sr, and Mg) were prepared by a mixed oxide method and were calcined at 600°C in an electric furnace. The powders were consolidated in pellet form and sintered in a conventional electric furnace at 1400°C for 6 h and compared using microwave energy at 1400°C for 20 min. The structure and microstructure of sintered products obtained by both methods were studied by x-ray diffraction and scanning electron microscopy. Their density and microhardness were also compared. The electrical conductivities of these samples were studied using alternating current impedance spectroscopy. The analysis of the products obtained by microwave aand conventional methods shows that the microwave sintered samples have uniform grain growth, higher density, higher microhardness and higher electrical conductivity than the corresponding conventionally sintered products. The microwave sintered sample of composition $Zr_{0.90}Y_{0.06}Ce_{0.02}Ca_{0.02}O_{2-\delta}$ was found to have the highest density and microhardness, as well as the highest electrical conductivity among all of the microwave and conventionally sintered products.

Key words: Microwave processing, grain size, microhardness, fuel cells

INTRODUCTION

Solid oxide fuel cells (SOFCs) are electrochemical devices that can convert the chemical energy of a fuel into electricity with high efficiency. They have multifuel capability and flexibility in their operation. The basic structure of an SOFC consists of a solid ceramic electrolyte sandwiched between two porous electrodes (cathode and anode), combined with interconnectors and sealants.[1] The SOFCs use ceramic electrolytes to allow the transport of oxygen vacancies (O^{2-}). The electrolyte of an SOFC must be dense and should have high ionic conductivity along with minimum electronic conductivity. Further, it should have large stability under oxidizing and reducing atmospheres along with good mechanical and thermal properties at operating temperatures. The SOFCs using zirconia-based electrolytes operate at very high temperatures, ranging from 800°C to 1000°C, for high ionic conduction. Such a high operating temperature leads to the high cost, thermal expansion mismatch, and the degradation of other cell components.[2,3] Therefore, there is a need to develop electrolyte materials that can exhibit sufficient conductivity at a lower temperature and provide an opportunity to reduce the operating temperature of SOFC systems.

Zirconia electrolytes have high ionic conductivity, high mechanical and chemical stability and less electronic conductivity in the oxidizing

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Effect of Microwave Sintering on the Properties of Zirconia Based Ceramic Electrolytes for Solid Oxide Fuel Cells

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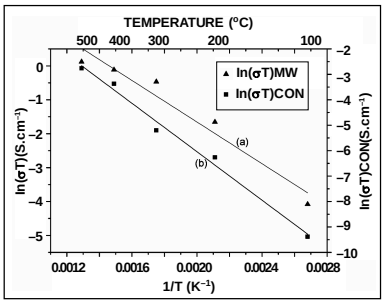
ABSTRACT

In this work, the effect of microwave sintering on the properties of scandia doped zirconia (10 mol% scandia in zirconia) was investigated. The sample was prepared by mixed oxide method and the sintering was done at the temperature of 1400°C for 20 min using a 2.45 GHz microwave furnace. Sintering behavior of this microwave sintered ceramics was compared with the corresponding conventional sintered ceramics, sintered at 1400°C for 6 h in a conventional furnace. It was found that both the sintering processes produced highly dense samples. X-ray diffraction analysis confirmed the presence of only cubic structure in both the samples. Scanning electron microscopy study was done for micro-structural analysis. Further, electrical conductivity was studied from room temperature to 500°C in the frequency range of 1 kHz to 1 MHz. Higher ionic conductivity was recorded for microwave sintered sample than the corresponding conventional sintered sample.



[Keywords: Ceramics, Solid oxide fuel cell, Electrolyte, Microwave sintering]

Introduction

As we know, at present, majority of the energy demand is met by the fossil fuels. However, due to the problem of limitation of conventional sources and the global need to reduce emissions of the greenhouse gases, there is a growing interest towards the development of renewable energy technology with less negative environmental impact. Fuel cells with fuel flexibility, energy efficiency and cleanliness have the potential to provide power in portable and stationary power applications and replace the internal-combustion engine in vehicles. Hence, one can expect fuel cells to be good substitution of the conventional power sources.[1, 2] Among different types of fuel cells available, a solid oxide fuel cell (SOFC) has shown great potential for industrial scale production. It is an electrochemical device that produces electricity very efficiently from the reaction of fuel and air, without production of harmful by-products. The electrolyte acts as a channel between the electrodes through which O^{2-} ions move in between the electrodes.[3, 4] It consists of three parts: anode, cathode and the electrolyte. These solid oxide fuel cells use metal oxide solid ceramic electrolytes for movement of O^{2-} ions. But sufficient ionic conduction is possible only at high operating temperatures, which, in turn, put a great pressure on material selection for other components of SOFC.[5]

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As a result, recent developments are focussed on improving the material property or modifying processing routes to reduce the working temperature of the SOFC. In this direction, microwave sintering is an enhanced technique in material processing in which microwave energy is delivered directly to materials through molecular interaction with the electromagnetic field. This technique of energy transfer can result in many possible advantages of using microwaves for processing of materials. Because microwaves can penetrate materials and deposit energy, heat can be generated throughout the volume of the material. The mechanism of heat generation during microwave-material interaction is complex and consists of absorption of electromagnetic radiation by materials due to their intrinsic dielectric properties.[6, 7] This non-conventional heating method can modify sintering mechanisms, resulting in changes in the microstructure and phase composition of the consolidated materials, while, at the same time, reduces the processing time and energy consumption.[8–10]

The aim of the present work is to examine the sintering behavior of scandia doped zirconia electrolyte. The most commonly used electrolyte materials are doped zirconia, doped ceria, doped bismuth oxides, etc.[11] Scandia doped zirconia is stable in reducing conditions and its thermal and mechanical properties are similar to those of yttria stabilized zirconia, which is the most commonly used material as an SOFC electrolyte. It has

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A Modified Newton–Özban Composition for Solving Nonlinear Systems

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In this work, a modified Newton–Özban composition of convergence order six for solving nonlinear systems is presented. The first two steps of proposed scheme are based on third-order method given by Özban [Özban, A. Y. [2004] "Some new variants of Newton's method," *Appl. Math. Lett.* **17**, 677–682.] for solving scalar equations. Computational efficiency of the presented method is discussed and compared with well-known existing methods. Numerical examples are studied to demonstrate the accuracy of the proposed method. The basins of attraction of some of the existing methods along with the proposed method are given to exhibit their performance.

Keywords: Nonlinear systems; Newton method; Özban's method; order of convergence; computational efficiency; basins of attraction.

1. Introduction

Approximating the solution of nonlinear systems is one of the most investigated topics in numerical analysis and plays an essential role in many areas such as science and technology [Ortega and Rheinboldt (1970); Traub (1977)]. These nonlinear systems of equations have been widely studied due to their diverse range of existence in many fields. The importance of this topic has led to the development of

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Complex Dynamics of Phytoplankton-Zooplankton Interaction System with Predation and Toxication Delay

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Abstract

In this manuscript, we propose a two-dimensional complex plankton dynamics of phytoplankton and zooplankton interacting species to investigate the impact of multiple delays, viz., predation and toxin liberation delay. We consider predation delay (PD) in the zooplankton population and toxin liberation delay (TLD) in both populations namely, the phytoplankton and zooplankton species. It is observed that the given system is bounded and positive with and without delay under certain conditions. The conditional local and global stabilities of different equilibrium points are obtained. The stability and instability of the delayed system have been discussed analytically and numerically to show the existence of Hopf-bifurcation and its properties for all possible combinations of both delays about the positive equilibrium of the plankton system. The study of different parameters has been carried out to discuss the occurrence and non-occurrence of planktonic blooms. It is concluded that variation in zooplankton predation delay and toxin liberation delay may lead to unstable the plankton system through the existence of periodic oscillations with the occurrence of planktonic blooms.

Key Words: Plankton, Predation delay, Toxin liberation delay, Hopf-bifurcation, Central manifold theorem.

1 Introduction

In the study of the aquatic ecosystem, it is very important to understand the dynamics of plankton populations, their interactions, survival, and extinction. Phytoplankton population is a biological wealth of oceans, a vital link in the food chain, gobble up carbon dioxide and generate almost 50-80 percent of oxygen present in the earth's atmosphere for the survival of living organisms. Some scientists have observed that the global phytoplankton population has declined continuously due to the rising of sea surface temperature. So, it is very essential to study the plankton ecosystem for environmental balance.
In the marine ecosystem, one of the important properties related to the phytoplankton population is their excessive growth resulting in the occurrence of massive plankton blooms.

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Comparison of microwave and conventionally sintered manganese and niobium doped lanthanum germanate based apatites by micro Raman Spectroscopy

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HIGHLIGHTS

- Sintering of apatites have been done by conventional and microwave processing.
- The XRD revealed that the sintered products had single Phase hexagonal oxy apatite.
- Raman Spectroscopy revealed that monoclinic phase was also present in the apatites.
- Microwave sintered products had uniform grain growth and higher density.
- Microwave sintered products had higher hardness and conductivity value.

ARTICLE INFO

Keywords:
Micro Raman spectroscopy
XRD
SEM and hardness

ABSTRACT

In this paper, the effect of microwave and conventional sintering on doping behaviour of Mn^{2+} and Nb^{5+} in lanthanum germanate based apatite have been compared. The precursor of apatite has been prepared by mixed oxide method and conventionally calcined at 1100 °C for 6 h. The resulting powders have been sintered by microwave energy at 1400 °C for 30 min and by conventional heating 1400 °C for 4 h. The products prepared have been characterized by X-ray diffraction, scanning electron microscope, Micro Raman spectroscopy, and Vicker's hardness and the results are compared. The apatites of similar compositions sintered by microwave energy have higher density and hardness than the apatites sintered by electric heating.

1. Introduction

The ideal general formula of apatite is $A_{10}M_6O_{24}X_2$ (A = alkaline earth, rare earth; M = P, Si Ge) and (X = OH, O and halide). Its applications ranging from biomaterial to electrolytes have been of interest and therefore highly researched [1]. Hassan et al. have written a review on microwave-assisted techniques for the synthesis of nano hydroxyl apatite but they did not cover the sintering of hydroxyapatite [2]. Transparent hydroxyapatite was prepared first time in the Microwave Processing & Engineering Center of Material Research Institute, Penn State by the group of Agrawal. They had used fine crystalline material prepared by hydrothermal process and microwave sintering of the fine powder at 1150 °C within 5 min of soaking time [2–5]. In another work, the group used microwave processing in the preparation of HAP/ZrO_2 composites to avoid loss of calcium phosphate. They could prepare HAP/ZrO_2 by microwave processing at the temperature as low as 1200 °C within 20 min of sintering time. Conventionally HAP/ZrO_2 was prepared at 1200 °C in 240 min which led to the loss of calcium phosphate [6]. The sintering of hydroxyapatite to be used as a biomaterial has been reported by the group of Singh [7].

In the year 1995, Nakayama et al. investigated lanthanum silicate-based apatites $La_{10}(SiO_4)_6O_3$, (Ln = La, Nd, Sm, Gd, Dy, Y, Ho, Er and Yb) for its applications as an ionic conductor [8] and later lanthanum germanates was also studied for the applications as ionic conductors [9] to be used at intermediate temperature in the solid oxide fuel cells (SOFC). Since the $La_{9.33+2x/3}(Si/Ge)_6O_{26+x}$ apatites have a conductivity

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MOFPL: Multi-objective fractional particle lion algorithm for the energy aware routing in the WSN

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Normalized network energy

ABSTRACT

Wireless Sensor Networks (WSN) has wider applications in the fields of the healthcare, military, and the weather monitoring. The efficient design of the WSN requires better energy optimization techniques, since the nodes in the WSN are battery operated. The traditional energy aware routing mechanisms neglect the delay, and the traffic rate of the WSN while improving the energy constraints in the node. This work overcomes these challenges by introducing a multi-objective energy aware routing protocol. This paper proposes the multi-objective fitness function based on the energy, delay, traffic rate, distance, and the cluster density. The energy-aware routing is done based on the proposed Multi-objective fractional particle lion algorithm (MOFPL). The proposed MOFPL algorithm finds the optimal cluster head from various cluster head nodes in the WSN. Then the optimal routing path is established based on the proposed multi-objective function. The proposed MOFPL algorithm has 5, 8, 10 alive nodes at the iteration round of 2000 for the WSN with 50, 75, and 100 nodes, respectively. Also, the proposed MOFPL algorithm has achieved higher normalized network energy of 0.05877 and 0.06022 for the WSN with 50 and 100 nodes, respectively.

1. Introduction

A Wireless sensor network (WSN) [1–4] contains a collection of sensors connected to the wireless medium. The WSN model is powered by the base station which acts as an access point for the series of the sensor devices in the network. The WSN finds application in the various fields, such as weather monitoring, meteorological data collection, and field surveillance [5]. The advancement in the WSN has resulted in the impact in the real-time applications, such as military, science, industry, commerce, transportation, and health-care. The efficiency of the WSN directly depends on the quality of the sensors present in it. The sensors in the WSN need to have better precision, accuracy, and robustness to noise [6]. The sensors [7–9] in the WSN are affected due to the various noise factors from the internal and the external environments. The noise of the surrounding hardware components in the WSN also affects the performance of the sensor nodes. The sensor nodes in the WSN are separated with the large distance. The communication between the sensors nodes is achieved with the wireless channel with low power. The base station effectively collects the data from the sensors and generates the necessary query for the each node [10–19].

The term routing defines the way of sending the packets between the sensor nodes and the base station of the WSN through the wireless communication medium. The main challenge during the routing of the nodes is the consideration

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Broad-band microwave absorption and magnetic properties of M-type $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ hexagonal ferrite in 18.0–26.5 GHz frequency range

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Abstract

La-Na co-substituted M-type Co-Ti-Mn barium hexaferrites $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ ($0.00 \leq x \leq 0.25$) were synthesized by conventional solid-state method. The influence of La-Na doping on the magnetic properties was investigated through VSM (vibrating sample magnetometer). The room temperature hysteresis loops show that the saturation magnetization decreases from 55.667 emu/g for x = 0.00 to 44.768 emu/g for x = 0.25 sample. To determine the complex permittivity ($\varepsilon_r = \varepsilon' - i\varepsilon''$) and permeability ($\mu_r = \mu' - i\mu''$) in 18.0–26.5 GHz frequency range, a vector network analyzer was employed. Reflection loss (RL) values were simulated from the values of ε_r and μ_r acquired using transmission line theory. The minimum RL obtained for the sample x = 0.10 is –45.94 dB (99.997 % signal absorption) with an absorption bandwidth of 8.33 GHz for 1.3 mm sample thickness. Thus, the synthesized hexaferrites can be utilised in electromagnetic shielding and radar stealth technology applications.

Keywords: Microwave absorption; EMI; K-band; M-H loops, Saturation magnetization; RL.

1 Introduction

The vast evolution of wireless communication in the gigahertz frequency range has expanded the issue of EMI (electro-magnetic interference), impeding the functioning of electronic gadgets. Electromagnetic materials with remarkable magnetic and dielectric losses in microwave frequencies are used to reduce the impact of EMI and enhance the working of microwave gadgets [1–5]. Since a long time, the spinel ferrites have been used for microwave absorbing applications; but they cannot be used at high frequencies due to their lower ferromagnetic resonance frequency (less than 1 GHz) [1,6]. The hexaferrites with magneto-plumbite (M-type) structure like $BaFe_{12}O_{19}$, $SrFe_{12}O_{19}$ and $CaFe_{12}O_{19}$ are the

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Model of adaptive WiMAX network incorporating diverse transforms

Lavish Kansal[1] · Vishal Sharma[2] · Jagjit Singh[3]

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Abstract
Recent advancements in mobile Worldwide Interoperability for Microwave Access (WiMAX) standards have led to the development of more reliable, robust and efficient broadband networks that can provide access for both fixed and mobile users. The physical layer of a WiMAX network is composed of orthogonal frequency-division multiplexing (OFDM) technology, which allows it to provide elevated data rates with minimum distortion in fading environments. However, the presence of interference affects the orthogonality of the OFDM sub-carriers, which increases the probability of network errors. The error probability can be reduced by increasing the output power level at the expense of an elevated peak-to-average power ratio (PAPR). In this work, discrete wavelet transforms (DWTs) and fractional Fourier transforms (FrFTs) are used to augment the reliability and efficiency of an adaptive WiMAX system. The results show considerable improvements in both bit error rate (BER) reduction and spectral efficiency enhancement at a given signal-to-noise ratio (SNR). In addition, a significant PAPR reduction is attained when the DWTs and FrFTs are used in place of fast Fourier transforms. Moreover, the proposed adaptive algorithm realizes a spectral-efficient WiMAX system that enables the system to select the suitable transform strategy (DWT/FrFT) with minimum SNR requirements to achieve the target BER of 10^{-4}.

Keywords WiMAX · DWT · FFT · FrFT · BER · PAPR

1 Introduction

Wide area access technologies will soon be replaced by broadband wireless access (BWA) networks because of their simpler equalisation mechanisms, higher spectral efficiencies and resilience in multipath fading environments. BWA networks can deliver high-speed mobile and data services to both small/medium-sized organisations and domestic users because of characteristics such as ease of installation, high levels of adaptability and increased reliability. BWA potentially offers a good option for users who are either dissatisfied with or otherwise unsupported by existing wired broadband services. The standardised version of BWA is WiMAX, which is also known as the IEEE 802.16 standard, and it has the capability to provide higher data rates to many users, even during high traffic scenarios. Additionally, the use of OFDM for the physical layer allows WiMAX to provide a more reliable service in multipath fading environments [1]. The various well-known versions of IEEE 802.16 are as follows [2]:

a) IEEE 802.16: Designed for use in line-of-sight (LOS) environments and operating in the 10–66 GHz frequency range.
b) IEEE 802.16a: Designed for use in non-line-of-sight (NLOS) environments and operating in the 2–11 GHz frequency range.
c) IEEE 802.16d: Initially defined for maintenance and system profiles for operation in the 2–11 GHz frequency band, but was later merged with 802.16-2004.
d) IEEE 802.16e: Described as a standard for mobile broadband wireless access systems.

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Investigation on R–S Coded Coherent OFDM Free Space Optical (CO-OFDM-FSO) Communication Link Over Gamma–Gamma Channel

Rajan Miglani[1] · Jagjit Singh Malhotra[2]

Abstract
Atmospheric turbulence is known to significantly degrade the efficiency and reliability of free space optical communication link. Use of coded-orthogonal frequency division multiplexing (OFDM) technique to mitigate the effect of adverse atmospheric conditions on free space optical (FSO) communication link has been proposed here. With Gamma–Gamma distribution for channel modeling, the error performance of the proposed RS8 (Reed Solomon) coded, 128 sub-carrier OFDM link has been investigated using coherent BPSK and QPSK modulation scheme. The results obtained from this analysis have also been compared with intensity modulated/direction detection (IM/DD) based OOK-OFDM FSO link. In case of strong turbulence and for target BER of 10^{-4}, it was observed that BPSK and QPSK modulated OFDM FSO link achieve a descent coding gain of 18.2 dB and 12.6 dB respectively over non coded OOK-OFDM FSO link. Also, it was observed that as the link conditions worsened from weak to strong turbulence, the effect of atmospheric impairments on FSO link becomes significantly pronounced. Additionally, in terms of BER performance, the BPSK modulated link out-performed QPSK and OOK under all the considered channel conditions.

Keywords Atmospheric turbulence · Bit error rate (BER) · Free space optical communication (FSO) · Orthogonal frequency division multiplexing · Reed–Solomon (RS) coding

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Multiuser Massive MIMO-OFDM System Incorporated with Diverse Transformation for 5G Applications

Lavish Kansal, Vishal Sharma & Jagjit Singh

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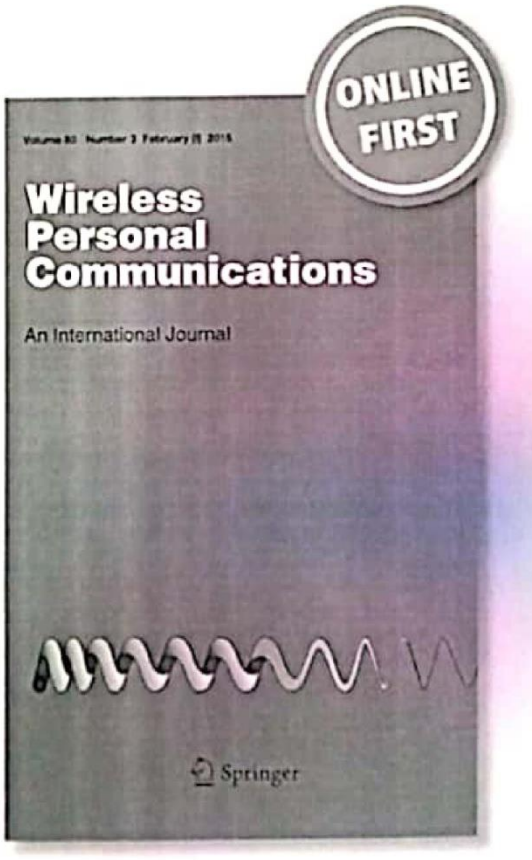

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ORIGINAL PAPER

Performance enhancement of high-capacity coherent DWDM free-space optical communication link using digital signal processing

Rajan Miglani[1] · Jagjit Singh Malhotra[2]

Received: 7 January 2019 / Accepted: 6 September 2019

Abstract
In this paper, 1.28 Tbps (32×40 Gbps) high-capacity DWDM-FSO link has been investigated for performance enhancement using coherent detection and digital signal processing (DSP). The DP-16QAM-modulated proposed DWDM-FSO link has been analyzed for both adverse weather and turbulent atmospheric conditions. It is observed that when link is subjected to strong turbulence along with adverse weather conditions, the DSP-aided coherent DWDM-FSO receiver achieves target bit error rate (BER) of 10^{-4} at signal-to-noise ratio (SNR) of 36.4 dB, while for similar conditions, the SNR requirements for IM/DD-based DWDM-FSO link shoots by 12.8 dB to 49.2 dB. Also, in terms of operational link range, the proposed link even under strong turbulent conditions serves 1.88 km, whereas IM/DD link was restricted to mere 1.12 km for target of BER of 10^{-4}, thus producing a decent range increment of 760 m. The proposed link has been designed and investigated using OptiSystem™ 14.2.

Keywords Free-space optical communication · Coherent detection · Digital signal processing DWDM · Atmospheric turbulence · Gamma–Gamma channel modeling

1 Introduction

Free-space optical (FSO) communication technology is being seen as possible last mile solution which can help deliver high-speed data services to the end users [1, 2]. It has already found its application in secure military communication networks, deep-space communication and disaster-affected areas as plug and play device [3]. Free-space optical (FSO) communication involves line-of-sight transmission between two nodes using optically modulated data stream. Thus, FSO links offer similar transmission capabilities as that of a conventional optical fiber network with an added goodness of being wireless. Miscellaneous advantages include inherent data security, quick deployment and relocation, license-free spectrum which can also support massive data transmission rates and immunity against electromagnetic interference [1–3].

Transmission of optically modulated signal through the free-space atmosphere makes FSO links vulnerable to meteorological events like rain, haze, snow, fog, smog, etc. Associated with atmospheric visibility, these meteorological processes may lead to absorption, scattering and attenuation of information-bearing photons that propagate through the channel [3]. On the other hand, even on a clear sunny day when atmospheric visibility is very high, the signal fading due multipath propagation and scintillation effect can still impair the link [3, 4]. Solar irradiance (heat), differential heating of medium and variable wind speeds may cause random fluctuations in refractive index of the medium. These effects in turn cause random fluctuations in received signal intensity and are commonly referred to as atmospheric turbulence (scintillation effect). Turbulence-induced fading may thus lead to non repairable loss of information [4–7]. Atmospheric adversity is therefore a detrimental factor that defines the overall reliability of FSO links.

The core networks of majority of communication service providers are already using light-wave communication as their backbone systems [3–5]. FSO systems therefore must become compatible with these existing optical networks

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Non Volatile Low Power Wake up Radio Transceiver for Wireless Sensor Network

Vikas Kumar, Jagjit Singh, Arvind Kumar

Abstract: *Wireless sensor nodes consume lots of energy during communication but huge power consumption has been observed during active listening in idle mode as source nodes can start data transmission at any time. Power saving can be achieved by establishing synchronization among end nodes. Many rendezvous solutions are available and out of which wake up receiver found extremely adroit. A non volatile wake up transceiver has been proposed in the present paper that works on the basis of ID matching. State of art using 4GB of memory to remember states of sensor nodes while proposed technique used only 60 bits of memory with very less false alarm probability. Power consumption for proposed model is only 59.47 nW. Hence this model is quite effective in terms of power consumption and memory usage as compared to trailing models.*

Index Terms: *ID matching, low power, wake-up receiver, wireless sensor network*

I. INTRODUCTION

Wireless sensor networks (WSNs) provide new technological elevation to many crucial applications like security, sports, entertainment and military etc. (Said, 2015). Most of sensor networks are battery operated and replacement or charging the power bank in application like space is very arduous. Energy efficiencies remain vital parameter for wireless sensor networks (Pflaum, Weigel, and Koelpin, 2018; .Lee, 2013). Power consumption during active communication is very huge and similarly huge power usufruct by sensor nodes while active listening in idle state (Pughat and Sharma, 2015). Therefore, the technique for judicially utilizing the power source is required and among state of arts available techniques wake-up receiver is rendering optimal result (Popovici, Magno and Marinkovic, 2013; Hutu et al.,2014). Incessant reform in design of wakeup receiver can create new realm for researchers. Elegant architecture for controlling switching states of sensor nodes can cut down usage of battery. In the present paper wake up receiver architecture is designed using a novel ID matching technique.

The proposed design can locate and manage switching of sensor nodes into different states like idle, active or sleep mode. Hash function operation will be performed on address bits of sensor node for parameters extraction and further atone with stored values in the memory as shown in Figure 1.

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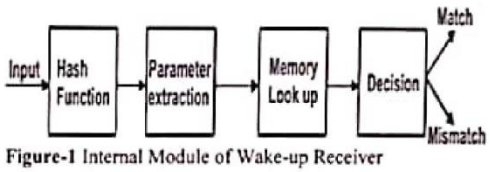

Figure-1 Internal Module of Wake-up Receiver

Wake up call has been initiated based upon atoning decision as shown in Figure 2. Present state of different nodes is stored in non volatile memory to avoid loss of states information in case of power failure.

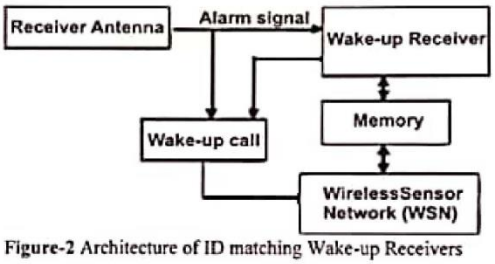

Figure-2 Architecture of ID matching Wake-up Receivers

In this way, proposed design can be utilized as general model in several WSN applications and further cost of receiver will be slashed by optimized use of non volatile memory.

II. STATE OF ART

This section presents the state of art about various techniques and aspects of low power design such as duty cycle control, improvement in battery, Network protocol and many aspects of Wake Up receiver (Berder and Sentieys, 2010).

A. Battery Improvement

With improvement in design and material used in battery may result in longer life. In this context, breakthrough has been achieved by using new discovered energy harvesting material which is composed of many substance i.e. NiMnCoIn (Wardlaw et al., 2013). It exhibits unique magnetic property that it can be used as transducer which can convert mechanical energy into magnetic field and further, into an alternating current (ac) with the help of special pick-up coil. Thus, generated alternating current can be converted into direct current and used as supply for wireless sensor

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A Post-Processing Algorithm for Spatial Domain Detection & Removal of Blocking Artifacts

Anudeep Gandam, Jagroop Singh Sidhu

Abstract*: Block based Discrete Cosine Transform (BDCT) is commonly used to detect and remove blocking artifacts in the compressed images. We proposed spatial domain post processing algorithm with four fold model. In the initial stage, pixel vector (PV) is calculated for horizontal as well as vertical block boundaries, after defining PV calculation of different threshold values is made for extracting blocking artifacts. These thresholds are basically adaptive to the image quality due to strong correlation with the PV. To avoid ringing artifacts across block edges directional filter is proposed. Our research further worked on region classification based upon activity of PV within the blocks. Based upon different PV activity regions separate filters are used to achieve best filtering and finally Symmetrical Pixel Normalization filter (SPN Filter) is used to normalize the values of symmetrical pixel value for better visual performance . Proposed technique various indices like PSNR, MSSIM, GBIM are calculated and compare with different post processing techniques used in literature

***Keywords* : BDCT, blocking artifacts, GBIM, PSNRB, SPNF.**

I. INTRODUCTION

In recent scenario, high data transmission is the need of hour which requires large bandwidth. The main constraint in transmission of data is basically non-availability of bandwidth. In image and videos data transmission, compression of data is done to avoid problems that arise due to large bandwidth. Earlier compression was done by just implementing JPEG, JPEG-2000 for images and MPEG for video which itself produced lots of artifacts. Now-a-days lot of development has been done in this area.One of the technique named Block-based Discrete Cosine Transform (BDCT) which has been widely used for image and video

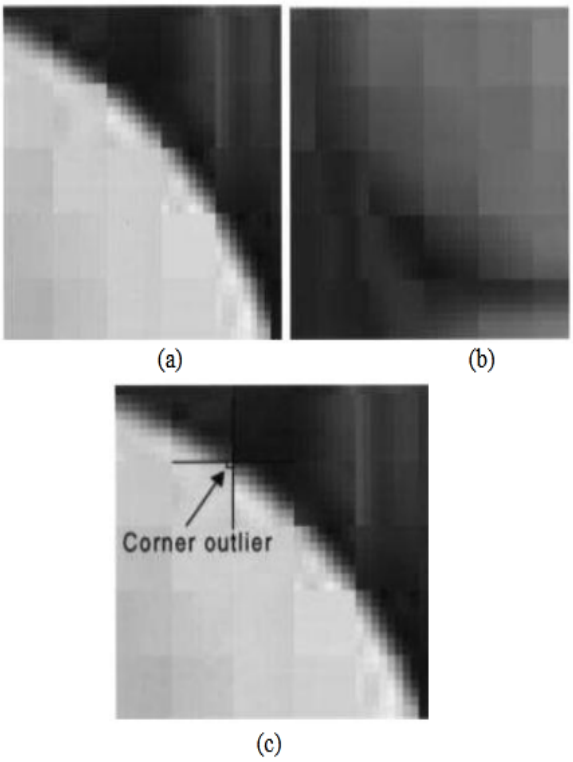

Fig 1. Typical blocking artifacts of JPEG decompressed images. (a) Staircase noise. (b) Grid noise. (c) Corner outlier[16-18]

During low bit rate compression, blocking artifacts develop after implementation of BDCT in which loss of information occurs due to rounding-off of high frequency coefficients

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Up-Scaling of the Compressed Images using Adaptive Image Interpolation

Amanjot Singh, Jagroop Singh

Abstract*: In this paper, a method of image up scaling has been proposed. In many applications the display of electronic devices needs up scaling of images, but some time size of original image is small, so it may require synthetically increasing the size of the image. Interpolation is one of the solutions for that. In the presented method, a new up-scaled image has been achieved, which is upgraded based on the original image pixels present in small images. In the paper, its working is defined for the different directions of the image. The well-known image quality matrices have been considered to evaluate the performance of proposed method. The method has outperformed than the other standard methods and results have been shown in the paper.

***Keywords* : About four key words or phrases in alphabetical order, separated by commas.**

I. INTRODUCTION

In today's time there are number of devices which are having digital displays. The size of the display is varying according to size of electronic device. In mobiles, tablets, laptops and TVs at every place the sizes of the displays are different. In order to see the same image its size should vary according to the display size. However, in some cases the original size of the image may be small so for the big displays size it should be increased. However for this, the device should have the processing capability. One of the solutions to these problems is the image up scaling based on interpolation. It includes the very simple processing and size of the image could be increased. Although there would be some loss in quality of image but the details could be maintained upto good extent. Image super resolution is the further advanced method of Image up scaling. Image interpolation includes the estimation of new pixels from the original pixels [9, 14, 18, 22]. In this paper images are up scaled with the help of simple interpolation.

A .Related work

In literature there are a number of methods which are based on basic principle that unknown pixel can be estimated based on the neighboring pixels [5,6,21]. Firstly the methods were based on simple interpolation [1,2], afterwards some methods were adaptive in nature [3,15-20].In some cases the methods were made advanced based edge detections [4,21]. The more advancements of these techniques leads to the term Super images [22]. In literature there are a number of methods under this category. However, these methods usually consumes time and some challenging to implement in practical situations but results in good quality of Image. In this paper section 2 is about image interpolation, section 3 is explaining the proposed method, section 4 is about the simulation results, and section 5 is presenting the conclusion.

II. IMAGE INTERPOLATION

Image interpolation is one of the methods of image up scaling. It is a very practical method of image up gradation. This method based on estimation of unknown pixels from known pixels [21]. In these methods, neighboring pixels are used to give the estimation of target pixels. With reference to literature there are a number of methods which are used for image interpolation [21]. However, there are 3 basic methods of image interpolation, one is neatest neighbor interpolation, second is bilinear interpolation and third is cubic interpolation. These types of methods are always very practical and fast in comparison to other methods. However the results are not very accurate but still could be used in many applications. In the some methods, adaptive interpolation is also explained [10-14].

III. PROPOSED METHOD

In the proposed method, an interpolation based method has proposed to upgrade the small images. In this method " X 2" (double) up scaling have been presented .

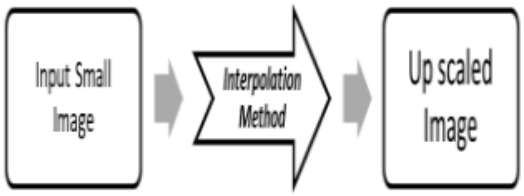

Fig. 1. Basic Block diagram of Method

In order to explain the proposed method, image matrix in Fig. 2 can be considered. In the Fig. 2 the shaded boxes indicates the original pixel values and indicated by small English letters a,b,c,..up to y. The target pixels are V,H and D ; vertical ,

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A novel framework for data acquisition and ubiquitous communication provisioning in smart cities

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HIGHLIGHTS

- In this paper, to resolve the issue of ubiquitous communication provisioning, the MADM techniques are employed for network selection in proposed scenarios under phase 1.
- Cohesive AHP-Entropy weights of respective attributes are derived from subjective weights generated by AHP and objective weights calculated by Entropy.
- Cohesive weights are employed by TOPSIS algorithm for ranking of the networks available in the vicinity of level 1, 2 & 3 of the communication networks hierarchy. The network with the highest preference level has been selected for communication.
- In phase 2, we propose a novel framework for data acquisition and provisioning of ubiquitous communication network in SCs. According to the suitability of applications, the data is acquired by proposed diverse acquisition techniques.
- Computation at diverse levels 1, 2 & 3 is described in phase 3 for provisioning of offloading, reducing delay and complexity.
- The overall framework resulted in real-time system scenario for smart cities in forthcoming days.

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ABSTRACT

Gigantic progressions in heterogeneous communication technologies have empowered smart cities (SCs) to communicate with each other, while ensuring network connectivity. These innovations cannot give impeccable network availability in SCs, because of the coexistence of thousands of gadgets, which realize some issues. In this paper, to resolve the issue of ubiquitous communication provisioning, the MADM techniques are employed for network selection in proposed scenarios under phase 1. Data rate, transmission power, latency, cost, reliability, coverage range, channel bandwidth and security attributes of diverse available networks are utilized for optimal network selection. Cohesive AHP-Entropy weights of respective attributes are derived from subjective weights generated by AHP and objective weights calculated by Entropy. Cohesive weights are employed by TOPSIS algorithm for ranking of the networks available in the vicinity of level 1, 2 and 3 of the communication networks hierarchy. The network with the highest preference level has been selected for communication. The implementation of proposed criterion showed that 3G (HSDPA), WLAN (802.11p), Bluetooth (802.15.1), WiMAX (802.16), Wi-Fi haLow (802.11 ah), 4G have the highest preference level in proposed scenarios UPN, HN, HAN, CR, NAN/MAN and WAN environments respectively. The continuous monitoring of the connected networks and time-to-time selection of optimal networks is required for provisioning of ubiquitous communication in diverse applications (e.g. smart buildings and infrastructure services, smart traffic and transportation system, smart metering of electricity, water, gas and emergency calling services) of SCs. In phase 2, we propose a novel framework for data acquisition and provisioning of ubiquitous communication network in SCs. According to the suitability of applications, the data is acquired by proposed diverse acquisition techniques. Computing at diverse levels 1, 2 and 3 is described in phase 3 for provisioning of offloading, reducing delay and complexity. The overall framework resulted in real-time system scenario for smart cities in forthcoming days.

1. Introduction

In recent years, innovations in communication technologies have been broadly recognized and devised to play an important role in the provisioning of seamless communication in SCs. SCs

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ORIGINAL PAPER

Enhanced Microwave Absorption Properties of Doped M-Type Barium Hexagonal Ferrites in Ka-band Frequencies

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Abstract

The present study reports the microwave absorption characteristics of La^{3+}-Na^{+} substituted barium hexaferrites with chemical composition: $Ba_{(1-2x)}La_xNa_xFe_{10}CoTiO_{19}$ and $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ ($0.00 \le x \le 0.25$) respectively in Ka-band frequencies. The electromagnetic characteristics such as complex permittivity, complex permeability, and microwave absorption properties were studied using Vector Network Analyzer in 26.5–40.0 GHz frequency band. Dielectric properties showed almost constant variation with increase in frequency. Magnetic permeability spectra observed wavy variation with frequency. Comparing the electromagnetic properties of two series, it is observed that Co–Ti–Mn series observes higher values of electromagnetic properties in comparison to Co–Ti series. For composition $x = 0.15$ of $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ series, −55.33 dB reflection loss at 30 GHz frequency with −10 dB absorption bandwidth around 3.51 GHz has been observed. Thus, these materials can be employed as effective absorbers for Ka-band microwave absorbers.

Keywords Microwave absorption · EMI · Ka-band · Complex permeability · Complex permittivity · Reflection loss

1 Introduction

In today's scenario, the increase in high-frequency electronic devices has made our life easy. This causes a serious issue of electromagnetic interference (EMI). To hinder the EMI problem, various materials are synthesized by many researchers. In this perspective, research has been focused recently on the advancement in EM wave absorbing and interference shielding materials among which hexaferrites have attracted immense concern. Doped hexagonal ferrites are one of the solutions of EMI because they are the most promising materials with excellent electromagnetic properties [1–3]. The doped Barium hexaferrites (BAHF) can meet the requirements in the GHz frequency band with large microwave absorption bandwidth. The substitution of Ba^{2+} ion and Fe^{3+} ion in barium hexaferrite is done to tailor its electromagnetic properties, which play an important role in microwave absorption characteristics. An extensive research is going on relating to the suppression of electromagnetic signals and radar signatures [3, 4]. Most of the researchers use simulation to calculate the microwave absorption using metal-backed plate approach. But a few researchers used open-circuit approach for analysis of microwave absorption characteristics of a material [5].

In this study, the microwave absorption characteristics of La^{3+}–Na^{+} substituted Co–Ti–BAHF and Co–Ti–Mn–BAHF ceramics has been studied in 26.5–40.0 GHz (Ka-band) frequencies at room temperature. The hexaferrites were synthesized by using solid-state reaction technique [2, 6]. We have not simulated the microwave absorption properties; the readings are taken directly from the vector network analyzer instrument. The results suggest that La–Na substitution is greatly helpful for fabrication of high–absorption microwave absorbers.

2 Experimental

The conventional solid-state reaction technique was used in our previous studies to prepare the samples of $Ba_{(1-2x)}La_xNa_xFe_{10}CoTiO_{19}$ (Co–Ti–BAHF) and $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ (Co–Ti–Mn–BAHF) hexaferrites ($0.00 \le x \le 0.25$). XRD analysis revealed the formation of M-type Barium hexaferrites matching with JCPDS

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ORIGINAL PAPER

Object acquisition and selection using automatic scanning and eye blinks in an HCI system

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Abstract
This paper presents an object acquisition and selection approach in human computer interaction systems. In this approach, objects placed over computer screen are automatically scanned and the user performs voluntary eye blinks for object selection when the focus comes over the object of interest. Here, scanning means moving the focus over objects placed on the computer screen one by one and the scanning time is the time taken to move focus from one object to the next object. The user is not required to perform any physical movement, the moving part is only the eye lids. A low cost webcam and MATLAB software with computer vision toolbox are required to implement the proposed approach. The performance of the proposed approach has been compared with the Camera Mouse for selection of text and graphic objects. The Camera Mouse utilizes facial feature tracking for mouse cursor control and dwell time for object selection. Three experiments were performed for evaluation of the proposed method in which ten healthy users voluntarily participated. The proposed method has given significantly better performance than the Camera Mouse when selection of text objects was performed in an html file. For selection of graphic objects placed on computer screen, where page scrolling is not required, no significant difference has been found in the performance of both the systems. The proposed method has also been evaluated for performing mouse analogous operations using eye blinks and a performance comparison has been made with state-of-the-art methods.

Keywords HCI system · Object acquisition · Object selection · Automatic scanning · Mouse analogous functions · Eye blinks

1 Introduction

The interface that provides control of a computer by human being is called as Human–Computer Interaction (HCI) system. Interfacing with a computer using a computer mouse is fast and intuitive. But researchers are investigating HCI systems which are more convenient to use, provide hands free interaction and can also be used by patients suffering from motor neuron diseases. Eye based HCI systems provide fast and hands free control of a computer and can be used by normal as well as differently abled persons.

Like any HCI system, an eye based HCI system has an input, an output and a translational algorithm that converts the former to the later. The HCI uses an algorithm to translate its input (eye movements/blinks) into output control signal. HCI output can be cursor movement, letter or icon selection, or another form of device control. The HCI provides a feedback that the user and the HCI can use to adapt so as to optimize the communication. The whole process is divided into three parts viz. object acquisition, object selection and feedback.

The term object acquisition as it is used here means moving the cursor/focus over object of interest. The important methods of object acquisition cited in the literature are eye

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Object Acquisition and Selection in Human Computer Interaction Systems: A Review

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Abstract: Object acquisition and selection are two important functions performed in most of the human computer interaction systems. Various techniques are devised by the researchers to perform these operations and the selection of a combination of object acquisition and selection techniques along with a feedback mechanism for a particular interaction system has become a research issue, especially, when the user of these systems are disabled persons. This paper presents a review on object acquisition and selection techniques used in human-computer interaction systems. The review process reveals that the existing object acquisition and selection techniques are not free from the problems of cursor instability, accuracy, response time, Midas-Touch problem, user fatigue, and the cost of commercially available eye-gaze trackers. It has also been observed that most of the interaction systems are available with mouse left-click feature. But, if we want to completely imitate the functions of a computer mouse then the interaction systems should provide all the mouse analogous operations including left click, right click, double click, drag & drop, cursor control, and page scrolling.

Keywords: *Human-computer interaction systems, object acquisition, object selection, mouse analogous operations, disabled users*

1. Introduction

Human-computer interaction (HCI) is a multidisciplinary field which deals with the design of new interaction techniques and enhancement of the usability and performance of existing HCI systems. A human-computer interface allows a user to connect with a computer naturally and more effectively. The research of designing user-friendly human-computer interaction systems has increased dramatically during past couple of decades and the focus of this research remains to design HCI systems not only for technical users but to devise HCI systems which can be efficiently used by non-technical and disabled users as well.

Like any system, a human computer interaction system has an input, an output and an algorithm that translates the input to output. The input can be in the form of pressing a button on a keyboard [1], mouse movement [2], audio signal [3], through images/video [4], physiological signal [5, 6] etc., and the output can be cursor movement [7], letter or icon selection [8], or another form of device control [9]. The system also provides a feedback in the form of audio and/or visual form so that the user or HCI system can adapt to optimize the communication.

Most of the HCI systems perform at least two important functions:

- Command Line Interfaces (CLI)
- Graphical User Interfaces (GUI)
- User interfaces specially designed for differently abled and aged persons according to their capabilities and needs

In either type of HCI, our goal remains to find the object of interest and perform selection by using suitable selection means. In a CLI, tab key is repeatedly pressed to move focus from object to object and selection is generally performed by pressing enter key. In a GUI, a mouse is operated to navigate and select an object. The mouse cursor is brought over object of interest and its selection is performed by pressing mouse left button.

Both CLI and GUI interfaces require some physical effort to acquire and select an object. But, sometimes a situation arises, in which, for a person performing physical efforts becomes difficult or impossible. In such conditions, a user can interact with computer by using other means such as speech, gestures, eye gaze & blinks, EMG signal, EEG signal etc. These types of interfaces may be called as specialised HCIs because these interfaces are designed by selecting input-output parameters according to the physical condition of a user. In these systems a user requires minimum or no physical effort to select an object. Further, these specialized interfaces may be classified as:

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Survey on Single Image based Super-resolution — *Implementation Challenges and Solutions*

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Abstract
Super-resolution includes the techniques which deal with the methods of converting the low-resolution image into the high-resolution image. In this paper, various challenges affecting the implementation of Super-Resolution (SR) along with the detailed survey of SR implementation methods have been presented. Different issues related to the SR have been explored from literature which are limiting the SR implementations. Besides, there are also various techniques to implement the SR, detailed survey of these techniques along with comparison, have been included in this paper. In this work main focus has been given to a single image based super-resolution as it is the more practical type of super-resolution. The basic purpose of the paper is exploring the various possibilities of SR along with practical constraints.

Keywords Super-resolution · Low-resolution (LR) · High-resolution(HR)

1 Introduction

In today's time, almost every digital imaging application demands high-resolution images. It is mainly required for efficient processing and analysis of image details. Image resolution basically describes the details contained in an image, i.e. the higher the resolution, higher the number of pixels and more is the image detail [78]. There are a number of examples where

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Hierarchical Clustering based Energy Efficient Protocols for Wireless Sensor Networks: A Review

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Abstract

Wireless sensor network are geographically distributed self-directed to scrutinize environmental and physical conditions for instance like noise, pressure, temperature and so on .Energy saving to protract the network life is one of the main design issue during developing a new Clustering Based Energy Efficient Protocol for wireless sensor networks. Clustering is the mechanism for multi hop WSN to acquiring scalability, sinking energy utilization and amplify the life time of a network to attain improved network performance. In this paper focus is mainly driven on the survey of the Hierarchical Clustering Based Energy Efficient Protocols for WSN.

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A Bio inspired energy efficient techniques in MANET- A Review

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Abstract—Mobile ad hoc network is the self-organizing network of mobile nodes which are connected by wireless links having no centralized access point and also no fixed infrastructure. The dynamic topology of MANET permits nodes to leave or join the network at any time they wish. The nodes in mobile ad hoc networks follow the broadcasting procedure to find a route from the source side to the destination. The selection of a path in the traditional routing protocols is made based on the hop count of the paths. Various authors' schemes are discussed for choosing the optimal path from source to destination.

Keywords—*MANET, AODV, cuckoo search, LEACH, multi cast routing, MAODV, Multipoint relay.*

I. INTRODUCTION

A new paradigm is introduced which is increasingly becoming demanding in multi-hop wireless networking is Ad-hoc wireless networks. A network which is generated by gathering numerous small-sized and light-weighted sensors is known as a wireless sensor network. The cost of these nodes is very less along with less energy and number of processing capabilities. Today with the increase in the technology wireless sensor networks are developing with new updates. The wireless sensor networks are deployed within various applications in order to gather important information from the surroundings. The various measures such as temperature, pressure and humid of the surroundings are calculated by the sensors deployed in those regions. There are numerous applications such as in military areas, intelligent communications, wildlife monitoring, observing critical infrastructures and so on in which these networks have been deployed in order to observe surroundings and take appropriate actions. It will become a mandatory part for the computing environment, which consists of fully infra-structured and infrastructure-less networks of mobile [1]. In MANET, nodes communicate with one other in direct form or indirect form via intermediate nodes. As a rule, route between nodes in a mobile ad hoc network may incorporate various hops and, thus, it is suitable to call such systems "multi-hop" manets. MANET is one which operates without any support from any kind of fixed stations and from existing infrastructure. This statement can be formalized by defining an ad hoc network as an autonomous system of mobile hosts (MHs) connected by wireless links, the union of which forms a communication network modelled in the form of an arbitrary communication graph. This is comparable to the cellular network with well-known single hop communication which supports the requirements of wireless communication by introducing BSs (base stations) as access points. In the cellular network, interchanges between 2 mobile hubs entirely depend on the fixed base station and wired backbone. In a MANET, no such framework exists, and the system topology may change dynamically in an unusual way since hubs are allowed to move freely.

Ad hoc network is essentially multi-hop peer-to-peer wireless mobile network where packets of information are transmitted in a "store-and-forward" way from a source to a random destination, by using intermediate node as appeared in Figure 1.1. As the MHs move, the subsequent change in system topology must be known to other nodes so that old topology data can be either removed or updated. For instance, MH2 in Figure 1.1 changes its connection from MH3 to MH4. Various nodes in the system could now utilize this new route to forward packets to MH2.

In Figure 1.1, it is accepted that to include all MHs inside the scope of each other is impossible. Figure 1.1 raises another issue of asymmetric and symmetric links. As it will be seen later on, a portion of the protocols about symmetric links having associative radio range, i.e., if (in Figure 1.1) MH1 is inside MH3 radio range, at that point MH3 is likewise inside radio scope of MH1.

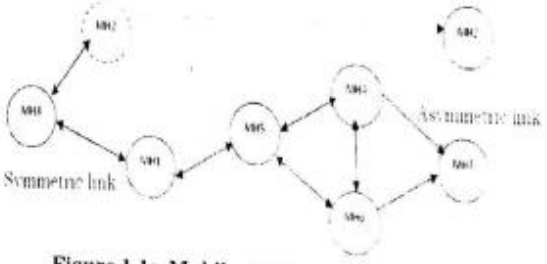

Figure 1.1: Mobile Ad-Hoc network [1]

An Efficient Routing Protocol Based on Modified Ant Colony Optimization and Cuckoo Search for Mobile Ad Hoc Networks

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Abstract: The technology of MANET represents self-governing mobile-based nodes resulting in a network on ad hoc basis in absence of fixed infrastructure. The property of dynamically built topology of MANETs may result in degradation of the network performance. This paper suggests methods to improve the performance-based routing over several parameters such as energy, packet delivery, and overhead by the process of optimizing the value of threshold using NLP based initialization along with ant-colony optimization process. This type of initialization process helps in improving the optimization performance on random basis and it results in an efficient and effective path for the reduction of energy and it also increases the rate of packet delivery. The results based on experimental analysis shows that the proposed approach significantly improves the performance of the system.

Keywords - Mobile ad hoc network, Ad hoc on demand distance vector, Multipoint Relay, Optimized Polymorphic Hybrid Multicast Routing Protocol

I. INTRODUCTION

Wireless Ad-hoc networks presents a new prototype shift in a wireless multi-hop networking process and these are becoming popular and a necessary part of computing that involves the mobile networks based on infrastructure or infrastructure-less networks [1]. Mobile ad hoc network presents a multi-hop network based on infrastructure-less methodology where each of the node performs the process of communication with other type of nodes whether on direct or indirect basis with the help of nodes of intermediate form. The praise for improvement of ad-hoc based network mainly goes to the property of self-organizing/configuring properties. All the nodes in MANET operate as mobile-based routers participating in few basic types of routing protocols. This is necessary for decision and maintenance of routes [14]. As the technology of MANETs presents a structure that is infrastructure-less, quickly deployable, self-organizing, these attributes results in a proper and suitable formation of applications consisting of specific outdoor events, regional communications with non-wireless framework, natural disasters and emergencies, and operations of military, mining site operations, business urgent meetings and robotic acquisition of data [2] [3].

instance of mobile network on ad hoc basis and its topology of communication.

1.1 Characteristics of MANET

The Ad hoc based networks consist of various features or characteristics that make them quite suitable and distinct from the other wired type of networks. Thus, it desires various inventive ways for implementing the functionalities of the network.

(1) Medium (Wireless): The medium used by the system nodes for the process of communication with other type of nodes attains the property of asymmetric propagation and time-varying coverage. It is more prone and less reliable to the mechanism of interference when compared to a medium of wired type.

(2) Dynamic Topologies: Here, the nodes move freely or arbitrarily with distinct speed. Thus, the topology of the network may shift on random basis and at uncertain times.

(3) Infrastructure less Network: The operation of the network does not depend over constant or fixed infrastructure.

(4) Management of Power: As the nodes are free to move, they mainly depend over the batteries as their source of power. Thus, protocols and mechanisms designed for such type of networks requires to keep an eye over the constraint of energy.

(5) Peer-to-Peer approach: Here, all the protocols need to be modelled for environments (distributed) formed by "peers" and such a system needs to be potent enough to care such distributed type of dynamic built topologies [4].

(6) Energy resources and limited computing: Here, the system has finite power for computing memory, size of disk, and power because of finite capacity of the battery as well as device size, cost, and weight.

(7) Finite coverage of service: Distance between several devices, limitations of network conditions, implementation of service for devices of wireless nature presents a challenging scenario as compared to the wired networks along with their elements and simultaneously the technology of MANETs faces several constraints.

(8) Low reliability due to high interference: The Infrared type of signals usually face interference from heat sources and sunlight, and it can be absorbed or shielded by several materials and objects. Radio signals are mainly less prone to the process of being blocked. But these can be hampered by other forms of electrical devices [5] [6]. Here, the mechanism of self-interference takes place due to multipath.

(9) Highly variable network conditions: High rates of data loss occurs due to the mechanism of interference. The movements of the user results in a common disconnection. The changes in a channel takes place due to movement of users around it.

(10) Limited Bandwidth: Wireless-based links continues to have

A Review on Finger Vein Recognition Matching Techniques

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Abstract : In today's society with the rapid growth in the field of computer and network technology, the identity verification is a critical key problem. Thus, the requirement for a better and more reliable approach for identity authentication becomes more significant. Since it is difficult to mislay, forge or share biometric identifiers, biometric recognition is more efficient and reliable than traditional passwords or PINs. Finger vein recognition technique has become the most preferred and novelist biometric method due to its low device constraint, low forgery risk, stability, aliveness detection and high anti counterfeit. A finger vein recognition consists of four main steps which include image acquisition, preprocessing, feature extraction, and matching. The matching technique is most crucial step of recognition to decide whether an input image is genuine or an imposter for one enrolled image, in which matching score is generated. A matching score measures the similarity between the enrolled template and the input image. This paper presents a detailed review on FVR matching algorithms. Matching stage plays a vital role as only this stage involves analysing the recognition performance which is the main criteria to measure the effectiveness of an algorithm. This paper presents the most recent research advancements in the recognition performance of FVR. Various matching algorithms reviewed in this paper have the potential to enhance the recognition performance in a broad sense.

Index Terms **- Biometric Recognition, Finger vein, Matching, Recognition performance.**

I. INTRODUCTION

Rapid developments of science and information technology lead to a major security issue that needs an immediate solution. Due to the growing demand of user-friendly and stringent personal identification, biometric authentication has become a booming research area for decades. The design of efficient biometric authentication systems is nowadays a challenging and pertinent task for both the scientific and the industrial communities.

Conventional approaches such as keys, passwords, and PIN numbers carry the risks of being stolen, forged, lost, or forgotten [1]. Hence, it gives rise to an efficient technique of identity recognition against digital impersonation based on biological features. Biometric recognition is proved more reliable and secure than the traditional hedges against identity theft such as passwords and PINs. It utilizes inherent physiological features and behavioral characteristics of an individual. Examples of physiological features are face, fingerprint, iris, vein, etc. Some examples of behavioral characteristics are like handwriting, voice, signature, etc. [2]. However, these conventional biometric techniques have their limitations regarding performance, accuracy and convenience. Hand-based biometrics commonly include fingerprint recognition, finger knuckle print recognition, and palm print recognition. However, all of these are vulnerable to forgery since the features are external to human bodies.

Out of these biometric techniques, finger vein biometric has drawn much attention and gaining popularity. The finger vein recognition system is more efficient and reliable and can solve many difficulties faced by conventional biometrics techniques. From the security and convenience point of view, the finger-vein is a promising biometric pattern as the vein pattern is defined as the vast network of blood vessels underneath the skin of a particular part of a human body. Veins features are unique, robust, stable and largely hidden patterns. In addition, vein patterns are not easily observed, damaged, or changed. Unlike facial features or fingerprints, though, it's much more difficult to forge finger vein patterns, or even distort them in attempts to fool a biometric security system. Additionally, individuals can't photograph finger veins and, unlike fingerprints, they can't be left on surfaces.

Compared with other biometric traits, the finger-vein is more advantageous because of these advantages as listed: a) Internal characteristic i.e., it is hard to copy or forge finger vein, and very little external factor can damage finger vein. b) The non-invasive and contactless capture of finger-veins are more convenient and hygienic for the user, and thus, it is more acceptable. c) Living body identification i.e., only vein in living finger can be captured [3]. Because of its uniqueness, stability, high accuracy, response timing and high resistance to criminal tampering, vein pattern offers a more reliable trait for a secure biometric authentication system. Regardless of advantages, there are some challenges that need to be overcome to achieve high accuracy and recognition performance. The main challenges are poor lighting, recognition rate and misalignment [4].

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FINGER VEIN RECOGNITION USING ROBUST FEATURE EXTRACTION AND SVM

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ABSTRACT

In today's society, the identity verification is a serious key problem with the rapid development in the domain of computer and network technology. Hence, the necessity for a superior and more consistent methodology for identity authentication becomes more prominent. As biometric identifiers are relatively tough to counterfeit, mislay or share, biometric recognition approach appears to be more effective and reliable than conventional passwords or PINs. Owing to its low forgery risk, consistency and aliveness detection, Finger Vein Recognition (FVR) has emerged to be the most promising and novelist biometric technique. Finger vein pattern is defined as the hypodermic vein structures arbitrarily developing a network of blood vessels underneath the skin of a finger to recognize individuals at a very high level of accuracy. However, it is challenging to extract a more reliable and accurate finger vein pattern due to the random noise, low contrast, illumination variation, image deformation and blur. Not much research has been conducted on effective frequency domain feature extraction techniques, hence, considering the above issues, this research presents an efficient feature extraction approach which employs the Local Directional Pattern (LDP), which is robust in the existence of random noise, ageing effects as well as illumination changes. Support Vector machines (SVM), which is a powerful machine-learning binary classifier, is implemented in order to enhance the recognition performance by classifying finger vein patterns as either imposter or genuine. The experimental results demonstrate that the proposed approach achieved significant performance and better classification accuracy on HKPU database. An accuracy of 97.5% with an Equal Error Rate of 0.81% is achieved indicating superior results over existing techniques.

Keywords: *Biometric Recognition, Finger Vein, feature extraction, Support vector machines.*

I. INTRODUCTION

Rapid developments of science and information technology lead to a major security issue that needs an immediate solution. Due to the growing demand of user-friendly and stringent personal identification, biometric authentication has become a booming research area for decades. The design of efficient biometric recognition systems is nowadays a challenging and pertinent task for both the scientific and the industrial communities.

Conventional approaches such as passwords, keys, and PINs carry the threats of being forged, stolen, or lost [1]. Hence, it gives rise to an efficient technique

of identity recognition against digital impersonation based on biological features. Hand-based biometrics commonly include fingerprint recognition, finger knuckle print recognition, and palm print recognition. However, all of these features are external to human bodies and hence, are more prone to forgery.

Out of these biometric techniques, finger vein biometric has drawn great attention and gaining popularity. The finger vein authentication system is more efficient and reliable and can solve many difficulties faced by conventional biometrics techniques. From the security and convenience point of view, the finger-vein is a promising biometric pattern as the vein pattern is defined as the vast network of blood vessels underneath the skin of a particular part of a human body [2]. Veins features are unique, robust, stable and largely hidden patterns. In addition, vein patterns are much difficult to be observed, damaged, changed or forged.

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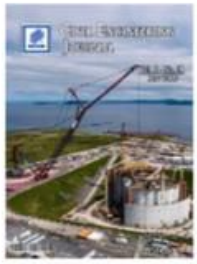

Performance of Circular Footing on Expansive Soil Bed Reinforced with Geocells of Chevron Pattern

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Abstract

Results from laboratory model tests performed on circular footing are presented in this paper to understand the performance of geocell reinforced expansive soil. Naturally occurring expansive soil was used in this study as subsoil. Geocells of chevron pattern fabricated from geotextile made up of polypropylene were used to reinforce the soil bed. The parameters studied in this testing program were the placement depth of the geocell mattress, pocket size of geocell and the height of geocell mattress. Contrary to other researchers; the improvement in the performance of reinforced bed is evaluated at a settlement level equal to the failure settlement of unreinforced soil bed. The performance of reinforced bed is evaluated through two non-dimensional factors viz. bearing capacity improvement factor (I_f) and settlement reduction factor (PRS%). Test results indicated that with the introduction of geocell as reinforcement, a substantial improvement in bearing capacity and decrease in footing settlement can be achieved. Bearing capacity of reinforced bed increases by more than 200% and 81% reduction in footing settlement was achieved by using geocell mattress of optimal dimensions and placing it just below the footing base.

Keywords: Circular Footing; Expansive Soil; Geocell Mattress; Chevron Pattern; Bearing Capacity.

1. Introduction

Due to rapid urbanization, need arises to construct structures on expansive soils. But there is difficulty in building any infrastructure facility over such soils due to its shrinkage and swelling properties. The development of any area depends upon the growth of infrastructure mainly roads, railways, buildings etc. Since the shear strength of these soils is very low, stability of structures built on such soils is a challenging job as there is a possibility of large consolidation settlement and bearing capacity failures. In order to build safe and stable structures, the expansive soils underneath need to be treated for the improvement of its bearing capacity. Reinforcing soils is one of the effective and reliable techniques to improve their strength since reinforcing soils improve bearing capacity & stability and reduce lateral deformation & settlement [1-3]. Different types of materials with many shapes and techniques are currently in use in civil engineering projects. Using fibres like polyesters, polypropylene, glass fibres, steel bars, natural fibres viz. jute, coir, sisal, palm etc. has been recognized as an effective reinforcement for soil [2, 4-6]. To improve foundations, roads, and construction of wall polymeric fibres and grids, metallic strips and meshes have been extensively used as planner reinforcement over the recent few decades [6-13]. Amongst various stabilizing techniques available providing high strength geosynthetic

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Maximum Power Point Tracking (MPPT) methods for Solar PV Generation- A Review

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Abstract— Solar panels have a trait of nonlinear voltage-current between a distinct peak energy point that happens based on environmental variables such as irradiation and temperature. Despite predictable changes in the situation to constantly achieve maximum energy through solar panels, the solar panels have to operate at MPP. Therefore, each solar energy electronic converter's controller utilizes different MPPT processes. The process by which the photovoltaic modules are built to operate at the optimum output and extract more energy from it is referred to as Maximum Power Point piloting with new control calculations. This would lead to a fast rise in the generation of PV energy and consequently a reduction in its cost.

Enhancement of produced energy is accomplished at this stage, therefore the control of MPPT are crucial. This point happens on the grounds of the panel temperature as well as the irradiance conditions. Both situations are changed throughout the day, which are also varied based on the season of the year. In addition, irradiation can change rapidly due to changing environmental circumstances such as clouds. In every possible

Load Balanced AOMDV- An Improvement over AOMDV Protocol

Mohit Angurala, Manju Bala, Sukhvinder Singh Bamber

Abstract

MANET is a kind of network which is self organizing and has a centralized control which means it has group of nodes which communicate with each other. Every Node in a network exchanges information with other node in the same network if source and the destination nodes are within transmission range boundary. In a network each source node and destination node can act as network router. There is a tremendous demand of MANET's nowadays because of the dynamic nature that it possesses. Moreover there are many factors that are affecting MANETs such as delay, MAC Overhead, Routing Overhead and many more. This paper presents a comparison of AOMDV and load balanced AOMDV with different parameters like delay and Routing Overhead. The proposed work is implemented in NS2 Simulator. Further, results indicates that this novel approach is able to achieve better Routing Overhead and delay without increasing the overhead in the network. In this case Energy consumption is also very less as compared to the standard AOMDV protocol.

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ORGANISED APPAREL RETAIL STORE: IS IT A FUTURE OF TOMORROW

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ABSTRACT

The Indian retail market was traditionally closed. People were less interested in apperel shopping .They used to shop as the need arises. So mainly prevalent sector was the traditional retail sector popularly known as unorganised sector .It is the sector that are privately owned ,not recognised nor registered and deal in apparels/products that are produced in the local market. But with the passage of time and after 1990's policies, India witnessed huge growth in the retail sector as well. With the opening of FDI in 2006, the culture of brands and organised retail entered in the Indian market. People have shown keen interest in fashion clothes and are now brand conscious .Although brand cost the customers dearly but the fever of 'The Brand' has swept the minds of the youth both male and female .This resulted in huge growth of organised retail apparel sector that is recognised and registered .This further opened the door of development of organised retail sector in urban, semi-urban and rural areas as well .Thus this paper attempts to find the significant difference in the preference of urban and rural youth towards organised retail and unorganised retail sector .It also aims to find out the type of apparels and brands preferred by youth of today. It was found that urban youth has shown keen interest in branded apparels specially sports/gym wear. On the other hand, rural youth likes to shop more at unorganised retail stores.

Keywords: Organized retail sector, unorganized retail sector, Consumer, Consumer behaviour

INTRODUCTION

India's textile sector is one of the oldest industries in the Indian Economy. It has evolved and developed with big boom and is now the major player in the market .The entire textile (apparel) sector broadly consists of two major segments unorganized and organized sector .Talking about handloom, handicraft, sericulture etc all are run on a small scale through traditional tools and are considered as unorganized sector .Also the unorganized sector is that sector which not registered for tax and working at local level, selling apparels in the local market. For example: Weekly Haat, mom and pop stores, small showrooms, local shops etc. On the other hand ,spinning apparel's and the garments made using modern technologies are covered under organized sector .The organized sector is registered for tax and are dealing in apparels that are branded and has registered trade mark. For example: Branded apparel stores in Malls, Department Stores, Super markets, Specialty stores etc. Further this organized sector can be classified as Single/Exclusive Brand Retail Store and Multi Brand Retail Store. According to A.T Kearney Report, organized retail accounts for 7% of India's roughly $435 billion market and is expected to reach by 20% in the coming year 2020.The major players in organized retail market is Pantaloons, K.Raheja Group, Tata Group, RPG group, Landmark group, Bharti Walmart, Reliance etc (www.indianretail.com).But still Indian market is predominated by unorganized retail sector .According to another survey by A.T Kearney, Rs4000crore retail market is organized in India and while Rs200000crore segment of market is unorganized .Thus organized sector has a huge potential to grow .Various national brands that are striving hard to capture and maintain its apparel market are Peter England, John Player, Park Avenue, Louis Phillipe, Polo, Global Desi, and, Madame etc. On the other hand various international brands are also lured to enter Indian market like Benetton, Hugo Boss, Guess, Mark & Spencer, Tommy Hilfiger, Kazo etc. The government of India has also taken relevant steps to promote Indian Retail Sector. The permission of 100% FDI by government in retail sector is a major push towards upliftment of the apparel retail sector. Also consumers of today are willing to pay for quality and in the name of brand they like. Majority of the Indian population is young and has become fashion conscious over the years .Women has started working .Both men and women want apparels that suits their status ,personality and profession .Seeking the demand, apparel industry of India has diversified on the basis of age, fashion, climate, region, culture and fiscal factors etc. Further apparels can be segmented as casual wear, formal wear or sports wear. Other factors that have contributed towards the volatile and lucrative market of India are changing lifestyles, improvement in civic sense, economic development,change in government policies,

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A Study of Customer Satisfaction Towards the CRM Strategies of LIC

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Abstract
The customers have become the lifeline of every service sector especially in this cut throat competition. After liberalisation and globalisation of the insurance sector, LIC is striving hard to face this competition. To keep their customers satisfied, it has to change their customer relationship management strategies. This paper aims to measure the customer satisfaction level about the CRM strategies due to different demographic variables of customers. Satisfaction level of customers is measured through a structured questionnaire. Data was collected about CRM strategies and customer satisfaction. The research design of the study is descriptive and diagnostic. Source of data collection is mainly primary.
The study area is limited to Doaba region (Jalandhar, Kapurthala, Hoshiarpur and SBS Nagar) of Punjab. Sample size of 500 policyholders of LIC is collected through a stratified random sampling method. Various statistical tools were used like Levene's test of homogeneity ANOVA. In the study, it is found that demographic variables except marital status and size of family affect the customer satisfaction with the services of LIC.
Key words: Customer satisfaction; Retention; Demographics.

Introduction

In 1993, the Indian government has set up a committee under the chairmanship of RN Malhotra, former Governor of RBI, to give recommendations for reforms in the insurance sector.
The goal was to supplement the changes started in the financial sector. The constituted committee has presented its report in 1994, it prescribed that the private part be allowed to enter the insurance business. They expressed that foreign organizations be permitted to enter by a joint venture with Indian accomplices. With the suggestions of the Malhotra Committee report, in 1999, the Insurance Regulatory and Development Authority (IRDA) was established as a self-governing body to direct and build up the business of insurance. The IRDA was consolidated as a statutory body in April, 2000. The key goals of the IRDA incorporate advancement of rivalry in order to improve consumer satisfaction through expanded purchaser decision and lower premiums, while guaranteeing the budgetary security of the insurance market. The Reserve Bank of India (RBI) has also given directions to the banks so that they can enter in the insurance business.
Due to steps taken by the Government of India, competition has increased. Private companies and banks are happy with the deregulation of insurance industry because with this, they become enabled to provide value added services in addition to normal banking services. With this there is a drastic change in the attitude of the policyholders because more choice becomes available to the customers as earlier only LIC was having monopoly over life insurance. But now, due to hard competition, LIC has to redesign its products, policies by keeping in mind the competitors' strategies and the customers preferences because now customers have become more aware and they want to buy the product of only that company which offers them best products, best services. The best possible comprehension of clients, their requirements and desires help insurance suppliers to acquire improvement in products and services.
It is a very difficult situation for the LIC to maintain its position in the market. The only solution to this problem is to build strong relations with the customers. For this LIC has

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Status of Sports Goods Industry in Punjab - An Overview

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Abstract:

This paper highlights the present status of sports goods industry in the Punjab state during the year 2018-19. The Jalandhar district of the Punjab state was the major hub of sports goods industry. Therefore, the Jalandhar district was specifically selected for the present study. Random sampling technique was base of the sample. A sample of 150 industrial units dealing with wide range of industry goods were taken for the study. Further, the sample was categorized into small, medium and large industrial units on the basis of number of employees and hence, each 50 small, medium and large category of industrial units were selected for the study. The study was based on the primary data. The relevant data of study were collected through well structured pre-tested survey schedules. Industry owner or responsible person was the main respondents of the study. The collected data were compiled in excel sheet by assigning codes. Simple statistical tools like frequencies and percentages were used to analyze the data. The main findings of the study brought to the fore a significant fact that the manufacturing of sports goods is no longer a profitable enterprise and manufacturers have been either turning their business from manufacturing to trading or have started trading along with manufacturing of sports goods. In general, majority of the sports industries were dealing with more than one sport goods, particularly all traders in the sample were dealing with multiple products. The study also concludes that market share of the sports industries observed to be varied with size of industry. The concentration of sports industries having market share more than 20 per cent was the highest on large farms. The large size industrial units were observed to be more competitive as compared to small and medium size. Moreover, the study highlighted the present scenario of different sizes of sports goods industries in terms of type and scale of business, extent of imports and exports, extent of demand and competition which could be helpful for stakeholders and policy planners on account of sustaining and uplifting the sports industry in the Punjab state.

Key Words: Industries, sports goods, scale of business, trader, and manufacturer.

Introduction

India's sports goods industry is an important component of Indian economy. Being labour intensive in nature, it provides employment to more than five lakh people in the country. India's sports goods have been gaining popularity in the world and have occupied a good share in the global market. Indian domestic industries have been exporting nearly 60 per cent of its production and its exports have been reported at US $ 232.80 million in the year 2017-18 as compared to US $ 224.83 million during the previous year *(IBEF, 2019)*. A flourishing sports sector has a significant socio-economic impact by improving physical health and mental ability of nation's human resources. Apart from this, sports industry can and may contribute from one to five per cent to the total gross domestic product (GDP) of the country *(Langhar, 2016)*.

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Emerging Problems And Challenges For Sports Goods Industry In Punjab: A Constraint Analysis

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Abstract:

Punjab state has been well recognized in the country in terms of sports goods industry. The state has been contributing significantly in terms of manufacturing and trading of sports goods. It has been observed that the sports industry has been facing a big challenge of competition in the international market which could disturb the output, import and export pattern of the sports goods industry in the domestic market. The study highlights the various problems faced by the sports industry in terms of production, imports and exports. The study was conducted in the Punjab state during the period 2018-19. The study was based on primary data and a sample of 150 sports industry (50 each corresponding to small, medium and large) were taken for the study. A well structured survey schedule was developed and the responses of the respondents with regard to various problems were recorded. Garrett ranking technique was applied to extract the most important problems on the basis of mean rank score. The main aim of the constraint analysis is to bring the important problems of the sports industry into the notice of stakeholders, policy planners for making this industry economically viable for the welfare of the society being engaged in this industry. The overall scenario of the industry revealed that scarcity of skilled labour was the common problem reported by all type of industrial units. The automation in sport industry has increased the demand for skilled workforce which is the most emerging challenge faced by the sports industry. Therefore, the study has suggested that there should be special training programme to produce trained labour force for the industry to cope up with this problem. Extent of competition with alternate products, price fluctuation due to change in demand, taste of consumers (consumer's preferences among various choices of similar sports goods) and unaware of government policies were emerged as other major issue of the sports industry in the Punjab state which needs immediate solution for the industry to compete in the global market. .

Key Words: Problem, Challenges, sports goods industry, Garrett ranking technique.

Introduction

The Sports Goods manufacturing cluster of Jalandhar is a unique example of transplanted cluster, where a major segment of an existing cluster shifted lock stock and barrel (the entrepreneurs, the workers and the raw material suppliers) to a new location due to political division of the country in the year 1947. Today Jalandhar is one of the largest producers of footballs, cricket bats and other inflatable sports equipments.

Earlier in Jalandhar sports goods manufacturing units are located only in the two localities of the city i.e Basti Nau and Basti Danishmandan. But with the passing of time this industry has also extend towards Basti Sheikh Road, Nakodar road, Sports Complex on Kapurthala road, Industrial Area and G.T. road towards Amritsar. Skilled workers engaged in

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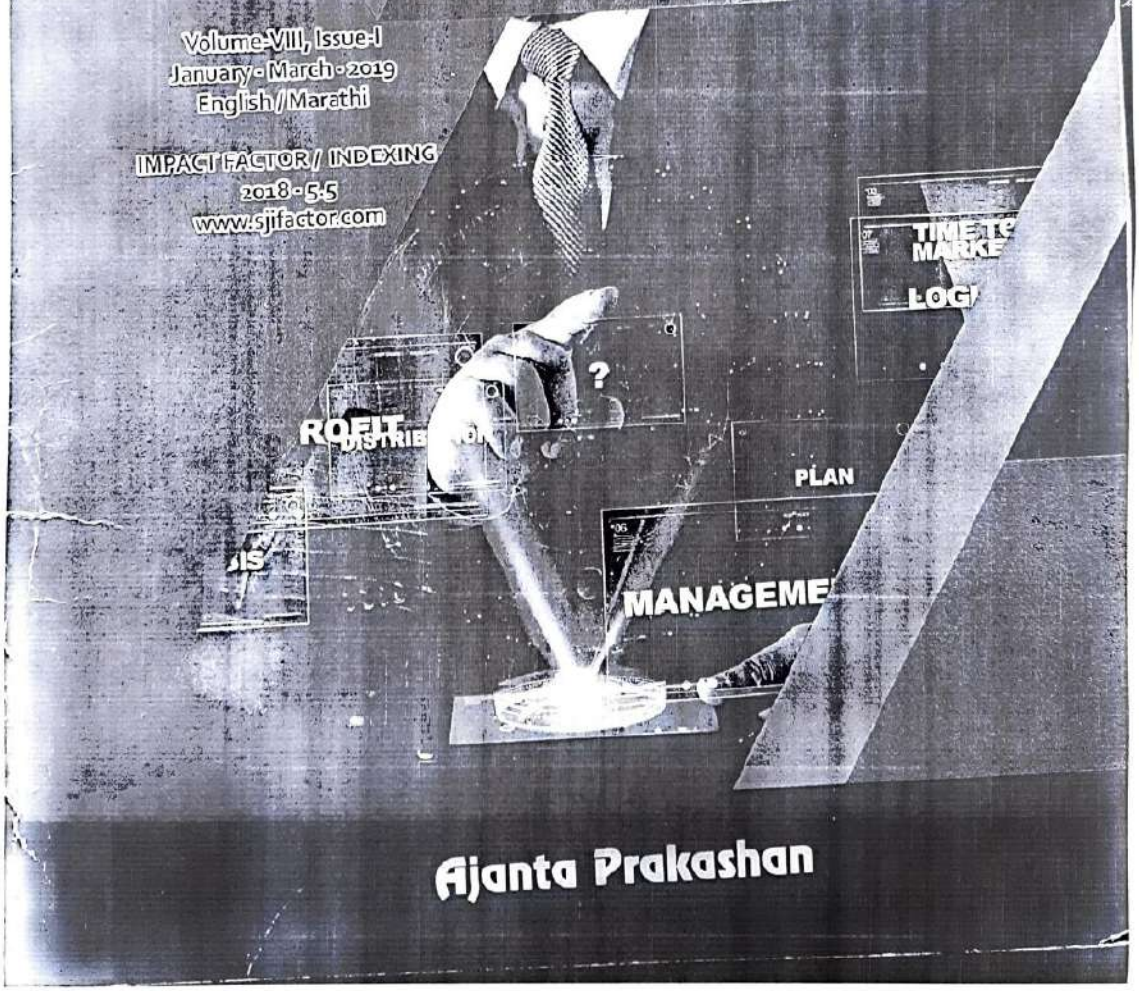

Ajanta Prakashan

11. A Study of Consumer Behaviour Regarding the Purchase of Cosmetic Products

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Introduction

Cosmetic is a product used to enhance the outer shell of the body. Cosmetics applied to the face to improve its appearance and often called makeup. Many cosmetics are designed for use of applying to the face and hair. Ordinary make-up include lipstick, mascara, eye shadow, foundation, rouge, skin cleanser and skin lotions, shampoo, hairstyling products, perfume and cologne. Different categories of people use different types of cosmetics. Basu (1994) true brand loyalty occurs when the customer holds favourable attitude towards the brand in addition to purchasing it repeatedly. Bakshi (2012) Consumer behaviour concerns with the process of selecting, using and disposing of certain products or services by consumers. Runyon (1980) "brand loyalty is a special case of programmed decision making when customers adopt a decision strategy of giving all or most of their support to a particular brand". There are so many ways to sell beauty products in the market. Some of the ways are through direct selling in the market, through retailers, vendors, shopkeepers and through agents. There are so many brands which are rising in the market now a days like Avon, Lakme Revlon, Oriflame etc. There are many International brands which are very well known in the market as Loreal, Uniliver etc. People also like to use ayurvedic and organic products.

Review of Literature

Gupta (2013) in her paper titled "**A study on Consumer perception and Brand Personality traits for making Cosmetic purchase decisions**" focused on factors that revolved around the potential consumers while making the cosmetic purchase decisions. **Joelle et al (2013)** in their paper titled **Analysis of Women Consumer Behaviour for Purchasing "Oriflame" Cosmetic Product: Phenomenology** stated that the female were mainly focused about their body and physical aspect. Women living in Indonesia had started using cosmetic products and their main focus was on the application of cosmetics or makeup. Women were using different cosmetic product but this study mainly focused on the products of oriflame. The

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Information Security through Image Steganography

Vimanyu Chopra, Devinder Priyadarshi

Abstract: ***Information security is an arduous task these days especially due to advancement in technology. Sending or receiving confidential information in an undetected form has been a major challenge. Steganography is the art or process of concealing information inside a text, audio or image file. The process of embedding information inside an image is known as Image steganography. The objective unlike cryptography is not to make the information difficult to understand but to hide it in plain sight. The concealed information is harder to detect and is only detected only by the receiver who is aware of its existence. Image Steganography is used to secure private files and documents, hide passwords and encryption keys as well as to transport highly confidential documents between international governments and organizations without revealing the existence of the hidden message. This also makes it essential in military and banking field for secure communication of information. This provides better security to the information being shared. This paper discusses history, techniques, applications, benefits and shortcomings of Image steganography. Further a discussion on the challenges and the future direction and trends of image steganography are also presented.***

Keywords: ***Information security, Stegnanalysis, Image Steganography.***

I. INTRODUCTION

Steganography is very important in today's world because of the need of secure communication. Steganography as a word has Greek origin and is formed by using two words "Steganos" and "Graphe" meaning concealed and writing or drawing respectively. As the name suggests steganography can be described as an art or process of concealing data or secret information within a text, audio or an image file. The process of embedding information inside an image is known as Image steganography. By using image steganography, it is possible to pass secret messages unbeknown the third party who maybe looking for it. It can hide the message in plain sight [1]. It is coupled with cryptography and provides an extra layer of protection along with encryption which strengthens the security of the object [2]. Some technologies like watermarking which are used for intellectual property protection are related to steganography [3]. Prisoner's problem is a good example of contemporary formulation of steganography even though it has been in use since ancient times [4].The problem as be described as having two prisoners named Alice and Bob who are imprisoned in isolated cells and they have to exchange information through a messenger in order to design a scheme to escape from prison while under surveillance of Eve who is the warden assigned to them. If Eve gets suspicious of any activity going on Alice and Bob will be sent to solitary confinement. They can't use only cryptography here as Eve would get suspicious thus, they use steganography to hide the information. Eve will try to find any hidden communication between the two prisoners so as to undo their plans. She can be passive where she would try to detect the message or active where she would actively try and modify or insert information with embedded messages. To send these concealed messages Alice would embed the secret message in information. Alice and Bob can use private or public key steganography. In private key steganography they both share a secret key used for embedding the message while in public key steganography both parties employ private-public pairs of keys while having access to the other persons' public. They have their private key pairs along with a public key. The warden eve examines all communication between the two inmates and the test is to plan the whole jailbreak without her knowing about it [5].

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II. STEGANALYSIS

Steganalysis can be described as the process of finding the hidden message in the information. The techniques also improve along with steganographic techniques. It is used as a measure to test the effectiveness of various steganographic techniques. If the message is easily detected then it is not deemed usable and this technique helps us to improve the existing steganographic techniques as well as in the formulation of new ones. Steganalysis can be universal or targeted [6]. In universal method the steganographic algorithms are detected without knowledge of embedding process. This process is very effective but its detection accuracy rate is very low. The targeted steganalysis method uses specific steganographic algorithms to detect the messages embedded using the defined algorithms. These have a higher detection efficiency than universal techniques as it uses well established algorithms for its search. Nevertheless, in practical scenarios one doesn't generally know the steganographic technique that the persons communicating will use to embed the images thus universal technique is employed if the specific algorithm used to embed images is not known [5]. If we can't find the hidden message it is also possible to destroy the message without understanding it. One such method to defeat the image steganography is compressing the image which will remove the information hidden by LSB method.

Role of Machine Learning in Manufacturing Sector

Vimanyu Chopra, Devinder Priyadarshi

Abstract: ***This paper discusses the basic concept Machine learning and its techniques, algorithms as well the impact of Machine Learning in Manufacturing processes and Industrial Production. There has been an unprecedented increase in the data available in the last couple of decades. This has enabled machine learning to be applied in various fields. Machine learning is field of study which enables the computer system to learn automatically as well as improve from experience and perform various tasks without explicit instructions. The primary aim of machine learning is to allow the computers learn automatically without human assistance or intervention and adjust actions accordingly It is being employed in many fields. Manufacturing one area where machine learning is very useful. This paper discusses the various areas where machine learning can improve the process of manufacturing like predictive maintenance, process optimisation, quality control, scheduling of resources among others. This can be done by employing various machine learning techniques and algorithms using concepts such as deep learning, neural networks, supervised, unsupervised and reinforcement learning. The relationship of how machines and humans can co-exist and work together to improve the efficiency of production is also discussed. Industry 4.0 or fourth revolution that has occurred in manufacturing which deals with advent of automation in manufacturing industry and its significance is discussed. We take a look at the various benefits and applications of machine learning in the field of manufacturing engineering. This paper also discusses the various challenges and future scope of employing machine learning in the manufacturing.***

Keywords: Machine learning, Industry 4.0, Manufacturing, Automation.

I. INTRODUCTION

Machine learning as the name suggest is the ability of the machine to learn by themselves. It deals with the programs which learn over time to improve and adapt the performance based on experience and past results without explicit instructions from humans. Machine learning is being employed in various fields ranging from image processing, predictive analysis, military to medicinal field. It has revolutionised the manufacturing industry over the last few decades. There are many techniques and approaches which enable the use of machine learning across various fields. This paper first discusses these techniques employed in manufacturing industry and then we take a look at the various aspects of industry that machine learning has helped including- predictive maintenance, quality control, optimization and scheduling, supply chain forecasting as well as the concept of industry 4.0 and the symbiotic relationship between machines and human beings needed for greater efficiency and better performance. The various challenges for employing machine learning in the field and the future scope of the technology is also discussed.

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II. TECHNIQUES

Machine learning uses many algorithms and tools for its implementation. Some of the types of machine learning along with their algorithms are:

A. Supervised Learning

Supervised machine learning algorithms use previous instances which are used to make prediction for future instances. The data is divided into training and test dataset [1]. A function is inferred from the training data which can be used to make predictions about output values. This approach after sufficient training can be used to provide targets for new inputs ad can also compare the predicted output to the intended value of output which is useful in finding errors so that the model can be modified accordingly. This approach when training intends to find some patterns in training dataset which can be used in prediction or classification [1]. Some of the most popular algorithms in supervised learning are:

- Decision Trees
- Naive Bayes

Decision Trees

Decision trees (Fig 1) are the type of trees which based on the values group the attributes together. Decision trees rely heavily on pre-determined classification [1]. Decision trees are used in classification to identify the attributes which can be used to extract the most information required for solving the classification puzzle.

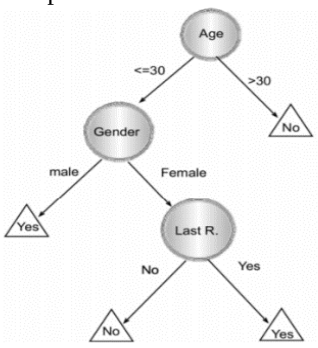

Fig 1 - Decision Tree [19]

Naive Bayes

Naive bayes is a classifier which is based on bayes theorem of conditional probability.

$$P(c|x) = \frac{P(x|c)}{P(x)} P(c).$$

Machinability improvement in Inconel-718 by enhanced tribological and thermal environment using textured tool

Chetan Darshan, Sumit Jain, Manu Dogra, Munish Kumar Gupta & Mozammel Mia

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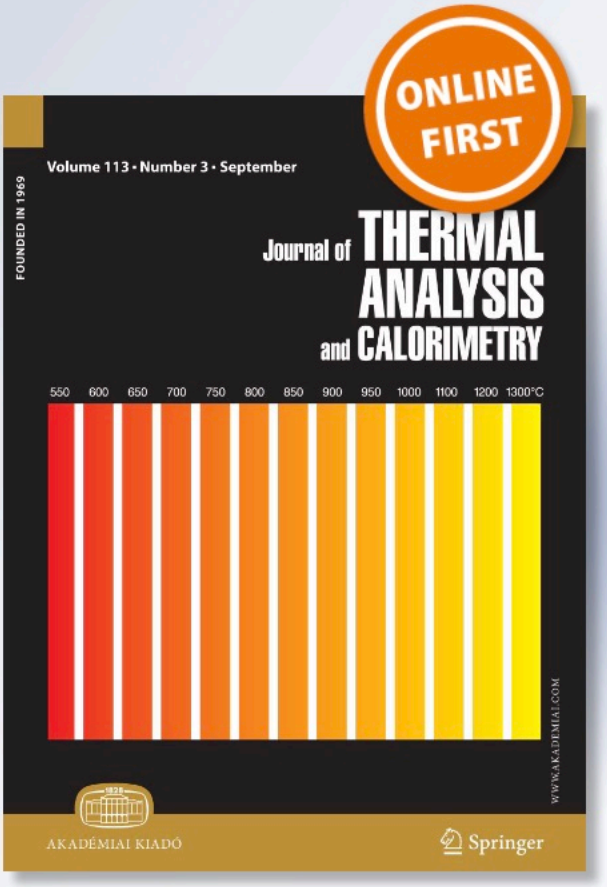

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Machinability improvement in Inconel-718 by enhanced tribological and thermal environment using textured tool

Chetan Darshan[1] · Sumit Jain[2] · Manu Dogra[3] · Munish Kumar Gupta[4,5] · Mozammel Mia[6]

Received: 23 September 2018 / Accepted: 15 February 2019

Abstract
Machinability of Inconel-718 superalloy in conventional approach is poor—this fact necessitates advanced technological adoption such as improved surface topography over used cutting tool. Recently, the performance of textured tool has been investigated to explore its potential benefits in achieving favourability in machining of superalloy. In that context, the impact of tool texturing, cutting speed and machining time on some of the prominent machinability indices like cutting forces, tool wear, surface finish and chip morphology has been deliberately investigated. The performance comparison of non-textured and textured tool has been conducted at cutting speed of 80, 120 and 180 m min^{-1} and at successive increment of machining times up to 10 min. Moreover, the scanning electron microscope analysis of worn tool edges was carried out to comprehend the wear mechanism. Furthermore, the thermal analysis was done for dedicated textured tooling condition. Results revealed that the textured tool performs better to ensure lower tool wear (V_B), reduced cutting forces (F_c), lower surface roughness (R_a) and acceptable form of chips. The spots of textured tool acted as fins to promote efficient heat transfer from cutting zone and reduced the effective chip–tool contact length to cause less friction.

Keywords Tribology · Inconel-718 alloy · Surface roughness · Textured tool · Tool wear

Introduction

Extensive utilization and demand of Inconel-718 superalloy in aviation, atomic reactor, chemical, food processing and marine industries are drawing much attention to the researchers, due to its unrivalled thermo-mechanical properties like high toughness, high tensile stress, rupture stress and resistance to degradation in corrosion and oxidation [1, 2]. Since this alloy has significant industrial values in various applications, still the machining of Inconel-718 is considered to be very difficult [3]. Thick layer of adhesion and high thermal stress at the tool–workpiece interaction zone during cutting area result in poor thermal properties, propensity to severe wok hardening and high tool–chip affinity, which represents several intrinsic characteristics [4]. For instance, tool becomes heated due to low thermal conductivity and heat flow towards it [5]. Moreover, the addition of Inconel-718 superalloy alloying elements into the tool diffuses the tool substrate and creates a thermal resistance and affects thermal conductivity; it further aggravates tool wear and these entire phenomenon forms a 'vicious circle' [6]. Recently, the cutting fluids and various tooling strategies have been generally used for enhancing the cutting tools performance during the machining of Inconel-718 and other superalloys. For instance, Sarikaya & Gullu, Sarikaya et al. and Yıldırım et al. implemented the minimum quantity cooling conditions for improving the machining performance of Waspaloy, Haynes 25, etc. [7–9]. The cutting fluids decreases the thermal wear on

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Influence of dry and solid lubricant-assisted MQL cooling conditions on the machinability of Inconel 718 alloy with textured tool

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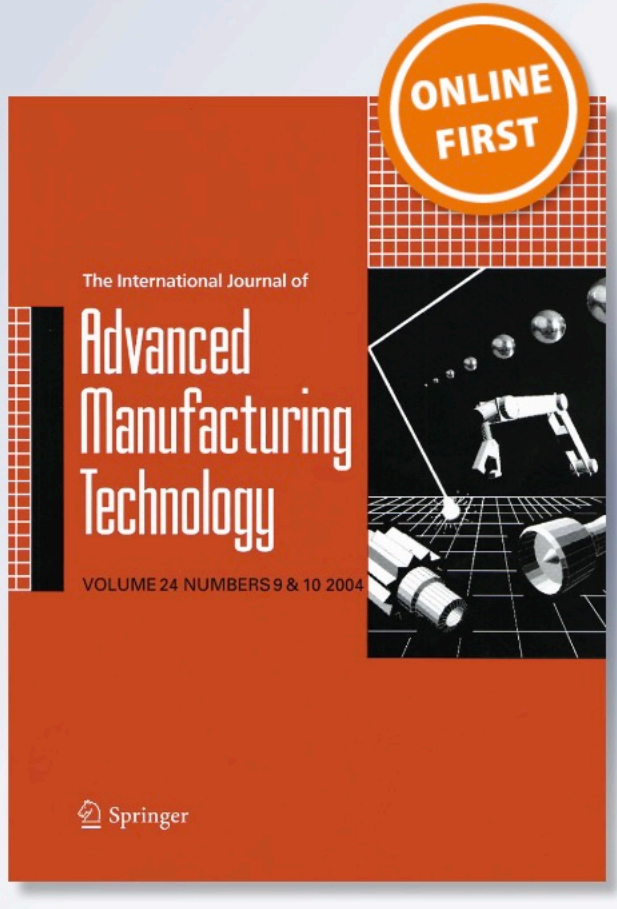

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ORIGINAL ARTICLE

Influence of dry and solid lubricant-assisted MQL cooling conditions on the machinability of Inconel 718 alloy with textured tool

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Abstract
Machinability of Ni-based aerospace alloy is considered to be difficult due to its numerous intrinsic properties. However, the machining performance of nickel-based alloys can be improved with the geometric alteration on the tool rake zone and by the proper cooling-lubrication mechanism. However, the complete consideration of the proper mechanisms is required. To fill this gap, the impact of cutting speed, machining time, and tool texturing was thoroughly inquired about along with cooling conditions on machinability indices such as tool wear, chip morphology, and cutting forces as well as surface finish. The machining tests were done with textured tools on Inconel 718 alloy at cutting speeds 80, 120, and 180 m/min respectively. Then, the comparison of machining characteristics with or without using solid lubrication mixed minimum quantity lubrication system were made. For that, the time of cutting was restricted to 10 min for comparison purposes. For machining at 80 and 180 m/min, the noteworthy reduction in flank and crater wear was observed, whereas at 120 m/min, small reduction is seen from 1 to 10 min under NFMQL condition. The surface roughness was found to be higher under a dry environment compared to a NFMQL environment due to the low coefficient of friction of MoS_2 at a constant feed rate with an increase in cutting speed. The worst surface finish with maximum of 28.17% difference under dry machining condition was observed. It was clearly seen that the blend of canola oil mixed with MoS_2 particles improved the cooling and friction at the cutting zone. In addition, analysis on the scanning electron microscope (SEM) has been done on the worn tools for better comprehension of tool wear during turning of Inconel 718 alloy. Finally, it has been reported that the performance of the textured tool under solid lubrication conditions is better to achieve a lower tool wear (V_b), surface roughness (R_a), cutting forces, and acceptable form of chips.

Keywords Dry turning · Inconel 718 alloy · MQL · Solid lubricant · Surface roughness · Textured tool · Tool wear

1 Introduction

One of the most important sectors to strengthen in manufacturing technology is the aerospace industry. In particular, civil aviation has seen an exponential growth over the last few decades. The aviation industry is driven by the individual needs of moving between places in less time, at low cost and in a more convenient way. The International Air

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Effect of deep cryogenic cooling on machining of Inconel 718 using surface textured tool

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Abstract : In the present study, uncoated tungsten carbide tools were subjected to textured fabrication on the rake face followed by deep cryogenic treatment (-190°C) and tempering to reduce residual stresses. Cutting experiments were conducted on Inconel 718 Ni-based alloy using untreated and cryogenically treated tools having (dimple) surface texture which leads to a reduction in cutting forces which results in low tool wear and improves surface finish. The machining tests were conducted using both the tools with varying cutting speeds of 80, 120 & 180 m/min with a continuous progression of time, feed rate and depth of cut remain constant. The surface roughness of machined workpiece with the treated tool is better at higher cutting speed, whereas the flank wear reduction was also observed. The cutting forces are lower using deep cryogenic treated textured tools as compared to untreated during machining Inconel 718. It was revealed that cryogenically treated textured tool is superior to untreated during the cutting process.

Keywords **– Inconel 718, surface texture, tungsten carbide, cryogenic, turning.**

I. INTRODUCTION

Inconel-718 alloy plays an important role in the construction of aircraft and gas turbines industries. There are many applications in addition to aerospace, marine, and industrial turbines, Nickel-based Inconel 718 is now used in the space shuttle, jet engine, nuclear reactor, submarine, and other high-temperature applications. This alloy is known as some of the most difficult-to-cut super-alloys to satisfy the machining quality requirements. These alloys provide high-temperature operation, corrosion resistance, and weight ratio, provide efficient fuel consumption for economical flight operations and extended service life. Inconel 718 contributes to bad machining because of this fact that they maintain high corrosion resistance, mechanical and thermal fatigue, mechanical and thermal shock, creep and erosion at high temperatures. Work hardening occurs during cutting, which contributes to wear on the tool nose notching, as well as abrasion due to the presence of solid abrasive carbides in a superalloy, due to wearing at high friction. The commercially available cutting tool chemically react at high cutting temperatures during machining which leads to high diffusion wear rate. During cutting, continuous and robust chips are produced, which are difficult to control by cutting tool seizure and crater wear. Among the tool-chip interfaces, heat thermal diffusion and high friction tool-chip interface produce high-temperature heat gradients in cutting tools. All these peculiar characteristics make Inconel 718 difficult to machine. The factors that affect Inconel 718 machining capacity, reduced tool life, and poor surface integrity of processed parts are important for consideration. Therefore, be very careful to confirm that the surface integrity and tool life for the machining of the nickel-based alloy is not sufficient. Most basic parameters include tool material, the geometry of tool, material removal rate, depth etc. They should be managed to achieve the proper tool life during cutting. The most important part of machining is cutting parameters and cutting tools; which is small and cheap. For machining nickel alloys high strength, hot hardness and strength, good abrasion resistance and heat shock properties, as well as adequate chemical stability at high temperatures is required. Since machining generally fulfills the set tolerance and surface size, the type of surface with which the machine operates and its characteristics are important in manufacturing. The focus of metal cutting research on the behavioral characteristics of tool and workpiece content that affect the performance and quality of cutting. With a specific force in the cutting action, a cutting tool is pressed against the workpiece, so that the material can be removed as a piece of chips. This generates excessive heat in the interfaces of the tool-workpiece. Using continuous cutting tool worn out, which eventually leads to failure.

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RESEARCH NOTE

Structure-property Interaction in Flux Assisted Tungsten Inert Gas Welding of Austenitic Stainless Steel

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ABSTRACT

Austenitic stainless steel SS304 grade was welded with active Tungsten Inert Gas (TIG) welding process by applying a flux paste made of SiO_2 powder and acetone. SiO2 flux application improves the weld bead depth with a simultaneous reduction in weld bead width. The improvement in penetration results from arc constriction and reversal of Marangoni convection. Experimental studies revealed that the SiO_2 flux assisted TIG welding can enhance the weld bead penetration by more than 100%. Full depth welds up to 6mm were obtained by applying SiO_2 flux. Microstructure reveals a reduction in ferrite formation in fusion zone by applying SiO_2 flux. Samples welded with flux exhibits reduction in tensile strength and improvement in impact strength. Fractography of the tensile test specimens reveals the presence of oxide inclusions in the samples welded with flux. The relation of ferrite content and mechanical properties are presented in this paper.

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1. INTRODUCTION

Tungsten Inert Gas (TIG) Welding Process or Gas Tungsten arc welding (GTAW) process uses a non-consumable tungsten electrode to generate an electric arc for fusion of work-piece. The electrode is protected with inert gas generally argon or helium to prevent oxidation at high temperature. This process is commonly used for good quality welds of stainless steel, alloy steels, magnesium and aluminum alloys [1]. However, the process lacks in achieving penetration greater than 3mm. Full depth fusion joints are made by V-Groove edge preparations and multi-pass welding procedures which reduce the productivity of process [2]. There was a definite need to improve the weld bead penetration in GTAW process.

Several techniques have been implemented in past to improve the weld bead penetration. Heiple et al. [3] proposed theories that change in the surface tension driven flow of the molten metal in weld pool can remarkably improve the weld bead geometry. Some of the alloying elements like sulfur, selenium can act as a surface active agent in the weld pool to change the surface tension driven flow. This can additionally enhance the weld penetration and depth/width proportion of the weld bead. Whereas some elements like phosphorus have not shown any effect on the weld bead geometry [4]. It was in this manner inferred that exclusive surface dynamic components like sulfur, selenium, oxygen over a specific point of confinement can change the surface strain driven stream to enhance the GTAW Productivity. In another technique, developed by Paton Institute of welding in the 1960s, active flux powder containing oxides, chlorides are applied to the base material before welding [5]. This technique gained the interest of researchers from the year 2000 onwards to improve weld bead geometry [6]. In this technique, active flux made of oxide powders is blended with a thinner like acetone or ethanol to have a paint-like consistency. It is applied to the base metal before welding as shown in Figure 1. At high temperature during welding, oxygen decomposes from the oxide powders [7]. Oxygen being a surface active element reverses the Marangoni flow to improve weld bead geometry [8]. Whereas some of the researchers consider arc constriction for improvement of weld bead penetration [9].

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Volume 127, 1 February 2019, Pages 82-91

Network selection criterion for ubiquitous communication provisioning in smart cities for smart energy system

Kiran Ahuja, Arun Khosla

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https://doi.org/10.1016/j.jnca.2018.11.011

Abstract

With the expansion of urbanization, energy becomes one of the foremost requirements of a smart city. Low energy consumption, renewable energy, and carbon footprints reduction are prime targets of a smart city. A smart city needs to be energy efficient and technology driven. Information and Communication Technology (ICT) helps to improve system efficiency and creates a way for the end consumer to communicate with utilities and the network service provider. The two-way communication model of a smart grid makes possible reliable, stable and efficient communication between utility and consumer by using ICT. The major issue in smart energy system is the lack of necessary interoperability and integration of communication standards, which hampers the effective deployment of communication networks. In this paper, we present a hierarchical architecture to resolve this issue, which will support smart energy system infrastructure and services in smart cities for provisioning of ubiquitous communication. It consists of two computing zones (fog computing and cloud computing) along with two implementation phases (initial and final). Fog computing will help to offer low latency response to anomalous and hazardous events in real time while reducing a burden on the cloud for computing as well as storage. To provide ubiquitous communication in smart energy system for data acquisition, a network selection algorithm has been proposed. TOPSIS MADM technique is employed for network selection in a heterogeneous environment at HAN/NAN (Bluetooth, Zigbee, Z-Wave, WLAN, LoRaWAN) and WAN (GPRS, UMTS, LTE, and WiMAX) levels of smart energy system's multilayer communication infrastructure. Coverage area, data rate, power consumption and security level attributes are employed for network selection. The results revealed that WLAN performed better in case of HAN/NAN environment, whereas LTE worked best at WAN level.

Previous article in issue Next article in issue

Original Paper | Published: 25 April 2019

Object acquisition and selection using automatic scanning and eye blinks in an HCI system

Hari Singh & Jaswinder Singh

Journal on Multimodal User Interfaces **13**, 405–417 (2019) | Cite this article

Abstract

This paper presents an object acquisition and selection approach in human computer interaction systems. In this approach, objects placed over computer screen are automatically scanned and the user performs voluntary eye blinks for object selection when the focus comes over the object of interest. Here, scanning means moving the focus over objects placed on the computer screen one by one and the scanning time is the time taken to move focus from one object to the next object. The user is not required to perform any physical movement, the moving part is only the eye lids. A low cost webcam and MATLAB software with computer vision toolbox are required to implement the proposed approach. The performance of the proposed approach has been compared with the Camera Mouse for selection of text and graphic objects. The Camera Mouse utilizes facial feature tracking for mouse cursor control and dwell time for object selection. Three experiments were performed for evaluation of the proposed method in which ten healthy users voluntarily participated. The proposed method has given significantly better performance than the Camera Mouse when selection of text objects was performed in an html file. For selection of graphic objects placed on computer screen, where page scrolling is not required, no significant difference has been found in the performance of both the systems. The proposed method has also been evaluated for performing mouse analogous operations using eye blinks and a performance comparison has been made with state-of-the-art methods.

Original Paper | Published: 03 October 2019

Performance enhancement of high-capacity coherent DWDM free-space optical communication link using digital signal processing

Rajan Miglani & Jagjit Singh Malhotra

Photonic Network Communications **38**, 326–342 (2019) | Cite this article

445 Accesses | **10** Citations | Metrics

Abstract

In this paper, 1.28 Tbps (32 × 40 Gbps) high-capacity DWDM-FSO link has been investigated for performance enhancement using coherent detection and digital signal processing (DSP). The DP-16QAM-modulated proposed DWDM-FSO link has been analyzed for both adverse weather and turbulent atmospheric conditions. It is observed that when link is subjected to strong turbulence along with adverse weather conditions, the DSP-aided coherent DWDM-FSO receiver achieves target bit error rate (BER) of 10^{-4} at signal-to-noise ratio (SNR) of 36.4 dB, while for similar conditions, the SNR requirements for IM/DD-based DWDM-FSO link shoots by 12.8 dB to 49.2 dB. Also, in terms of operational link range, the proposed link even under strong turbulent conditions serves 1.88 km, whereas IM/DD link was restricted to mere 1.12 km for target of BER of 10^{-4}, thus producing a decent range increment of 760 m. The proposed link has been designed and investigated using OptiSystem™ 14.2.

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Articles

Adaptive deblocking technique based on separate modes for removing compression effects in JPEG coded images

Amanpreet Kaur, Jagroop Singh Sidhu & Jaskarn Singh Bhullar

Pages 501-513 | Received 13 Jul 2018, Accepted 05 Jan 2019, Published online: 20 Jan 2019

Download citation https://doi.org/10.1080/1206212X.2019.1567045 Check for updates

ABSTRACT

Adaptive post-processing filtering techniques significantly improve the perceptual quality of decoded images by alleviating compression artifacts. However, there are still some noticeable compression artifacts in the block-based coded images especially at a low bit rate. In this paper, we proposed a three-step deblocking filter technique that removes the compression artifacts, undesired noise, and corner outliers. The proposed deblocking technique has been applied to the variety of JPEG compressed images and results are compared with existing post-processing techniques on the basis of standard metrics such as PSNR, PSNR-B. Experimental simulation results illustrate that the proposed technique could effectively improve the perceptual quality of various images and outperform existing deblocking technique.

KEYWORDS: Image compression | post-processing | blocking artifacts | DCT | corner outlier

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Journal of Network and Computer Applications
Volume 127, 1 February 2019, Pages 82-91

Network selection criterion for ubiquitous communication provisioning in smart cities for smart energy system

Kiran Ahuja, Arun Khosla

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https://doi.org/10.1016/j.jnca.2018.11.011

Abstract

With the expansion of urbanization, energy becomes one of the foremost requirements of a smart city. Low energy consumption, renewable energy, and carbon footprints reduction are prime targets of a smart city. A smart city needs to be energy efficient and technology driven. Information and Communication Technology (ICT) helps to improve system efficiency and creates a way for the end consumer to communicate with utilities and the network service provider. The two-way communication model of a smart grid makes possible reliable, stable and efficient communication between utility and consumer by using ICT. The major issue in smart energy system is the lack of necessary interoperability and integration of communication standards, which hampers the effective deployment of communication networks. In this paper, we present a hierarchical architecture to resolve this issue, which will support smart energy system infrastructure and services in smart cities for provisioning of ubiquitous communication. It consists of two computing zones (fog computing and cloud computing) along with two implementation phases (initial and final). Fog computing will help to offer low latency response to anomalous and hazardous events in real time while reducing a burden on the cloud for computing as well as storage. To provide ubiquitous communication in smart energy system for data acquisition, a network selection algorithm has been proposed. TOPSIS MADM technique is employed for network selection in a heterogeneous environment at HAN/NAN (Bluetooth, Zigbee, Z-Wave, WLAN, LoRaWAN) and WAN (GPRS, UMTS, LTE, and WiMAX) levels of smart energy system's multilayer communication infrastructure. Coverage area, data rate, power consumption and security level attributes are employed for network selection. The results revealed that WLAN performed better in case of HAN/NAN environment, whereas LTE worked best at WAN level.

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Research articles

Broad-band microwave absorption and magnetic properties of M-type $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ hexagonal ferrite in 18.0–26.5 GHz frequency range

Sukhleen Bindra Narang [a], Amit Arora [a, b]

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https://doi.org/10.1016/j.jmmm.2018.10.042

Abstract

La-Na co-substituted M-type Co-Ti-Mn barium hexaferrites $Ba_{(1-2x)}La_xNa_xFe_{10}Co_{0.5}TiMn_{0.5}O_{19}$ ($0.00 \le x \le 0.25$) were synthesized by conventional solid-state method. The influence of La-Na doping on the magnetic properties was investigated through VSM (vibrating sample magnetometer). The room temperature hysteresis loops show that the saturation magnetization decreases from 55.667 emu/g for x = 0.00 to 44.768 emu/g for x = 0.25 sample. To determine the complex permittivity ($\varepsilon_r = \varepsilon' - i\varepsilon''$) and permeability ($\mu_r = \mu' - i\mu''$) in 18.0–26.5 GHz frequency range, a vector network analyzer was employed. Reflection loss (RL) values were simulated from the values of ε_r and μ_r acquired using transmission line theory. The minimum RL obtained for the sample x = 0.10 is –45.94 dB (99.997% signal absorption) with an absorption bandwidth of 8.33 GHz for 1.3 mm sample thickness. Thus, the synthesized hexaferrites can be utilised in electromagnetic shielding and radar stealth technology applications.

Introduction

The vast evolution of wireless communication in the gigahertz frequency range has expanded the issue of EMI (electro-magnetic interference), impeding the functioning of electronic gadgets. Electromagnetic materials with remarkable magnetic and dielectric losses in microwave frequencies are used to reduce the impact of EMI and enhance the working of microwave gadgets [1], [2], [3], [4], [5]. Since a long time, the spinel ferrites have been used for microwave absorbing applications; but they cannot be used at high frequencies due to their lower ferromagnetic resonance frequency (less than 1 GHz) [1], [6]. The hexaferrites with

International Journal of Innovative Technology and Exploring Engineering (IJITEE)
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Development of QoS optimized routing using Artificial bee colony and TABU-GA with a mobile base station in Wireless Sensor Network

Varsha , Manju Bala , Manoj Kumar, Neeraj Kumar

Abstract*—Routing in Wireless Sensor Networks (WSNs) have been playing an important and progressive role in different scenarios like the environment and traffic monitoring. In this research paper, extensive contributions have been explored concerning the routing mechanisms involving WSN. Enhancing the critical attributes like network lifetime and reliability are prime areas of research in this field. To obtain the desired results, optimizations have been performed using Swarm Intelligence (SI) based routing mechanism like the Artificial-Bee Colony (ABC) optimization and TABU-GA routing technique. Although, since the past decade, the Ant-Colony Optimization (ACO) and Particle Swarm Optimization (PSO) have been introduced and applied in this field, but the ABC and TABU-GA approach is relatively novel and considered a prominent choice as compared to other methods. However, a lot of scope for further enhancement of the ABC optimization and TABU-GA problem. This paper highlights and explains the comparison between RZLEACH (Rendezvous LEACH), ABC and TABU-GA algorithm based routing mechanisms. The simulation results obtained show that the TABU-GA have significant result over the ABC and RZLEACH and found 6% improvement when compared with the RZLEACH approach in terms of Remaining Energy and 9% lesser in case of First node dead (FND) with comparison to RZLEACH.

Keywords*— Wireless sensor network, Artificial Bee Colony, TABU-GA, LEACH, RZLEACH, First node dead, Packet Delivery Ratio.

I. INTRODUCTION

In WSN applications, various nodes spread over the monitoring region with low-cost sensors. These nodes are arranged effectively into a wireless network, where every individual sensor node stores the information and transmits the reports intermittently to the Base Station (BS).

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Low energy consuming devices are necessary for WSNs since it would be difficult to replace the power supply of these nodes when they placed in remote locations. There have been multiple methods created to reduce power consumption like Media-Access-Control (MAC) protocols, sleep scheduling, topological control, data aggregation, routing protocols, etc. Out of these techniques, routing protocols are considered critical for structuring the wireless sensor network. Hence, it is necessary to increase the total efficiency and lifespan of the network [1]. Therefore, an efficient technique proposed for creating a path between the sending and receiving nodes, based on the ABC algorithm. This is performed to deal with the changes taking place in routing since the virtually simulated bees identify a group of initial solution vectors randomly and then make improvements using iterations. A neighbor search mechanism used in the algorithm for improving poor solutions. In the ABC calculation, three types of honeybees considered as administrators for dealing with enhancement issue: employees, onlookers, and scouts. Luo and Hubaux [2] consistently deployed sensor nodes in a circular area and presumed that moving a sink along the outer area of the circle helps upgrade the network's lifetime to a large extent in contrast to when the location of the sink is fixed at the center of the circle. Since Mobile sink (MS) cannot be located near to all of these nodes for gathering information, another set of nodes called Rendezvous Node (RNs) or Rendezvous Point (RPs) produced. RN characterized as a point nearer to the region of MS. At whatever point MS comes nearer to RNs; RN sends the data to it. MS informs RNs of its arrival by sending a signal called beacons. Initially, the LEACH protocol had contributed a lot for reducing energy consumption among sensor nodes. Later on, the idea of rendezvous nodes (RZ) and mobile sink had been combined with LEACH to decrease energy consumption. Artificial bee colony connects with RZLEACH in the transmission phase because it has a fast convergence speed and more robustness. The drawback of RZLEACH is that it cannot pursue any optimization strategy in routing to accomplish the best outcomes. The ABC-RZLEACH overcomes the shortcomings of RZLEACH with changes in routing because the virtually simulated bees identify a group of initial solution vectors randomly and then make improvements using iterations. Similarly, the concept of TABU-GA routing is appointed. TS-GA hybrid model proposed by Zdansk&Pozivil in 2002. This model is intended to combine the TS and GA in a single algorithm that firstly creates a set of random valid solutions, and for several iterations it optimizes them using a TS-based method.

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Hybrid TABU-GA Search For Energy Efficient Routing In WSN

Varsha, Manju Bala, Manoj Kumar, Neeraj Kumar

Abstract*— The heterogeneity is contextual in wireless sensor network. In the case of hardware terms, there might be different batteries, memory, MAC layer, communication protocol, and computing architecture. To measure the system's lifetime, this paper focuses on node heterogeneity that implies it has three kinds of nodes: advance nodes, supernodes, and normal nodes. In this paper, proposed a new multilevel stable and energy-efficient clustering protocol using TABU-GA search mechanism carries out two neighborhood generating operations to detect the optimal path with the aim of maximize the network lifetime in the area of 200m×200m. The simulation is done under the MATLAB environment to observe network stability, throughput, average remaining energy, etc. Our proposed protocol outperforms in comparison with the multilevel stable and energy-efficient clustering protocol.

Keywords*— Wireless sensor network, heterogeneity, multilevel stable and energy-efficient clustering protocol, tabu – GA search, MATLAB, network stability, throughput, average remaining energy.

I. INTRODUCTION

A wireless sensor network comprises of an extensive number of low - cost, low - capability, and multi-purpose sensor nodes that are distributed in areas that are difficult to access, which requires sensors to be energetically autonomous and able to operate without manual intervention.[1]

The Sensors are mainly used to sense the environment and to gather the data to a centralized location. Advent of processing devices and networks makes it as "Wireless Sensor Network". Development in Semi-conductor technology and Networking method has stimulated the use of sensor networks for observing and information collection. In Wireless sensor network, information collected by sensors is gathered at a distant location for analyzing and computation purpose via wireless links. From last few decades researchers are making exertions for Wireless Sensor Network (WSN) routing technology with more power efficient protocols.

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Diverse government and research agencies are trying to put different proposals for Wireless Sensor Technology advancements. Wireless sensor network contains battery functioned small nodes which are positioned over a wide geographical area to monitor the events and to accumulate the collected data to a distant centralized location called as base station. Nodes are deployed in such a way that the entire area is in the coverage of wireless nodes The deployed nodes sense the data from its neighborhood and transmit the collected data for further processing. The main distinction between ad hoc networks and Wireless Sensor Networks is their applications area. Ad-hoc networks primarily focus on communications aspects whereas wireless area networks focuses more on monitoring and information collection. In this paper TABU-GA MSEEC routing protocol is proposed .The main aim of this protocol is to prolong the network period .The performance of purposed approach will be compared against basic multi-level stable and energy efficient clustering protocol and TABU based multi-level stable and energy efficient clustering protocol.[2]

The rest of the paper is in the following order: Section II examines related work, Section III characterizes the network model. Section IV depicts the TABU-GA based MSEEC Protocol, Section V gives the experimental setup, and Section VI gives the results and discussion and in conclusion Section VII finishes up the paper with future degree.

II. RELATED WORK

D. Kumar et al. [3] have reviewed the impact of heterogeneity of nodes in terms of their energy. They assume that the sensor nodes are randomly distributed and measurements of the sensor field are known. Homogeneous nodes have the same amount of energy. Adjusting to this methodology, they presented a energy productive heterogeneous bunched conspire for WSN depend on weighted political decision probabilities. At last, the recreation results exhibited that proposed heterogeneous grouping approach is progressively sufficient in drawing out the system lifetime related to LEACH.

Saini, Parul et al. [4] have studied the upgraded conveyed energy proficient grouping plan for heterogeneous systems. It contains three sorts of sensor nodes to improve the security of the remote sensor organizes and to make longer lifetime of the network. Along these lines, the heterogeneity and energy level of the whole system is expanded. The outcome shows that the exhibition of EDEEC is better when contrasted with SEP. V. Raghavendran, G Naga Satish et al.

Parametric Analysis and Optimization on Modified Hexagon Shaped Antenna Amalgamated with Staircase to Accomplish Wide Impedance Bandwidth suitable for Wireless Portable Applications

Ria Kalra, Dr.Manoj Kumar

Abstract

The highlights of this paper are a detailed parametric analysis and optimization on a modified hexagon shaped antenna. Staircase is amalgamated in the designed antenna after carefully observed parametric variations in the geometry. The modified shape of the proposed antenna contributed in enhancement of Bandwidth as observed in the simulation results. The proposed modified hexagon shaped antenna amalgamated with staircase is found suitable for wireless portable applications. HFSS (Version 15.0) is used for designing and analyzing the proposed antenna and provides wide impedance bandwidth between 3 GHz to 30 GHz for VSWR < 2. Parametric analysis and optimization is done on significant design parameters to attain minimal return loss characteristic of -15.30 db obtained at 19.1 GHz and exhibiting good radiation performance over the entire frequency range. The prototype antenna is fabricated and tested to measure the experimental results. A reasonably fine agreement is observed in the simulated & measured results. The proposed antenna exhibits advantages of compact geometry and simultaneously shows minimal return loss characteristics and wide impedance bandwidth. Thus, it is considered appropriate for wireless portable applications such as GPS (1.57 GHz), GSM (1.8 GHz), Wi-Max (2.3 GHz) and WLAN (2.45 GHz).

PDF

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Section
Articles

An Energy-Efficient routing protocol based on TABU-Genetic Strategy in Wireless Sensor Network

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----------**ABSTRACT**----------

In Swarm Intelligence, various techniques are being planned as far as ACO, PSO, Fish Swarm, Bats Swarm, Bacterial Foraging, TABU, GA search and so forth.TS and GA is a single algorithm that firstly creates a set of random valid solutions, and for several iterations it optimizes them using a TS-based method. Afterwards, it takes this set of optimized solutions as the initial population for the GA, and iterates until the adopted stop criteria have been met.The objective of this research paper is to implement TABU-GA search to make the protocol more efficient and effective. This paper proposed MSEEC (multilevel stable and energy efficient clustering protocol) utilizing TABU-GA mechanism in the territory of 200m×200m.The recreation is done under the MATLAB 2013 a environment and observed the performance of TABU-GA MSEEC against MSEEC protocol on 4% increase in the case of first node dead (FND) and 28% increase in the case of last node dead (LND).

Keywords—Wireless sensor network, heterogeneity, TABU-GAmechanism, MATLAB, FND, LND.

I. Introduction

The Sensors are mainly used to sense the environment and to gather the data to a centralized location. Advent of processing devices and networks makes it as "Wireless Sensor Network". Development in Semi-conductor technology and Networking methods have stimulated the use of sensor networks for observing and information collection. In Wireless sensor network, information collected by sensors is gathered at a distant location for analyzing and computation purpose via wireless links. Some applications of wireless sensor network include medical, environmental, transportation, military, entertainment, homeland, defense, and crisis management etc. Alike to other communication systems, wireless sensor network systems development has a diversity of origins. The history of development can be briefly alienated into four phases: [1]

Phase 1: During the cold war period, there was a need to monitor and detect the positions of enemies which gave birth to number of projects such as Sound Surveillance System and radar networks developed by United States.

Phase 2: DARPA (Defense Advanced Research Projects Agency) of United States Department of Defense initiated the research programs in the early 1980s that were basically focused on advance developments on new technologies and protocols of wireless sensor networks.

Phase 3: Projects undertaken by DARPA laid the foundation for military applications developments based on wireless sensor networks. Huge amount of money spent on newer technologies made the development faster in early 1990s.

Phase 4: Recent advancements in semi-conductor technologies and networking techniques directed an innovative stage in the growth of sensor network technology. In 2000's IEEE released the first version of IEEE Standard i.e. 802.15.4 standard "Low Rate

Randomization of Node Scheme with Optimization in Wireless Sensor Network

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Resonant Enhancement of THz Radiation Through Vertically Aligned Carbon Nanotubes Array by Applying Wiggler Magnetic Field

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Abstract

The present analysis develops a novel theory of terahertz radiation generation by beating of two laser beams, incident obliquely on the array of vertically aligned carbon nanotubes (CNTs) in the presence of an external wiggler magnetic field. The array of CNTs behaves as nanoantenna to generate THz radiations. The incident lasers exert a ponderomotive force on the electrons of the CNTs to produce nonlinear oscillatory velocity, which beats with the applied wiggler magnetic field. This beating produces a nonlinear current at $(\omega_2 - \omega_1, k_2 - k_1 + k_0)$ which acts as an antenna to produce the THz radiation. We observe that when the beat frequency $(\omega_2 - \omega_1)$ lies near the effective plasmon frequency of the CNTs, strong THz radiation is produced due to a resonant interaction of the laser with CNT electrons. The externally applied wiggler magnetic field enhances the efficiency of THz radiation of nanoantenna by providing the necessary momentum to the generated THz radiation. We explore the impact of radius and length of nanotubes on the efficiency of THz generation. The generated THz power is enhanced at an optimum angle of incidence of lasers with an array of CNTs.

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Comparison of microwave and conventionally sintered manganese and niobium doped lanthanum germanate based apatites by micro Raman Spectroscopy

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HIGHLIGHTS

- Sintering of apatites have been done by conventional and microwave processing.
- The XRD revealed that the sintered products had single Phase hexagonal oxy apatite.
- Raman Spectroscopy revealed that monoclinic phase was also present in the apatites.
- Microwave sintered products had uniform grain growth and higher density.
- Microwave sintered products had higher hardness and conductivity value.

ARTICLE INFO

Keywords:
Micro Raman spectroscopy
XRD
SEM and hardness

ABSTRACT

In this paper, the effect of microwave and conventional sintering on doping behaviour of Mn^{2+} and Nb^{5+} in lanthanum germanate based apatite have been compared. The precursor of apatite has been prepared by mixed oxide method and conventionally calcined at 1100 °C for 6 h. The resulting powders have been sintered by microwave energy at 1400 °C for 30 min and by conventional heating 1400 °C for 4 h. The products prepared have been characterized by X-ray diffraction, scanning electron microscope, Micro Raman spectroscopy, and Vicker's hardness and the results are compared. The apatites of similar compositions sintered by microwave energy have higher density and hardness than the apatites sintered by electric heating.

1. Introduction

The ideal general formula of apatite is $A_{10}M_6O_{24}X_2$ (A = alkaline earth, rare earth; M = P, Si Ge) and (X = OH, O and halide). Its applications ranging from biomaterial to electrolytes have been of interest and therefore highly researched [1]. Hassan et al. have written a review on microwave-assisted techniques for the synthesis of nano hydroxyl apatite but they did not cover the sintering of hydroxyapatite [2]. Transparent hydroxyapatite was prepared first time in the Microwave Processing & Engineering Center of Material Research Institute, Penn State by the group of Agrawal. They had used fine crystalline material prepared by hydrothermal process and microwave sintering of the fine powder at 1150 °C within 5 min of soaking time [2–5]. In another work, the group used microwave processing in the preparation of HAP/ZrO_2 composites to avoid loss of calcium phosphate. They could prepare HAP/ZrO_2 by microwave processing at the temperature as low as 1200 °C within 20 min of sintering time. Conventionally HAP/ZrO_2 was prepared at 1200 °C in 240 min which led to the loss of calcium phosphate [6]. The sintering of hydroxyapatite to be used as a biomaterial has been reported by the group of Singh [7].

In the year 1995, Nakayama et al. investigated lanthanum silicate-based apatites $La_{10}(SiO_4)_6O_3$, (Ln = La, Nd, Sm, Gd, Dy, Y, Ho, Er and Yb) for its applications as an ionic conductor [8] and later lanthanum germanates was also studied for the applications as ionic conductors [9] to be used at intermediate temperature in the solid oxide fuel cells (SOFC). Since the $La_{9.33+2x/3}(Si/Ge)_6O_{26+x}$ apatites have a conductivity

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Analysis of Pedagogy of Teacher's Capability to Transform Knowledge Into Practice Using Fuzzy Logic

Authors: Jagmohan Mago, Dinesh Kumar Authors Info & Claims

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Abstract

Current literature and common practices suggest that there is no consistent method available to analyze the performance of teachers. Due to its inherent vagueness and uncertainty, this article analyzes the effectiveness of a teacher depending upon various factors using fuzzy logic. It explains various parameters influencing professional, interpersonal and personal behavior of teachers. Secondly, a fuzzy inference mechanism is developed to decide the possible quality of teachers. The article concludes by observing that the proposed fuzzy logic based system is consistent with that judged by the experts and can be used to predict the possible quality of teachers.

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Multiuser Massive MIMO-OFDM System Incorporated with Diverse Transformation for 5G Applications

Lavish Kansal[1] · **Vishal Sharma**[2] · **Jagjit Singh**[3]

Abstract

Wireless systems and standards are now progressing towards the implementation of fifth generation (5G) to combat with an expected and explosive growth of demands of wireless services in future. Consequently, the orthogonal frequency division multiple access (OFDMA) technology is being utilised for the uplink and downlink transmission to afford the high spectral efficiency in fading environments. However, the 5G implementation requires additional improvements to meet the futuristic stress. This work proposes an innovative solution that combines OFDMA technology with multi-user massive multiple input multiple output (MIMO) technology to meet the required elevated data rates as desired by the growing application needs of 5G. Massive MIMO is capable to fulfil the vision of 5G to realize a huge number of base stations equipped with a large number of terminals to be served in the same time–frequency resource without severe inter-user interference. Furthermore, the proposed system is demonstrated incorporation with discrete wavelet transform, and fractional Fourier transforms. The evaluated outcomes exemplify a considerable improvement in spectral efficiency and BER performance in contrast with the earlier reported work.

Keywords OFDM · MIMO · FFT · DWT · FRFT · PSK

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An innovative approach for performance enhancement of 320 Gbps free space optical communication system over turbulent channel

Rajan Miglani[1] · **Jagjit Singh Malhotra**[2]

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Abstract
Free space optical (FSO) communication systems have recently gained huge attention as possible last mile solution in delivering high speed data services for terrestrial applications. However the FSO link performance, particularly the link range is significantly limited by the severity of atmospheric adversities affecting the channel. In this paper we advocate the use of multi-hop relay techniques to transmit wavelength division multiplexed (WDM) signal over the FSO channel. Since weather induced impairments in FSO links are distance dependent phenomena, hence relay transmission allows substantial performance enhancement by alleviating channel losses while, WDM provides cost effective solution in improving the transmission capacity. With aggregate link losses as high as 40 dB/km, the proposed 32 channel—10 Gbps (320 Gbps) FSO link has been evaluated by comparing bit error rate (BER) performances and eye patterns over different turbulent regimes. Gain optimized EDFA amplification and conventional electrical amplification have been employed to realize amplify-and-forward (A–F) multi-hop transmission in the proposed link with the former delivering more inspiring BER performance of over the latter. Our simulation results indicate that for receiver SNR of 35 dB, BER improvement up to five orders of magnitude can achieved using triple relay FSO link in contrast to direct link operating under similar conditions. Additionally, it is also observed during the analysis that for target BER of 10^{-5}, incorporation of triple relay enhances the link range by approximately 1200 m over direct link. However on the flip side, our investigations also revealed that as the number of relay nodes is increased, the SNR gain for specified BER does increase but the magnitude of gain declines. The proposed link was designed and investigated using OptiSystem™ 14.2.

Keywords Free space optics (FSO) · Dense wavelength division multiplexing (DWDM) · All optical relaying · Atmospheric turbulence · Multi-hop FSO · Gamma–Gamma fading

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Investigation on R–S Coded Coherent OFDM Free Space Optical (CO-OFDM-FSO) Communication Link Over Gamma–Gamma Channel

Rajan Miglani[1] · **Jagjit Singh Malhotra**[2]

Abstract
Atmospheric turbulence is known to significantly degrade the efficiency and reliability of free space optical communication link. Use of coded-orthogonal frequency division multiplexing (OFDM) technique to mitigate the effect of adverse atmospheric conditions on free space optical (FSO) communication link has been proposed here. With Gamma–Gamma distribution for channel modeling, the error performance of the proposed RS8 (Reed Solomon) coded, 128 sub-carrier OFDM link has been investigated using coherent BPSK and QPSK modulation scheme. The results obtained from this analysis have also been compared with intensity modulated/direction detection (IM/DD) based OOK-OFDM FSO link. In case of strong turbulence and for target BER of 10^{-4}, it was observed that BPSK and QPSK modulated OFDM FSO link achieve a descent coding gain of 18.2 dB and 12.6 dB respectively over non coded OOK-OFDM FSO link. Also, it was observed that as the link conditions worsened from weak to strong turbulence, the effect of atmospheric impairments on FSO link becomes significantly pronounced. Additionally, in terms of BER performance, the BPSK modulated link out-performed QPSK and OOK under all the considered channel conditions.

Keywords Atmospheric turbulence · Bit error rate (BER) · Free space optical communication (FSO) · Orthogonal frequency division multiplexing · Reed–Solomon (RS) coding

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Model of adaptive WiMAX network incorporating diverse transforms

Lavish Kansal[1] · Vishal Sharma[2] · Jagjit Singh[3]

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Abstract
Recent advancements in mobile Worldwide Interoperability for Microwave Access (WiMAX) standards have led to the development of more reliable, robust and efficient broadband networks that can provide access for both fixed and mobile users. The physical layer of a WiMAX network is composed of orthogonal frequency-division multiplexing (OFDM) technology, which allows it to provide elevated data rates with minimum distortion in fading environments. However, the presence of interference affects the orthogonality of the OFDM sub-carriers, which increases the probability of network errors. The error probability can be reduced by increasing the output power level at the expense of an elevated peak-to-average power ratio (PAPR). In this work, discrete wavelet transforms (DWTs) and fractional Fourier transforms (FrFTs) are used to augment the reliability and efficiency of an adaptive WiMAX system. The results show considerable improvements in both bit error rate (BER) reduction and spectral efficiency enhancement at a given signal-to-noise ratio (SNR). In addition, a significant PAPR reduction is attained when the DWTs and FrFTs are used in place of fast Fourier transforms. Moreover, the proposed adaptive algorithm realizes a spectral-efficient WiMAX system that enables the system to select the suitable transform strategy (DWT/FrFT) with minimum SNR requirements to achieve the target BER of 10^{-4}.

Keywords WiMAX · DWT · FFT · FrFT · BER · PAPR

1 Introduction

Wide area access technologies will soon be replaced by broadband wireless access (BWA) networks because of their simpler equalisation mechanisms, higher spectral efficiencies and resilience in multipath fading environments. BWA networks can deliver high-speed mobile and data services to both small/medium-sized organisations and domestic users because of characteristics such as ease of installation, high levels of adaptability and increased reliability. BWA potentially offers a good option for users who are either dissatisfied with or otherwise unsupported by existing wired broadband services. The standardised version of BWA is WiMAX, which is also known as the IEEE 802.16 standard, and it has the capability to provide higher data rates to many users, even during high traffic scenarios. Additionally, the use of OFDM for the physical layer allows WiMAX to provide a more reliable service in multipath fading environments [1]. The various well-known versions of IEEE 802.16 are as follows [2]:

a) IEEE 802.16: Designed for use in line-of-sight (LOS) environments and operating in the 10–66 GHz frequency range.
b) IEEE 802.16a: Designed for use in non-line-of-sight (NLOS) environments and operating in the 2–11 GHz frequency range.
c) IEEE 802.16d: Initially defined for maintenance and system profiles for operation in the 2–11 GHz frequency band, but was later merged with 802.16-2004.
d) IEEE 802.16e: Described as a standard for mobile broadband wireless access systems.

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ORIGINAL PAPER

Performance enhancement of high-capacity coherent DWDM free-space optical communication link using digital signal processing

Rajan Miglani[1] · Jagjit Singh Malhotra[2]

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Abstract
In this paper, 1.28 Tbps (32 × 40 Gbps) high-capacity DWDM-FSO link has been investigated for performance enhancement using coherent detection and digital signal processing (DSP). The DP-16QAM-modulated proposed DWDM-FSO link has been analyzed for both adverse weather and turbulent atmospheric conditions. It is observed that when link is subjected to strong turbulence along with adverse weather conditions, the DSP-aided coherent DWDM-FSO receiver achieves target bit error rate (BER) of 10^{-4} at signal-to-noise ratio (SNR) of 36.4 dB, while for similar conditions, the SNR requirements for IM/DD-based DWDM-FSO link shoots by 12.8 dB to 49.2 dB. Also, in terms of operational link range, the proposed link even under strong turbulent conditions serves 1.88 km, whereas IM/DD link was restricted to mere 1.12 km for target of BER of 10^{-4}, thus producing a decent range increment of 760 m. The proposed link has been designed and investigated using OptiSystem™ 14.2.

Keywords Free-space optical communication · Coherent detection · Digital signal processing DWDM · Atmospheric turbulence · Gamma–Gamma channel modeling

1 Introduction

Free-space optical (FSO) communication technology is being seen as possible last mile solution which can help deliver high-speed data services to the end users [1, 2]. It has already found its application in secure military communication networks, deep-space communication and disaster-affected areas as plug and play device [3]. Free-space optical (FSO) communication involves line-of-sight transmission between two nodes using optically modulated data stream. Thus, FSO links offer similar transmission capabilities as that of a conventional optical fiber network with an added goodness of being wireless. Miscellaneous advantages include inherent data security, quick deployment and relocation, license-free spectrum which can also support massive data transmission rates and immunity against electromagnetic interference [1–3].

Transmission of optically modulated signal through the free-space atmosphere makes FSO links vulnerable to meteorological events like rain, haze, snow, fog, smog, etc. Associated with atmospheric visibility, these meteorological processes may lead to absorption, scattering and attenuation of information-bearing photons that propagate through the channel [3]. On the other hand, even on a clear sunny day when atmospheric visibility is very high, the signal fading due multipath propagation and scintillation effect can still impair the link [3, 4]. Solar irradiance (heat), differential heating of medium and variable wind speeds may cause random fluctuations in refractive index of the medium. These effects in turn cause random fluctuations in received signal intensity and are commonly referred to as atmospheric turbulence (scintillation effect). Turbulence-induced fading may thus lead to non repairable loss of information [4–7]. Atmospheric adversity is therefore a detrimental factor that defines the overall reliability of FSO links.

The core networks of majority of communication service providers are already using light-wave communication as their backbone systems [3–5]. FSO systems therefore must become compatible with these existing optical networks

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Article

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Effect on Morphology and Optical Properties of Inorganic and Hybrid Perovskite Semiconductor Thin Films Fabricated Layer by Layer

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In recent time, organic–inorganic halide perovskite solar cells govern photovoltaic field, due to its remarkable development on the power conversion process. Still, large variations in device efficiency and basic physical properties are reported. This is due to variations during film fabrications and consecutive treatments employed. Here, we report a layer by layer deposition of inorganic perovskite ($CsBi_3I_{10}$) and lead halide perovskite ($CH_3NH_3PbI_3$) thin films. We find that the absorbance for corresponding thin film goes on increasing dramatically. UV-vis spectrum of film recorded to find the band gap of films, ~1.55 eV optical band gap have been obtained for the film fabricated layer by layer. We further study the fabrication of different perovskite layers impact on microstructure, surface morphology and optical properties. The optical and structural characterization outcomes all suggests the perovskite films processed by using the layer by layer fabrication are well controlled, making this processes an auspicious technique to fabricate thin-films for numerous prospective device applications and scientific studies.

Keywords:

1. INTRODUCTION

Hybrid perovskite solar cells (PSCs) have fascinated excessive attention as the principal energy conversion devices, owing to its practically low fabrication cost [1], higher absorption coefficients [2], high charge carriers [3] and band gap (BG) tenability [4–7], without compromising its photovoltaic performances. The organometallic halide perovskite founded semiconductor devices particularly the PSCs, have developed melodramatically. The power conversion efficiency (PCE) of PSCs has improved rapidly within a few years spam from 3.8% [8] (2009) to 22.7% [9, 10] (April 2018). Besides, the combination of perovskites and well established silicon (Si) photovoltaic (PV) technology has been also investigated extensively to manufacture solar cells with developed PCE [11, 12]. Additionally, hybrid perovskites also have been extensively studied in further fields, such as laser [13], light emitting diodes (LED) [14, 15] and photo-detectors [16, 17]. These studies approve the gifted potential application of hybrid perovskites for semiconductor devices.

Presently, with latest developments in the materials design, fabrication technique and device architecture, leads PCE >20% are routinely reported [18, 19] and still has room for improvement in their performance. The hybrid perovskite PV materials already expanded much courtesy as a potential replacement of the Si-PV devices, which is quiet employed the furthermost leading position in the existing PV market, with record efficiency of about ~26% [20]. Hybrid perovskite PV materials due to its low cost fabrication method compared to Si based devices, also have potential of fabrication of these solution processed materials on flexible substrate make a greater possibilities to the large scale roll-to-roll fabrication that can be used by the industry for its commercialization [21–23]. One of the utmost fundamental boundaries on solar cell efficiency is the BG of the semiconductor from which the cell is made; the optimum BG is in the range of 1.1 to 1.7 eV. Perovskite absorbing semiconductor materials has one of the most striking features for PV is its ability to tune their BG

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Effects of Thermal Annealing Duration on the Film Morphology of Methylamine Lead Triiodide ($MAPbI_3$) Perovskite Thin Films in Ambient Air

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In the present communication we have studied the effect of thermal annealing duration on morphology of methylamine lead triiodide ($MAPbI_3$) perovskite (prepared using single step method) semiconductor that changes into lead iodide (PbI_2). Furthermore, the effect of annealing duration on thin films is investigated and correlated with its potential photovoltaic application. Thin films characteristics study by X-ray diffraction and scanning electron microscopy results indicate $MAPbI_3$ degraded strongly by annealing duration. However, thin films (about 1.25 micron-thick) annealed at 80 °C for 10 min in ambient conditions cause minimum degradation with smooth and uniform surface morphology. It also shows a higher absorption coefficient with the band gap of ∼1.5 eV rendering this perovskite suitable for practical applications.

Keywords: Perovskite, $MAPbI_3$, Degradation, Ambient Air, Annealing Duration, Thin Film.

1. INTRODUCTION

In the last few years we have seen the remarkable rapid evolution with the development of a new class of solar cells based on hybrid materials. These hybrid materials are based on mixed organic–inorganic halide perovskites also known as Metal-halide perovskites. Perovskite solar cells (PSCs) are substantial candidate of future solar cells due to their rapidly increasing power conversion efficiencies (PCEs) [1, 2], extraordinary optical/electrical properties, high absorption coefficient [3–5], high carrier mobility compared to Si solar cell [6–8], and good ambipolar transport of charge carriers [9–11]. The easiest method of the deposition, it requires only a simple heating treatments to convert the deposited precursor solution (contain organic and inorganic components) to the crystalline hybrid perovskite material thin-films [12–14]. Within the last seven years, the reported efficiency has been excel at 22% which is very close to other PV technologies. This unique material property makes it an exceptionally auspicious and fast developing candidate for next-generation solar cells [15].

Whenever perovskite material thin film is deposited on a substrate from solution annealing of the film is required. This treatment removes excess solvent along with the formation of the perovskite crystal structure [16]. A major challenge with this material is maintaining its thermal stability in the presence of heat, and moisture [17–19]. To prevent degradation due to water and moisture can be overcome by encapsulation [20]. Smith et al. [21] used two dimensional (2D) perovskite semiconductors in the solar cell which show better stability against moisture. Tang et al. [22] reported the degradation of perovskite to metallic lead in a vacuum. Li et al. [23] concluded perovskite degraded due to sensitivity to laser irrespective of the heating effect of the laser.

However, most of these groups who work on this material carry out perovskite deposition in a dry atmosphere in order to avoid exposure to humidity during solar

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Structural, Thermal, Electrical and Dielectric Properties of $La_{1-x}Sr_xMn_{0.50}Fe_{0.50}O_3$ $\{0.10 \leq x \leq 0.40\}$ Cathode Material for Solid Oxide Fuel Cells

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$La_{1-x}Sr_xMn_{0.50}Fe_{0.50}O_3$ $\{0.10 \leq x \leq 0.40\}$ perovskite ceramics material is prepared by solid-state reaction method and samples are characterized to study their structural, thermal, electrical and dielectric properties. X-ray diffraction results show that as prepared samples are well crystallized in single phase and have rhombohedral crystal structure. Density is measured by Archimedes principle and with Sr substitution its value decreasing. Thermogravimetric analysis shows the weight gain in the material above 300 °C. Thermal expansion coefficient value for x = 0.10 and 0.40 composition is found to be 12.9×10^{-6} °C^{-1} and 11.3×10^{-6} °C^{-1}, respectively upto 800 °C. Impedance analyzer is used to study dielectric and electrical properties which show that all the as prepared samples obey non-Debye relaxation behaviour. The maximum conductivity value is 121.09 S cm^{-1} for $x = 0.10$ and 155.96 S cm^{-1} for $x = 0.40$ at 600 °C and 303.59 S cm^{-1} for $x = 0.10$ and 362.35 S cm^{-1} for $x = 0.40$ at 800 °C which confirmed that in the experimental perovskite the conductivity increases after Sr doping . Activation energy also found to be decreases with Sr substitution. Therefore, studied properties confirmed that the as-prepared material is a suitable cathode material for intermediate temperature solid oxide fuel cells (SOFCs).

Keywords: Solid oxide fuel cells, Cathode material, Stronium, Impedance spectroscopy, Conductivity.

INTRODUCTION

The reduction of resources of fossil fuel makes it a necessity to discover sustainable as well as clean alternative energy sources. One of such alternative forthcoming generation energy carriers is hydrogen which is portable, clean and renewable [1,2]. Solid oxide fuel cells (SOFCs) are well known sources of production of hydrogen and one of the striking alternative energy sources because of its comparatively high efficiency, inexpensiveness and low sensitivity to impurities [3-7]. The efficiency of solid oxide fuel cells is approximately 60% and can reach up to 80% if total heat recovered in the cell [8]. Material of component of SOFCs plays an important role to reach at this high efficiency, however certain issues arise which limit the effectiveness of cathode materials such as lowering the operating temperature and mismatching of thermal expansion coefficient with another components result in to fall in the conductivity and degredation of the material, which further affect the performance of the cell [8-11]. To attain desired efficiency, cathode material of SOFCs must have high electronic conductivity (larger than 100 S cm^{-1}), large catalytic activities, chemical compatibility with other components, sufficient porosity and low cost [4]. There is a number of perovskite cathode materials like $LaMnO_3$, $LaFeO_3$ and $LaCoO_3$ with appropriate ion doping, recommended and used as cathode materials in SOFCs as reported earlier [12]. Size of strontium is comparable to lanthanum, hence strontium is generally used as dopant in $LaMnO_3$ which increases the concentration of electrons and holes in $La_{1-x}Sr_xMnO_{3\pm\delta}$ $(x \leq 0.80)$ (LSM) and lift up the electrical conductivity [13]. However, on lowering the operating temperature LSM show high value of polarization resistance and activation energy (E_a) which further fall the SOFC performance [14]. Strontium modified $LaFeO_3$ (LSF) is also reported as promising cathode material for SOFCs. Substitution of Sr in $LaFeO_3$ produce charge imbalance, which further compensated either by formation of Fe^{4+} ion or by creation of oxygen vacancy

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Original research article

Optical properties of transition metal doped ZnS nanoparticles in PVK based nanocomposite films

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ABSTRACT

In the present work, the optical properties of transition metal (Mn, Fe, Cu and Ag) doped ZnS nanoparticles in PVK polymer composites have been studied. The pure and transition metal (TM) doped ZnS nanoparticles were prepared by co-precipitation method and PVK/ZnS(TM) nanocomposites were synthesized by spin coating technique. The nanocomposites were characterized by X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), optical absorption, energy and time-resolved photoluminescence spectroscopic techniques. The XRD patterns suggest the formation of the cubic phase of ZnS nanoparticles while FTIR spectroscopy reveals the incorporation of transition metal dopants in ZnS nanoparticles. The wide variation in surface morphology for differently doped nanoparticles in PVK based composites has been observed from FESEM technique. The optical gap has been found to increase with nanoparticle incorporation while the increased luminescence quenching is observed for PVK/ZnS:Mn nanocomposites. The time-resolved photoluminescence reveals a change in the lifetime of charge carriers for these composites. These results are important for designing new organic/inorganic nanocomposites for emerging technologies.

1. Introduction

The organic-inorganic hybrid materials are of recent interest due to their importance as UV photo detectors [1], temperature sensors [2], white light-emitting diodes [3], bulk heterojunction solar cells [4,5] and gas sensors for environmental monitoring [6]. The incorporation of nanoparticles in different polymer systems has improved their physical characteristics. A correlation between morphology and surface photo-voltage has been studied by scanning Kelvin probe for TiO_2 nanoparticle/poly(3-hexylthiophene) hybrid blends [7]. The enhancement in dielectric constant and electrical conductivity for PMMA/ZnS based nanocomposites was proposed as a highly efficient emissive layer in OLED devices [8]. The Schottky diodes based on PVA:$BiFeO_3$ nanocomposites show high leakage current, a large value of idealist factor, dielectric response and exhibit diamagnetic behaviour for nanocomposites even though bismuth ferrite is antiferromagnetic [9]. Kumari et al. have reported a slight increase in electroluminescence intensity and red-shift of the peak with a concentration of CdSe nanoparticles in PVK polymer matrix [10]. The effect of n-type ZnO nanoparticle concentration in p-type PVK based hybrid nanocomposites has favoured an enhancement in charge transfer characteristics of QDs/polymer hybrid LED by interface controlling by Kang et al. [11]. The transition metal doping or co-doping has been found to influence

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Impact of Environment Toxin on Phytoplankton-Zooplankton Dynamics.

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.

Abstract

In this article, we propose a two-dimensional complex plankton model of phytoplankton and zooplankton interacting species to observe the impact of environmental toxin (T_e) and rate of toxin librated by phytoplankton (θ) on the survival of plankton species and termination of planktonic blooms. The growth of phytoplankton is affected by environmental toxins released by industries and by natural resources. The growth of zooplankton depends upon the growth of phytoplankton by Holling type-II functional response. It is determined that the given model system is bounded and positive under certain conditions. The conditional local stability of different equilibrium points is obtained. The study of different parameters has been carried out to discuss the occurrence and non-occurrence of planktonic blooms. The Hopf-bifurcation analysis has been studied by taking T_e and (θ) as bifurcation parameters which lead to unstable the plankton system through the existence of periodic oscillations with the occurrence of planktonic blooms.
Key Words: Plankton, Environmental toxin, Hopf-bifurcation, Toxin librated by phytoplankton.

1 Introduction

Aquatic toxicology is an important field of study which deals with the effects of chemicals, natural materials and human activities on water organisms from the cell through individuals to big communities. The target of the aquatic toxicology is to make predictions about the effects of contaminants in ecosystems. Our biosphere is made up of 70 percent water and 30 percent land also 50-80 percent oxygen is made up by phytoplankton. Therefore the study of the marine ecosystem is very significant.

In the marine ecosystem, one of the significant characteristics related to the phytoplankton population is their excessive growth resulting in the occurrence of massive plankton blooms. Some blooms occur annually due to change in temperature and nutrient levels like spring bloom, while others are associated with the change in water temperature and salinity. But, it is found that some phytoplankton species such as Alexandrium, Pseudo-nitzschia, and Dinophysis, etc. produce toxins called toxin-producing phytoplankton (TPP) species. A bloom of these toxin-producing phytoplankton species is known as Harmful Algal Bloom (HAB). These harmful algal blooms drastically affect the pelagic food chain as infected phytoplankton transfer its infection to zooplankton through ingested algal toxins which are being transferred upward to adult fish, squid, carnivorous

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Complex dynamics of sixth order multipoint iterative methods for nonlinear Models

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Abstract

In this paper, iterative methods are analyzed under different approach. A research area that is becoming popular in recent years consists of applying tools of complex dynamics to the associated fixed point operator of iterative methods. The dynamical study of such rational operators when applied on the simplest function (polynomial of lowest degree) provides vital information regarding convergence and stability of the method. Here, we study dynamical behavior of some sixth order iterative methods, designed for nonlinear equations. This study is concerned with the asymptotic behavior of the fixed points (roots, or not, of the equation) and also geometrical behavior by drawing basins of attraction on different polynomials.

Keywords: Nonlinear equations; Iterative methods; Stability analysis; Fixed points; Basins of attraction.

1. Introduction

The application of iterative methods for solving nonlinear equations $f(z) = 0$, where $f : \mathbb{C} \to \mathbb{C}$ gives rise to rational functions whose dynamics are not well known. There is a vast literature available on the study of iteration of rational functions of a complex variable (see, Douady and Hubbard (1985) and Devaney (1989)). The simplest model is obtained when $f(z)$ is a quadratic polynomial and the iterative process is Newton method. The dynamics of this iterative method has been widely investigated (see, Curry et al. (1984), Blanchard (1994) and Fagella (2008)). Vrscay (1986) and Vrscay and Gilbert (1988) studied the dynamics of other well known quadratically convergent iterative functions. This analysis has further been extended to other iterative methods, used for solving nonlinear equations with convergence order higher than two (see, Varona (2002), Amat et al. (2004), Amat et al. (2005), Amat et al. (2010), Gutierrez et al. (2010), Plaza and Romero (2011) and Chun et al., (2012)). More recently, many researchers have analyzed and provided a comparison of iterative methods from dynamical point of view (see, Scott et al. (2011), Chicharro et al. (2013), Neta et al. (2014), Babajee et al. (2014), Behl et al. (2015), Cordero et al. (2015), Lotfi et al. (2015),

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A secure n-secret based client authentication protocol for 802.11 WLANs

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Abstract
Authentication has strong impact on the overall security model of every information system. Various authentication techniques are available for restricting the access of unauthorized users to the enterprise scale networks. IEEE 802.1X defines a secure and reliable authentication framework for 802.11 WLANs, where Extensible Authentication Protocol (EAP) provides the base to this architecture. EAP is a generic architectural framework which supports extensibility by incorporating the new and improved authentication schemes, which are based on different types of credentials. Currently there exist a number of EAP and Non-EAP methods with varying level of security and complexity. In this work, we have designed a new n-secret based authentication scheme referred here as Personal Dialogue Based Authentication, for the client authentication to the network. It is a Transport Layer Security (TLS) protected authentication protocol, which will be executed inside the secure TLS tunnel for providing the privacy and credential security to the wireless client. The developed authentication protocol has a reasonable set of features like; strong security, user privacy, simplicity and extensibility. For the formal analysis of the protocol we have used SPAN–AVISAP model checker on Ubuntu platform for validating the realization of the specified security goals. The experimental results obtained by simulation performed with the Automated Validation of Internet Security Protocols and Applications (AVISPA) tool shows that our protocol is efficient and secured.

Keywords Information security · Authentication · WLAN · EAP · 802.1X

1 Introduction

Wireless technology is preferred choice for every network because of its efficiency, flexibility and cost savings. Applications of wireless networks are evolving rapidly and all its security concerns are also getting resolved very quickly. As the information security is a highly dynamic area, it requires continuous up-gradation and advancement by the incorporation of new methods and techniques. Authentication is an essential component of every secure communication system. A well designed authentication scheme can protect a network from various potential threats. Almost all the authentication schemes are based on the theory of: something we are i.e. biometric based, something we have i.e. token based or something we know i.e. secret based [1]. Simple authentication schemes use one of these authentication factors, while the multifactor authentication schemes combine two or more authentication factors to make the system more secure and difficult to crack [2].

Wireless standards WPA2 and 802.11i offers the protection against almost all identified WLAN attacks associated with privacy, integrity and authenticity in the wireless communication [3]. Keeping in view the importance of authentication in every network security model and to boost up the authentication aspect of security an exclusive authentication framework 802.1X was designed by the IEEE in the year 2004. This specialized authentication framework was developed for deployment in both type of environments wireless as well as wired LANs. This 802.1X port-based NAC (Network Access Control) framework is based on the EAP (Extensible Authentication Protocol) [4].

In wireless communication systems, broadcasting nature of channel demands more sophisticated authentication techniques for providing the security in communication. As there

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Performance enhancement of in-network probabilistic aggregation (PEPA) for vehicular ad-hoc networks

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Abstract

In the current scenario of vehicular communication, it is very difficult to believe that the aggregated packet of information is not malicious. The algorithm is developed to allocate probability to the packet transmitted by the cluster head depending upon, the number of vehicles involved in creating a clustered information. The aggregated packet with the highest value of probabilistic correctness is considered by the receiving-end cluster head when multiple packets of similar information with related timestamps are received. The performance of the technique is tested under varying vehicular densities and data-sending rates. This scheme provides robust aggregation performance in comparison to the existing state-of-the-art structured and structure-free aggregation techniques.

Keywords

Aggregation, Broadcast storm, Information dissemination, MANET, Structured aggregation, Structure-free aggregation, VANET.

Structure-free vehicular ad-hoc networks (VANETs) exchange information through roadside units (RSUs) using IEEE 802.11p at 5.9 GHz. To make the journey experience safe and secure for the user, we need to ensure real-time information to road users on the highway or city scenario (S Al-Sultan et al., 2014; Schoch et al., 2008). Figure 1 indicates the basic communication module used for the propagation of information of the cluster to the end user. Cluster is required to overcome the issue of message storm in VANETs (Bali et al., 2014; Dietzel et al., 2014; Kumar et al., 2019). There exist many routing protocols in mobile ad-hoc networks, but they are not directly applicable to VANETs (Sharma and Kumar, 2016).

Researchers contributed to the area of structured aggregation (Bilal et al., 2014; Wischhof et al., 2003) but it does not find its scope in real-life situations. Smart data aggregation method aggregates on the basis of vehicle direction, road speed limitation, and duplicate packet removal, but the mechanism does not support effective utilization of bandwidth (Allani et al., 2018, 2020). Data dissemination based on map splitting is created by building zones of relevance and extracting related data, but the basic issue of broadcast storm is not addressed (Allani et al., 2018). There were contributions in the area of structure-free aggregation, wherein there is a dynamic mechanism to propagate packets and make information available to the users through improved forwarding delay (Molina-Gil et al., 2014; Ibrahim and Weigle, 2008; Kumar and Dave, 2013). The information-centric networks are being replaced to ensure efficient communication in terms of efficient delivery and address the trust management issues of the network (Rathee et al., 2020). Another mechanism where a trust evaluation matrix is

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Wavelet-Based Least Common Ancestor Algorithm for Aggregate Query Processing in Energy Aware Wireless Sensor Network

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Accepted: 29 October 2020

Abstract
Wireless sensor network (WSN) is developed as a network of sensors, which engage in sensing and transmitting the data to the sink node. The constraints, such as energy, memory, and bandwidth insist the researchers to develop an efficient method for data transmission in WSN. Accordingly, this paper introduces a data aggregation mechanism based on query processing, Wavelet-based Least Common Ancestor-Sliding window (WLCA-SW). The energy-loss and memory-crisis is well addressed using the proposed WLCA-SW through the successive steps of query processing, duplicate detection, data compression using the wavelet transformation, and data aggregation. The proposed WLCA-SWA is developed with the integration of the weighed sliding window and Least Common Ancestor (LCA), which enables the energy-aware aggregate query processing and de-duplication such that the duplicate records are detected potentially prior to the communication of the sensed data to the sink node. It is prominent that the weighed sliding window is the extension of the existing time-based sliding windows. The effectiveness of the proposed aggregate processing approach is evaluated based on the metrics, such as number of alive nodes, data reduction rate, data-loss percentage, and residual energy, which is found to be 33, 85%, 8.222%, and 0.0610 J at the end of 1000 rounds using 150 nodes for analysis. Moreover, the proposed method has the minimum aggregation error of 0.03, when the analysis is performed using 50 nodes.

Keywords Wireless sensor networks · Least Common Ancestor · Data aggregation · Energy-constraint · Query processing

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Fuzzy Based Decision Making System for the Detection of Diabetic Retinopathy

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ABSTRACT

Diabetic Retinopathy is disease of eye that causes injury to the retina and it may ultimately lead to absolute loss of sight. Tests which detect the diabetic retinopathy like visual acuity examination, pupil dilation, and Optical Coherence Tomography (OCT) are time- intense and affects patients too. Fuzzy inference based model allows intelligent system to examine the patient and then infers a conclusion. The proposed fuzzy expert model deploys 9 Input Parameters (Intra ocular pressure, visual field, glucose level in blood, high density lipoprotein, low density lipoprotein, hemoglobin, Glycated sugar, blood pressure and Triglyceride). In this model, expert system recognizes the normal eye, diabetic retinopathy (Severe), diabetic retinopathy (moderate) and diabetic retinopathy (Mild) on the behalf of these 9 Parameters. This technique has efficient low computational cost and has comparative outcomes to those of the ophthalmologist having 88% accuracy.

KEYWORDS: *Fuzzy Expert System, Diabetic Retinopathy, FIS*

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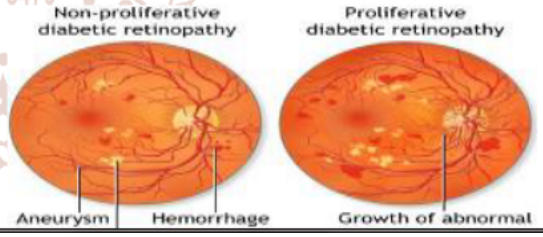
I. INTRODUCTION

The therapeutic examination of an infection possibly will be a main trouble in this world. With new advances in therapeutic engineering and totally different managing structures that are most preferred by bringing into play artificial intelligence (AI) strategies [1]. Artificial intellect has completed an active investigation which incorporates with fuzzy logic, artificial neural networks (ANN) and genetic



Range-speed mapping and target-classification measurements of automotive targets using photonic-radar

Vishal Sharma[1] · Sergey Sergeyev[1] · Love Kumar[2] · Hani J. Kbashi[1]

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Abstract

The frequency-modulated continuous-wave radar is an ideal choice for autonomous vehicle and surveillance-related industries due to its ability to measure the relative target-velocity, target-range, and target-characterization. Unlike conventional microwave radar systems, the photonic radar has the potential to offer wider bandwidth to attain high range-resolution at low input power requirements. Subsequently, a frequency-modulated continuous-wave photonic-radar is developed to measure the target-range and velocity of the automotive mobile targets concurrently with acceptable rang resolution keeping in mind the needs of the state-of-the-art autonomous vehicle industry. Furthermore, the target-identification is also an important parameter to be measured to enable the futuristic autonomous vehicles for the recognition of the objects along with their dimensions. Therefore, the reported work is extended to characterize the target-objects by measuring the specular-reflectance, diffuse-reflectance, the ratio of horizontal-axis to vertical-axis, refractive index constants of the targets using the bidirectional reflectance distribution function. Furthermore, the reflectance properties of the target-objects are also measured with different operating wavelengths at different incident angles to assess the influence of the operating wavelength and the angle at which the radar-pulses incident on the surface of the targets. Moreover, to validate the performance of the demonstrated work, a comparison is also presented in distinction with the conventional microwave FMCW-RADAR.

Keywords FMCW · Photonic-radar · RADAR · LRCS · BRDF

1 Introduction

Recent developments in sensor technology, imaging, radar, light detection and ranging, electronics, and artificial intelligence have enabled the state-of-the-art autonomous vehicles (AVs) to provide significant services including collision avoidance, blind-spot monitoring, lane departure warning, or park assistance (Bimbraw 2015; Self-Driving Cars

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Rajneesh Kumar and Love Kumar

Performance enhancement of ultra-dense WDM over FSO hybrid optical link by incorporating MIMO technique

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Rajneesh Kumar and Love Kumar*

Performance enhancement of ultra-dense WDM over FSO hybrid optical link by incorporating MIMO technique

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Abstract: Free-space optical (FSO) communication is a wireless optical data transmission technology with a high data transmission rate. It has received much attention in recent years as it is cost-effective and has license free operation. It is line-of-sight free space communication principle and attracted many researchers due to high data rate carrying capability at lower cost [1]. Optical wireless communication system with higher bandwidths and has no interference with RF links, help in hassle-free upgradation of the existing wireless LAN networks without any significant compromise [2]. FSO technology is a promising alternative where the deployment of optical cables is not feasible and radio frequency (RF) systems are inadequate.

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Photonic-Radar Based Multiple-Target Tracking Under Complex Traffic-Environments

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ABSTRACT Recent developments in the state-of-the-art Intelligent Transportation Systems enable autonomous vehicles to offer significant safety services to take appropriate and prompt actions to avoid any probable unfortunate road-hazard. As the utmost functions of the advanced driving assistance system-equipped autonomous vehicles governed by the equipped radar, therefore, the radar system should have the ability to track multiple-targets accurately with high radar-resolutions. Unlike the microwave-radar, the photonic-radar comes out as an attractive candidate owing to provide wide-spectra to attain improved and precise radar-resolutions at low-power requirements along with extended target-range even under severe atmospheric fluctuations. Therefore, a linear frequency-modulated continuous-wave photonic-radar is developed in this work to carry out a radar cross-section-based tracking of multiple mobile-targets in the presence of fog, cloud, and rain. Besides it, some complex real-time traffic-scenarios consisting of multiple mobile-targets make the target-detection, data-association, and classification processes more complicated. Therefore, this work is tested for different multiple-mobile targets in different complicated traffic-scenarios modeled by using MATLAB™ software. The performance of the demonstrated photonic-radar is assessed through the power spectral density and range-Doppler mapping measurements. Furthermore, a comparison of the developed photonic-radar is also established with conventional microwave-radar to present a comparative analysis.

INDEX TERMS Atmospheric fluctuations, microwave-radar, photonic-radar, radar cross-section.

I. INTRODUCTION

Recently, the demands of the photonic-radar (PHRAD) technology augments significantly in the arena of smart autonomous transportation, surveillance, and navigation-related applications owing to provide wide-spectra to attain improved and precise radar-resolutions. Especially in Autonomous Vehicle (AV) industry, the laser-driven radar is being implemented to offer numerous substantial services including lane-detection, collision-evading, multiple target-detection, blind-spot monitoring, and park assistance [1], [2] to enable the self-driving vehicles to respond promptly to avoid any unfortunate road-hazard [2]–[5]. As a part of AV-related industries are looking for alternative approaches to enhance the accuracy of self-driving vehicles with prolonged detection-range at low-power requirements [6], [7]. For the last few years, the photonic-radar technology proves to be an attractive candidate for intelligent transportation systems (ITS), remote-sensing, and other related surveillance industries [8]–[11]. On the other hand, the existing advanced microwave-based surveillance and navigation systems are limited to a marginal accuracy-range, especially in the populated areas at high frequencies [12], [13]. Keeping in mind the current requirements of the advanced AVs, the importance of the frequency-modulated continuous-wave photonic-radar

A content adaptive method of de-blocking and super-resolution of compressed images

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Abstract
In this paper, a new method of image upscaling along with de-blocking of compressed images has been presented. In the case of highly compressed images, there is a high probability that these images may contain the noise in the form of blocking artifacts. In this presented work, a spatial domain-based approach has been suggested with two roles, one of which is to process the image for reduction of compression-based blocking artifacts and other is to upscale the low-resolution image to high-resolution image. Image upscaling is one of the implementation techniques of image super-resolution (SR). It is a type of SR where only a single image-based SR is being implemented. In the proposed technique, image de-blocking along with interpolation based super resolution has been developed in the spatial domain, therefore it is a practical and realistic method. The results of the proposed method in the form of quality metrics like PSNR, MSE and MSSIM have been compared with other methods of interpolation along with de-blocking method.

Keywords Image upscaling · Image interpolation · Image de-blocking · Super resolution · High resolution · Low resolution

1 Introduction

In recent years the multimedia content of data is exponentially increasing and the content of this data like videos, images etc. is mainly stored in downscaled and compressed forms. In this

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Inverse Kinematics of a Spatial Mechanism using Multibond Graph

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DOI: http://dx.doi.org/10.24423/cames.280

Abstract

Various methods are available to compute kinematics and dynamics in the case of spatial mechanisms. These methods are cumbersome and laborious for large and multibody spatial mechanisms. The bond graph technique is a powerful alternative tool for modeling. A four-link closed-chain 3R2S (3Revolute 2Spherical) spatial mechanism stands out among the other four-link closed-chain spatial mechanisms due to its ability to be used in a number of applications. The main aim of this paper is to compute the inverse kinematics of the mechanism using the bond graph structure of the system. In this paper, modeling of a four-link closed-chain 3R2S spatial mechanism has been conducted using a multibond graph approach. Inverse kinematics of the spatial mechanism, under various applications, has been directly obtained from the bond graph modeling. MATLAB coding for simulation has been done directly from the multibond graph without explicitly deriving system equations. The simulation results have been analyzed and discussed using various plots.

Keywords

kinematics, bond graph, spatial mechanism, modeling, simulation,

Different Dynamic Formulations for a Mechanism using Bond Graph

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DOI: http://dx.doi.org/10.24423/cames.298

Abstract

For modeling dynamics of mechanisms, various classical formulations are available in the literature. The equations of dynamics given by various classical formulations can also be derived from the bond graph. The bond graph is a convenient graphical representation for modeling dynamics of physical systems in multi-energy domains.
In this paper, various alternative causality assignment procedures in the bond graph are used to derive different classical formulations such as the Lagrange's equations of the first kind (with multipliers), Lagrange's formulation of the second kind, and Hamiltonian formulations. An example of the quick return mechanism has been modeled using the bond graph technique, and various alternative causality assignment procedures are applied to derive the various formulations. Simulation coding has been done using MATLAB and results have been analyzed and discussed. The purpose of this paper is to show how the various formulations can be obtained from bond graph using various alternative causality assignment procedures.

Keywords

classical formulations, modeling, system dynamics, bond graph,

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Optimum Generation Scheduling Using PSOGSA-Explore Optimization Algorithm

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Abstract-In this article, optimum generation scheduling drawback is resolved using hybrid meta-heuristic algorithmic rule known as the Particle Swarm optimization and Gravitational Search Algorithm-Explore (PSOGSA-E).The objective of optimum generation scheduling (OGS) is to abate the general generation charges whereas satisfying the diverse restraints, once the essential load request of an power system is provided. The POSGSAE is used for 3 diverse test benches for determination the OGS with varied load demands. Parenthetically the efficaciousness of PSOGSA-E to resolve OGS drawback results was compared with different existing algorithms.

Keywords—PSOGSA-E; optimum generation scheduling; transmission loss

I. INTRODUCTION

In the recent modern world electric power contains a crucial role to suit numerous necessities. So, it's most importance that generated electric power is transferred and distributed with efficiency to meet the necessity. The foremost necessary downside within the designing and operating electrical power generation system is the economical load scheduling of all generators in every system to satisfy the required demand. In OGS problem, the ultimate goal is to minimalize the operative charges of the generation system, while fulfilling the specified load demand. Additionally, different operational constraints of the system have to be taken care of. Common methods to resolve OGS problem embrace the applied mathematics methodology, gradient methodology, lambda-iteration & Newton's methodology [17].

Journals & Magazines > IEEE Access > Volume: 8

Performance Analysis of Modified AODV Routing Protocol With Lifetime Extension of Wireless Sensor Networks

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Cite This PDF

Mohit Angurala ; Manju Bala ; Sukhvinder Singh Bamber All Authors

Abstract:
Amalgamation of Re-Charging and Load Balancing are introduced here to overcome the problem of quick battery energy depletion and jamming in Wireless Sensor Networks. The primary approach (Re-Charging) is to maintain the desired energy level at each node in the network. The second method guarantees jamming-free communication in the network. To maintain the required energy level of the nodes, the SenCar visits the chosen anchor point along the pre-defined trajectory. At the chosen point, SenCar tests all the nodes within its coverage and re-energize all the nodes that have the energy level below the threshold value (3 Joules). Then, the SenCar moves on to the next anchor point and so on until the pre-defined trajectory completes. Finally, the implementation of the proposed mechanism proves the performance enhancement of Wireless Sensor Networks in terms of Throughput, Energy Level, and Packet Delivery Ratio.

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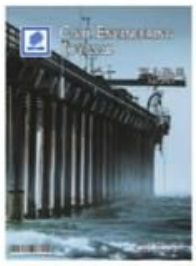

Influence of Jute Fibre on CBR Value of Expansive Soil

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Abstract

Construction of structures on expansive soil is highly risky due to its susceptible behavior towards differential settlements. Different soil stabilization techniques including soil reinforcement have been adopted to improve the properties of the unsuitable soils. In this present study, randomly distributed jute fibres have been used to improve geotechnical properties of expansive soil collected from South Delhi (India). California Bearing Ratio (CBR) tests were carried out on the expansive soil blended with jute fibres. Jute fibres of length 10 mm and 30 mm were included in different percentages viz. 0.25, 0.50, 0.75, 1.00, 1.25 and 1.50 by the dry weight of the soil. The test results indicate that the inclusion of randomly distributed jute fibres significantly improves the CBR value of the soil. The Optimum value of fibre content is found to be 1.25%. An improvement of 226.92% in CBR value of the reinforced soil as compared to unreinforced soil has been observed at the optimum jute fibre content. Since Jute is agricultural waste, the present study provides a cost-effective solution to problematic clayey soils.

Keywords: Random Inclusion; Jute Fibre; California Bearing Ratio; Expansive Soil; CBR Value.

1. Introduction

Infrastructure development like buildings, roads, bridges etc. on expansive soil is a challenging job for Civil engineers due to its swelling and shrinking nature in wet and dry conditions respectively. Nearly 20% of total area in India is covered by black cotton soils. Due to the changes in moisture content, these types of soils exhibit much variation in swelling, compressibility; shear strength and results in failure of structures. Therefore, certain properties of these types of soils require improvement. Among different proven techniques chemical stabilization using lime or cement is one of the technique to improve soil properties [1-3] but soil reinforcement is reliable and effective technique to improve properties of fine grained soils. The established methods of soil reinforcement include metallic strips, bars, geogrids, geotextile or fibres. The reinforced soil obtained using ideally inextensible inclusions like metallic strips or bars is known as reinforced earth [4] whereas that obtained using ideally extensible inclusions like geogrids, geotextile or fibres is known as ply-soil [5].

The stress deformation behavior is different in these two types of reinforced soils. The reinforcement using metallic strips, geogrid or Geotextiles increases tensile strength of soil in one particular direction. Despite the fact that the role of tensile stresses may be considerable but there may be possibility to develop planes of weakness at soil-reinforcement interface. Random mixing of fibres with soil is also considered as more effective soil reinforcement technique [6-8] and is quite similar to that of admixture stabilization. Fibres in this technique are simply added and

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Preliminary Amplification Studies of Some Sites Using different Earthquake Motions

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Abstract

Stability of infrastructure during earthquakes demands ground response analysis to be carried out for a particular region as the ground surface may suffer from amplified Peak Ground Acceleration (PGA) as compared to bedrock PGA causing instability. Many studies have been carried out the world over using different techniques but very few studies have been carried out for the northern part of India, Punjab situated at latitude of 31.326° N and longitude of 75.576° E, which is highly seismic and lies in seismic zone IV as per IS:1893-2016. In this paper 1-D equivalent non-linear ground response analysis has been conducted for sixteen sites of Jalandhar region, Punjab (India) by using five earthquake motions. Input ground motions are selected from the worldwide-recorded database based on the seismicity of the region. Based on the average SPT-N values, all the sites have been classified as per the guidelines of National Earthquake Hazard Reduction Program (NEHRP). Shear modulus (G) was calculated using correlation between G and SPT–N Value. The ground surface PGA varies from 0.128 to 0.292 g for the sites of Jalandhar region with Amplification Factor values varying from 1.08 to 2.01. Hence the present study will be useful to the structural designers as an input towards suitable earthquake resistant design of structures for similar sites.

Keywords: Ground Response Analysis; Shear Modulus; Peak Ground Acceleration (PGA).

1. Introduction

The Indian Subcontinent has been witnessing the damaging Earthquakes since ancient times. The movement of Indian plate against the Asian plate at a rate of 47 mm/yr. [1]. Approximately is the main reason. Kramer and Steven (1996) [2] highlighted that though seismic waves generally travel several kilometres in rock but a few meters in soil, yet the soil plays a very important role in determining the characteristics of ground motion and its analysis. Ground response analysis is used to predict ground surface motions for development of design response spectra, to evaluate dynamic stress - strain for evaluation of liquefaction hazards and to determine the earthquake induced forces that can lead to instability of earth or earth retaining structures. In major part of Haryana state, carved out of the former state of East Punjab, the studies conducted by Puri and Jain (2015) [3] highlighted that codal acceleration values are found to be very conservative, and the local site conditions like the topography, nature of bed rock and the geometry of the deposits are the primary factors that influence the local modification of the wave motion between the bed rock and soil outcrop and have a profound influence on the ground response during an earthquake.

In North India, Himalayan and Kashmir region also has experienced many events of magnitude more than 8 during

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Assessment of Seismic Site Response and Liquefaction Potential for Some Sites using Borelog Data

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Abstract

Assessment of Liquefaction susceptibility of soil is very important aspect of disaster risk reduction for a particular region. The present research is an investigation to find out the liquefaction capability for the sites of Jalandhar and its surrounding region, Punjab (India) using semi empirical approach of Idris and Boulanger. Initially, the response of Ground has been analyzed with the help of DEEPSOIL software for evaluating the maximum ground acceleration values (PGA_{SUR}) at surface using five earthquake motions of magnitude, M = 6.0, 6.8 and 7.3 selected from worldwide recorded database based on seismicity of the region. The investigated PGA values ranges from 0.196 g to 0.292 g for the sites under investigation. Soil's potential against liquefaction for 45 locations has been carried out using PGA_{SUR} results so obtained. It has been observed that eighteen sites out of forty-five are found to be susceptible to liquefaction. In order to help structural designers and geotechnical engineers for the preparation of realistic plan towards disaster risk reduction for the region, PGA_{SUR} contour map of obtained results and liquefaction hazard maps for earthquake of magnitude 6.0 and 7.0 has been prepared on geographical information system (GIS) platform using QGIS software.

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A STUDY OF SERVICE QUALITY OF LIFE INSURANCE CORPORATION OF INDIA

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ABSTRACT

The service quality has become the only weapon in the hands of the service providers in this competitive environment. Every consumer prefers only to the enterprise that gives best services to the consumers because best services lead to more satisfaction and helpful to build the trust of the customer in the enterprise. Earlier Life Insurance Corporation of India was having monopoly over the insurance market but after the deregulation of insurance industry, it has to focus more on service quality to maintain as well as gain the new customers. The aim of the study is to identify the factors affecting service quality in Life Insurance Corporation of India. An instrument is formulated to collect the data from the policyholders of LIC in Doaba region (Jalandhar, Kapurthala, Hoshiarpur and Nawanshahar districts). Data has been collected from 500 policyholders of the selected area. The tools used for the analysis are descriptive and factor analysis. The main findings of the study showed that there are six factors i.e. responsiveness, reliability, assurance, comfortable, empathy and tangibility that are helpful to determine the importance of service quality in LIC.

Keywords: Service Quality, Life Insurance, Perception.

INTRODUCTION

Insurance provides protection not only to the person but also to the family from any type of risk that may arise any time to the most valuable asset that is Human life. Life insurance is done for various reasons e.g. future safety, savings and tax benefits etc. As earlier, life insurance business was the monopoly of LIC, therefore there was no problem in the market. But after liberalisation of insurance sector, competition has increased manifold. The private players entered into the market with new products, innovative ideas. With this, the consumers became more aware and more demanding.

Every company has to work hard to fulfil the increased demands of their customers. There is a need to know more about their customers to keep them satisfied and loyal. Although there is increase in competition with the opening of the sector, but still the major portion of the population is untapped. So, to capture the market's large share, every company has to use its strategies more tactfully and it becomes possible only with the application of CRM strategies in the market. CRM strategies should be more lucrative to attract more customers towards the company to retain the customers for long term. In order to retain the customers for long term, the first thing that every company should do is to provide qualitative services to the consumers, it will leave positive impact on the policyholders directly. Therefore, to sustain within the market, service quality becomes a most critical component of competitiveness for Life Insurance Corporation of India. Service quality means to deliver superior quality services to the customers than the private players.

But the organisations face difficulties in measuring the quality of services offered to the customers. As compared to the quality of goods, the estimation of the quality of services offered by the organizations is troublesome because of the three one of a kind highlights of administrations viz. elusiveness, heterogeneity, and indivisibility. The present study is an attempt to measure the effect of various factors of service quality that will help the LIC to capture the market, build positive reputation and increased profitability.

LITERATURE REVIEW

Vikas Gupta (2010) made a study to know the relevant dimensions of the service quality and to compare the service quality perception of customers in public and private life insurance companies. The study included five dimensions of the service quality like reliability, assurance, responsiveness, empathy and tangibility. As per his findings, public insurance company has high significant quality perception among the insurance customers as compared to the private limited companies. (1)

Dr. H. S. Sandhu and Ms. Neetu Bala (October 2011) stated that in this competitive world, service quality is very important. LIC, earlier although havjng monopoly in life insurance business has provided a benchmark in service quality. The study measured the customers' perception towards life insurance service quality by applying a framework developed by Suresh Chandar et al. (2001). The paper also investigated the relationship between service quality dimensions and client's overall assessment of life insurance service quality. It uncovered that from the list of seven factors, three i.e., Proficiency; Physical and ethical excellence; and Functionality have huge effect on the general service quality of Life Insurance Corporation of India. Administrative ramifications and suggestions for further research had also been discussed. (2)

Dr. Harish B. Bapat, Dr. Vishal Soni and Dr. Ritu Joshi (April 2014) studied the product offerings of largest public sector life insurance Company Life Insurance Corporation of India and the private giant ICICI prudential life insurance company Ltd

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Shopping Behaviour Of Consumers: Youth Perspective

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Abstract:
With the advent of technology, world has globalised and every information is available at the click away. Markets are now customer centric and all facilities are being given at the ease of customers. Online shopping, electronic payment facility, customised products are few examples that are worth to be mentioned. It has been aptly said that "the consumer is the king of the market". Different people have different opinion about the various brands of products available in the market. Talking particularly about apparels segment: there is a sea change in the apparel style, preferences and choices of the people. In fact, there is a difference in choice of apparels based on age, gender, religion, status, customs and traditions as well. In this paper an attempt has been made to study the perception of youth towards branded apparels. Also, it aims to find whether there is any association between shopping behaviour of the youth and branded apparels based on their age and education. The population of the study is Ludhiana City, which is Manchester of India and hub of hosiery and woolen industry. The sample size taken is 350 respondents belonging to age group of 16years to 29 years. The opinion of the respondents is taken with the help of structured questionnaire and analysis is done using SPSS software. It was found that the shopping behavior of youth is greatly affected by their perception towards particular brand of apparels. Only if they perceive a product positively, then they will buy it. But there is no difference in the perception of customers based on gender. Also, it was found that there is no association between the consumer shopping behavior and their age. A customer of any age likes apparel shopping. Further, there is no association between the customer shopping behavior and their educational qualification. A youth of any educational back ground prefers to buy branded apparels.

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***Keywords**: Consumer Perception, Consumer, Youth.*

1. INTRODUCTION

In today's era "Clothes market a man", since apparels define the personality, education, behaviour and way of thinking of the people. The fashion industry is the fastest growing industry in the world. Also, fashion industry in India has been experiencing an explosion due to considerable dynamic nature and fashion consciousness among the consumers especially youth of today. They want apparels of different styles and for different occasions too. There has been a paradigm shift towards branded apparels. Consumers buy branded clothes not only to enhance their personality but also for social dignity and association. They are looking

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AN ANALYTICAL STUDY OF INDIA'S IMPORT FROM PAKISTAN IN POST LIBERALISATION PERIOD

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ABSTRACT

Trade among countries is very important as it helps in development and maintaining relation among the involved countries. India's trade relations with Pakistan are very important because of many reasons. Before partition both the countries were one entity but with partition many unwanted and bitter issues emerged between both nations. Issues related to religions and Kashmir matter are the burning political issue of both the governments. But trade among both the countries hold a special place when it comes to the economic development. Post partition the scenario in regard to distribution of natural resources has changed completely, as earlier all the natural resources belonged to one country but after partition things have changed. The products for which the country was self-dependent were divided with the partition, now both the countries have to import from each other and it costs them a lot. There were many complications which were the products of the political disturbance among both the countries. There were times when there was no trade among both the countries. So, the paper studies the import of India from Pakistan, it also takes into consideration the projected growth rates for different imported items in times to come.

Key words: trade, Liberalisation, Perceptions, india, export, pakistan

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http://www.iaeme.com/IJM/issues.asp?JType=IJM&VType=11&IType=11

1. INTRODUCTION

From being neighbour's to sharing the same past, history and social economic circumstances these two countries also share same bitter experiences and most are political. These relations are built on the natural similarities and are not developed out of any need or necessity. There is

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AN EMPIRICAL STUDY OF INDIA'S EXPORT WITH PAKISTAN

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ABSTRACT

Trade is quintessential for nations around the globe, as it helps in economic prosperity and maintaining cordial relations amongst the involved countries. India has trade relations with many countries but its bilateral trade with Pakistan holds great significance because of several reasons. With partition, many resources were divided among both the countries, leaving them dependent on each other for several products. Pakistan's major exports to India include vegetable products, textiles, dry dates, rock salt, cement, leather, surgical instruments, carpets, and gypsum. While India's major exports to Pakistan consist of cotton, organic chemicals, dyes and pigments, machinery, pharmaceutical items, teas and spices, iron and steel and plastic goods. Since 1947, both countries have witnessed cordial as well as estranged trade relations, there have been several occasions where due to political tensions no trade has taken place. Trade has occurred between the two nations through various formal and informal channels. This paper will study the India's export to Pakistan in the post liberalisation era and will also discuss the future projection of trade between the two nations.

Key words: trade, export, india, Pakistan, economic, SAFTA

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http://www.iaeme.com/IJARET/issues.asp?JType=IJARET&VType=11&IType=12

1. INTRODUCTION

For the economic prosperity of developing countries, international trade holds an important place. In early stages of development, foreign exchange and capital goods are very important inputs, especially for developing countries. It promotes capital formation and helps in efficient allocation of resources and reaps the benefits of internal and external economies. *Cairncross* remarks that foreign trade provides the urge to develop, the knowledge and experience that

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A Study of Consumer's Attitude towards Mobile Marketing

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Abstract:

The tremendous growth of smart phones has opened door of opportunities for marketers to market their product and services easily through mobile phones. Consumers are attracted towards the mobile marketing as enhancement of usage of smart phones. They are more conscious about knowing all the trends and technology and accepting them in their daily lives. This is due to the reason that they get to know about each product and services on their phones via SMSs, emails, various apps, etc. This paper shows a study employs to analyse the relationship between demographic factors on the mobile marketing. For the study, authors collected the data using a structured questionnaire. The study involved 102 respondents of various age group, gender and different qualification in order to have a unbiased evaluation. The study aims to evaluate the mobile marketing impact based on the determined factors analysis. During this study, it is observed consumers have positive attitude towards mobile marketing but companies should focus on improving strategies.

Keywords: Mobile Marketing, Smart Phones, Technology.

1. Introduction

In today's world, technology influences our culture more than ever. Marketers have noticed for this trend and have move on to more techniques. Focusing a message on the individual customer is replacing the more impersonal, mass messaging techniques. They are playing a vital role in our lives. Today, maximum people are using mobile phones or can say android mobile phones. Mobile marketing begins with the mobile internet service. Mobile marketing is a way of marketing through wireless networks. It refers to the process of marketing when done through mobile phones. As defined by Andreas, Mobile Marketing is "any marketing activity conducted through an established network to which consumers are constantly connected using a personal mobile device."Mobile marketing is a marketing approach that sees brands and businesses using a variety of techniques to promote their business, brand, product or service directly to mobile users. We have also shifted from using mobile phones with a limited set of features, to using smart phones that themselves are capable of more with each update, now also complemented by the addition of tablet devices, and smart watches.
But as the technology has developed, and the reach and use of mobile phones has grown, The figure 1 shows the graphical representation of the most preferred mobile marketing tool used by the smartphone users and has expanded to include sms/text messages, email, mobile websites, voice-calls, and more recently mobile apps.

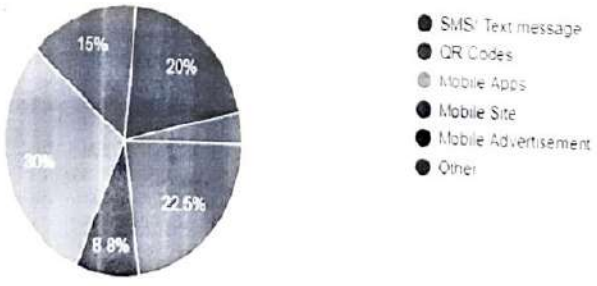

Figure 1: Graphical representation of the most preferred mobile marketing tool used by the smartphone users

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Bioactivity of microwave and conventionally synthesized 70sr–HA.xZn (30-x)si composites

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HIGHLIGHTS

- Composites sintered by microwave and conventional methods.
- Microwave sintered samples have higher density, hardness and bioactivity.
- Silica enhances the grain growth.
- Microwave processed samples showed high pH change in SBF solution.

ARTICLE INFO

Keywords:
Microwave processing
X-ray diffraction
Scanning electron microscopy
Hardness
Bioactivity

ABSTRACT

The composites of different compositions of 70Sr–HA.xZn (30-x)Si were prepared by two different methods: conventional sintering and microwave sintering. XRD characterized the prepared samples for phase identification, FTIR and Raman for functional groups, SEM for microstructure, hardness for mechanical properties. X-ray diffraction studies showed that multiple phases were present in all the samples. The values of density and hardness of apatite composite samples sintered by microwave processing were higher than the apatite composite samples sintered by the conventional method. Microwave sintered products showed more uniform and higher grain growth in comparison to conventionally sintered products. In vitro bioactivity of the synthesized composites was assessed by the SBF immersion method. It was observed that the bioactivity of the microwave processed apatite was better than the conventionally processed apatite.

1. Introduction

The calcium phosphate group constitutes the largest and most significant inorganic part of bones and dentine materials [1]. Synthetic calcium phosphate resembles natural bone materials, chemically and crystallographically. $CaHPO_4.2H_2O$, $Ca_3(PO_4)_2$ and $Ca_{10}(PO_4)_6(OH)_2$, etc., are the different phases of Calcium phosphate [2]. Among these, the main focus is towards HA, $Ca_{10}(PO_4)_6(OH)_2$ as it constitutes 60–65% as a main inorganic part of the natural bone [3]. Due to its chemical resemblance with bone and biofunctional properties such as bioactivity and biocompatibility, HA can be used for bone applications because it can be slowly substituted by natural bone after implantation [4]. The hexagonal structure of HA comprises of complexes of orthophosphates tetrahedra and Ca^{2+} ions [5]. Calcium and phosphate are key components of the mineralized matrix, acting as the calcium reservoir and plays a vital role to maintain calcium homeostasis across the body [6]. The chemical composition of HA is non-stoichiometric as it is calcium deficient with a mole ratio of Ca/P of 1.67. When it was implanted with the bone, it takes sodium, zinc, magnesium, iron, and carbonate from the body fluid due to bone metabolism [7]. In spite of these useful properties of HA, its use is still limited to a non-load bearing area such as powders, coatings, and porous scaffolds due to its poor mechanical properties and in vivo bioactive properties [8]. The possibility of using HA ceramic as a load-bearing implant is entirely dependent upon the availability of properly sintered hydroxyapatite with improved mechanical properties [9].

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Exploring the impact of HgI_2 doping on optical, structural and morphological properties of pure $CH_3NH_3PbI_3$ perovskite

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ARTICLE INFO

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Doping
Crystallinity
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ABSTRACT

In current work, authors used a single-step spin coating method to fabricate $CH_3NH_3PbI_3$, and $CH_3NH_3Pb_{.97}Hg_{.03}I_3$ perovskite thin films. The influence of Hg doping on optical and structural properties has been investigated systematically. XRD, SEM, and UV–Vis spectroscopy have been used to characterize their structural, morphological, and optical properties. Also, Rietveld refinement has been used to investigate the detailed structural parameters. Morphological analysis unveil crystallinity enhancement and change in surface morphology with Hg doping in the pristine $CH_3NH_3PbI_3$ perovskite. The bandgap of HgI_2 doped perovskite was found to be ~ 1.56 eV, which is ideal for photovoltaic applications. A lower value of lattice strains and stacking faults for doped perovskite also make this material composition ideal for perovskite solar cell applications. UV–VIS spectroscopy has shown the enhancement of absorption energy for 3% HgI_2 doping in pristine perovskite. These outcomes open up the entrance of different perceptiveness of transition metals to terminate the lead-free scheming of novel shielding materials with innovative photovoltaic properties.

1. Introduction

Hybrid lead (Pb) halide perovskite materials have emerged as a crucial point in optoelectronic research. Benefitting from wide absorption of light, tunable bandgap, efficient photoluminescence (PL) and higher absorption coefficient (α), they have shown desirable optoelectronic and photovoltaic (PV) properties [1–5] Generally, hybrid perovskite solar cells (PSCs) exhibit outstanding power conversion efficiencies (PCE) exceeding 22% [6,7]. Out of numerous hybrids lead halide perovskite: methylammonium lead iodide ($CH_3NH_3PbI_3$), with a bandgap of about 1.50–1.60 eV has so far been widely used as a light harvester in solar cells. Unfortunately, Pb contained hybrid perovskites are toxic and less stable. To overcome such restrictions, numerous studies were performed and reported [8]. However, new combinations of cesium (Cs) and formamidium (FA) based perovskite material produced high-performance devices along with advanced stability under ambient conditions [9,10]. Besides this, the substitution of some elements in $CH_3NH_3PbI_3$ makes it feasible that controls structural, morphological, optical, and electronic characteristics prominent for the development of PSCs with high stability and performance.

Surprisingly, much less attention has paid to the substitution of Pb by other divalent elements. Another group 14 elements (Sn^{2+} and Ge^{2+}) belongs to a similar group of Pb^{2+} considered and the most promising replacement for Pb [11]. However, Pb free Sn and Ge based perovskite solar cells (PSCs) have shown inferior PV performances as compared to Pb based PSCs along with poor stability [12,13]. Hence, considering the toxicity of Pb, doping of metal ions (Zn^{2+}, Mn^{2+}, Cd^{2+} etc.) into lead halide perovskites is a general and effective approach to reduce toxicity and obtained distinct optical properties [14,15]. It has been observed that structural deformation takes place on doping of divalent material for Pb^{2+} and also affects the optical properties of lead-based perovskites.

Muscarella and his co-workers clearly show that the shape size and orientation of different elements of perovskite has a wide impact on its optoelectronic properties [16]. Although, doping of metal ions makes no alteration to crystal system & basic properties of host material [17]. No doubt, dopant strategy has emerged as one of the influential techniques for altering key characteristics of halide perovskites and this makes them as famous materials even more striking for real application.

Besides this, the film morphology of the perovskite layer has played an important role in the absorption of light. The rate of light absorption

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Structural, Optical and Thermal Properties of PVC/ Polyaniline Composite Thin Films

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Free-standing thin films of polyaniline (PANI) with polyvinyl chloride (PVC) were synthesized and studied for variations in the structural, optical, and thermal properties with changing polyaniline concentration in the composites. Fourier transform infrared spectra show interactions between polymeric entities. XRD shows an increase in peak intensities with polyaniline with an exception at 50% polyaniline content. SEM micrographs verify the morphological changes of the composites. The reduction in chain length of composites with increased concentration of PANI is supported by the shift in absorption edge of UV-VIS spectra towards longer wavelengths. A reduction in direct and indirect band gaps and Urbach's energy with increasing PANI concentration was observed. A monotonic increase in the intensity of photoluminescence with PANI concentration was observed with an exception for 40% polyaniline content. The glass transition temperature (T_g) for PANI/PVC composites showed a slow reduction with increased PANI concentration.

INTRODUCTION

Among the wide range of organic materials developed for a number of optical and electronic applications, a new field of conducting polymers was launched after the discovery of polyacetylene by Heeger, MacDiarmid, and Shirakawa. Conducting polymers (CPs) are similar to metals and semiconductors due to their electrical and optical properties, while retaining the properties of common polymers, such as easy and inexpensive synthesis and flexibility.[1–3] Polyaniline (PANI) is one of the most promising intrinsically conducting polymers (ICPs) as it is not only a conducting polymer but also possesses redox activity, non-linear optical properties and paramagnetism.[4–8] The conductivity of PANI can be controlled depending on its oxidation states and mode of conductivity. Charge propagation in PANI is based on the movement of delocalized electrons through inter-chain conjugated systems and defects, and leads to reorganization of the bonds.[9–13] Nanostructured PANI offers the possibility of enhanced performance for the fast transfer of electrons, and can be utilized for potential applications such as supercapacitors,[14,15] biochemical sensors, bio-medicine and tissue engineering,[16–22] microelectronic devices, rechargeable batteries,[23,24] organic LED display devices, and photovoltaic cells.[25–30] PANI composites are also utilized in catalysis and anti-corrosive coating,[31–36] EMI shielding, electronic packaging, and microwave absorption.[37,38] However, the manageability of PANI has two limitations: the powdered form of the polymer does not dissolve in its doped form in any common organic solvents, and the polymer is degraded at high temperature, which results in poor mechanical strength.[9–11] An effective way to improve the mechanical stability of ICPs is to form their composites with nanoparticles or blend them with other polymers that have better mechanical properties for their intended applications than their pristine analogs.[11,39] Conducting polymer

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Role of Ba^{2+} substitution on structural, thermal, dielectric and electrical properties of $La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$ {$0.10 \leq x \leq 0.40$} cathode for SOFCs

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Cathode material
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ABSTRACT

$La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$ {x = 0.10,0.20,0.30 and 0.40} perovskite fabricated by use of solid-state method and the prepared ceramic has been characterized to find the influence of Ba^{2+} on its thermal, structural, dielectric and electrical behavior. Result of X-ray diffraction noticeably shows single phase crystalline behavior and hexagonal crystal structure. Density calculation confirmed that Ba^{2+} addition decreased its value. TGA confirm weight gain above 300 °C temperature in the material. Thermal expansion coefficient have been measured for x = 0.10 and 0.40 sample and its value is 10.3×10^{-6} °C^{-1} and 9.2×10^{-6} °C^{-1} respectively up to 800 °C temperature. Electric and dielectric behavior confirmed non-Debye relaxation behavior of the material. The highest conductivity is found to be 126.44 Scm^{-1} and 143.38 Scm^{-1} for x = 0.10 at 600 °C and 291.86 Scm^{-1} and 349.25 Scm^{-1} at 800 °C temperature for x = 0.40 which confirm that with Ba^{2+} doping conductivity increases. Activation energy falls with Ba^{2+} content. Results verified that the present fabricated perovskites are suitable to be used as cathode for intermediate temperature SOFCs.

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1. Introduction

Increasing demand of energy and reduction of conventional energy sources directed the present research to develop non conventional energy sources. Substitute source of energy is solid oxide fuel cell (SOFCs) which is portable, clean and renewable [1,2]. Solid oxide fuel cells produce hydrogen and also reasonably inexpensive, highly efficient and low sensitive to impurities [3–7]. Its efficiency is about 60% and on heat recovery enhance to 80% [8]. Efficiency of the cell is much affected by electrode or electrolyte material used in SOFCs [9–11]. Electronic conductivity more than 100 Scm^{-1}, matched value of thermal expansion coefficient with other component (especially electrolyte), good chemical compatibility among the components, higher catalytic activities, adequate porosity and low cost are main requirement of the SOFCs [4]. Perovskite materials like $LaFeO_3$, $LaMnO_3$ and $LaCoO_3$ with suitable ion doping are well studied cathode of SOFCs [12]. Size of Sr atom is comparable to La atom, therefore Sr addition in $LaMnO_3$ raise the extent of charge carrier (electrons and holes) in $La_{1-x}Sr_xMnO_{3\pm\delta}$ (x is less than 0.80) (LSM) and improve the electronic conductivity [13]. On decreasing the working temperatures, higher polarization resistance and activation energy (Ea) is shown by LSM and affect the performance of SOFCs [14]. Charge imbalance is created by substitution of alkaline earth metal at La site in $LaFeO_3$ compensated moreover by creation of Fe^{4+} ion or O_2 vacancy and thus raise the conductivity [15–17]. Therefore in this research work, Ba^{2+} is doped at La site of $LaMnFeO_3$ to synthesized new ceramic material $La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$; {x = 0.10, 0.20, 0.30, 0.40} for cathode of intermediate temperature SOFCs and the as prepared ceramic samples has been characterized for study the thermal, structural, dielectric and electrical behaviour.Table 1 Table 2.

2. Experimental

$La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$; {x = 0.10, 0.20, 0.30, 0.40} perovskite (LBMF) synthesized via solid state reaction process. 99.9% pure $BaCO_3$, MnO, Fe_2O_3 and La_2O_3 from sigma Aldrich has been used as raw material. Powders of raw materials in stoichiometric ratio are taken in a bottle containing zirconia oxide balls and acetone

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Harmonic generation by an interaction of laser with an array of anharmonic carbon nanotubes

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ARTICLE INFO

Keywords:
Harmonic generation
CNTs
Anharmonicity
Silica

ABSTRACT

A scheme of second and third harmonic generation from laser irradiated anharmonic carbon nanotubes (CNTs) embedded in silica is proposed. An intense ultra short laser pulse interacting with the array of CNTs displaces its electrons. When this displacement becomes comparable to the radius of electrons of CNTs, the restoring force of electrons varies nonlinearly with the displacement. As a result, plasmon resonance gets broadened and the large resonance absorption of the laser by the electrons of CNTs occurs. The power conversion efficiency of harmonic generation due to the anharmonicity of CNTs is much higher than that due to the ponderomotive force nonlinearity. The effect of amplitude modulated parameter on the amplitude of second and third harmonic is studied. The high amplitude of generated harmonics can be realized with the amplitude modulated laser as compared to ordinary unmodulated laser.

1. Introduction

In laser-plasma interaction, harmonic generation is an important nonlinear process and has attained great attention from both fundamental and applicative points of view. It has applications in frequency up-conversion, signal processing and a valuable diagnosis in short-pulse laser plasma experiments. Different approaches have been used by various researchers to generate the second and third order harmonics of high power and high amplitude of the fundamental laser beam in plasma.

Second harmonic generation in planar optical waveguides was studied by Bratz et al. [1]. They developed a general formalism for the calculation of mode generation by a planar antenna embedded in the waveguide. Harmonic generation in a self-sustained plasma channel has been the major issue to understand among various nonlinear phenomena [2]. Rax et al. [3] studied the phenomenon of third harmonic generation in density modulated plasma via interaction of an intense plane polarized laser pulse.

Carbon nanotubes (CNTs) and carbon nanofibers (CNFs) have recently achieved significant scientific attention owing to their extraordinary and useful properties, such as compact size, exceptional combination of transverse and longitudinal dimensions, exceptional tensile strength, elastic modulus and electrical and thermal conductivity [4, 5]. The study of carbon nanotubes (CNTs) is now an active area of research in the field of nanoelectronics, which could lead to the development of advanced tech nology devices. Due to this, nowadays various researchers have focused their research on harmonic generation via interaction of laser with CNTs [6-14]. Akimov et al. [6] experimentally studied the generation of the second and third harmonics by femtosecond pulses of a Cr: forsterite laser in a layer of single-walled carbon nanotubes produced by low-velocity spraying. Third harmonic generation of the

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THE EUROPEAN PHYSICAL JOURNAL PLUS

Regular Article

Resonant terahertz generation from laser filaments in the presence of static electric field in a magnetized collisional plasma

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Abstract A new scheme of terahertz (THz) generation from laser filaments in plasma in the presence of static electric and magnetic fields is proposed. Two femtosecond laser pulses of different frequencies (ω_1, ω_2) and wave numbers (k_1, k_2) are co-propagating under the action of filamentation in a magnetized collisional plasma. THz wave is generated due to the nonlinear coupling between nonlinear velocity and electron density in magnetized collisional plasma. For suitable laser and plasma parameters, the nonlinear coupling results in enhanced nonlinear current density which leads to resonant THz waves. The external D.C. electric and magnetic fields are applied perpendicular to each other and mutually perpendicular to the direction of co-propagating lasers. We have obtained the expression of a dielectric tensor with anisotropic nature, and it is found very useful in the study of THz generation. The applied magnetic field also aids to enhance the transverse components of nonlinear current. This nonlinear current is responsible to generate enhanced terahertz waves at frequency ($\omega_1 - \omega_2$). We have found that the normalized THz amplitude increases significantly with the increase in applied D.C. electric field from 10 to 30 kV/cm and magnetic field from 10 to 50kG. Our scheme with numerical analysis may open the door for efficient and cost-effective way to generate THz radiation.

1 Introduction

In modern days, compact and efficient THz sources have great importance in the field of science and technology because of their numerous applications in industrial manufacturing and packaging units [1], security and safety [2], broad band communication [3], biological and pharmaceutical sciences [4–6], remote sensing [7]. Due to this, various researchers have studied the schemes of THz wave generation by using different mechanisms to enhance the normalized THz amplitude like optical rectification [8], cross-focusing [9], optical mixing [10] and filamentation [11–13], etc. Among them, the mechanism of THz generation by laser filamentation produces THz pulses of very high order energy. Femtosecond laser filamentation is a distinctive, dynamical and unique phenomenon in which laser beam breaks up

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Resonant Terahertz Generation by the Interaction of Laser Beams with Magnetized Anharmonic Carbon Nanotube Array

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Abstract

In this novel scheme, a theoretical analysis of resonant terahertz (THz) generation in the array of magnetized anharmonic carbon nanotubes (CNTs) is presented. Two laser beams with frequencies (ω_1, ω_2) and wavenumbers (k_1, k_2) propagate through the array of vertically aligned anharmonic CNTs in the presence of an applied static magnetic field. It provides different displacements to the various electrons of CNTs. Due to this, restoration force varies nonlinearly with the displacements of electrons and hence results in anharmonicity. This anharmonicity plays a significant role in the enhancement of absorption of laser beams by the electrons of CNTs. The nonlinear restoration force produces the current which is responsible for the THz generation. It is observed that the applied magnetic field (170 to 235 kG) helps in the enhancement of the THz generation by increasing the nonlinearity of the system. The impact of dimensions, inter-tube separation, and density of CNTs on the THz amplitude has also been analyzed.

Keywords Carbon nanotube · Nonlinear restoration force · Anharmonicity · Inter-tube separation · Magnetic field

Introduction

In this modern world, THz technology has attained great importance due to compact and highly efficient THz sources for various applications in many fields like security protection [1], medical sciences [2–4], and broadband communication [5]. The various researchers have proposed several schemes for THz wave generation to provide compact, efficient, and reliable THz sources. For this purpose, they have used different mechanisms to enhance the amplitude of THz radiation. Some of these are by beating of two chirped-pulse laser beams in spatially periodic density plasma [6], the interaction of laser filaments in the presence of a static electric field in a magnetized collision plasma [7], laser coupling to an anharmonic CNT array [8], nonlinear mixing of laser beams [9], and by applying a magnetic field on an array of CNTs [10–12]. The CNTs are considered very reliable and effective sources for THz generation, due to their compact size, large current density, high electrical conductivity, and excellent combination of transverse-longitudinal dimensions. The CNTs are considered a more favorable medium for the efficient generation of terahertz radiation [13]. Moreover, CNTs are also helpful in the strong absorption of the laser beam [14] due to which generated THz amplitude is enhanced. Titova et al. [15] have proposed the generation of THz radiation by using single-walled CNTs, excited by femtosecond laser beams. Batrakov et al. [16] and Portnoi et al. [17] have explained and reviewed THz generation processes in CNTs to increase the efficiency of THz generation. Wang and Wu [18] studied the properties of THz radiation experimentally, emitted by CNT antenna. Dragoman and Dragoman [19] have studied the characteristics of metallics, single-walled CNTs as a THz antenna. Dagher et al. [20] have studied the amplification of THz radiation in metallic CNTs under the influence of the D.C. magnetic field and observed enhancement in the normalized amplitude of THz radiation.

In the present paper, we propose a new scheme for THz generation by irradiating two co-propagating laser beams of nearly equal frequencies on vertically aligned hollow anharmonic CNTs in the presence of an external static magnetic field. In this, we are using an array of CNTs to ease the propagation of THz radiation. A single-walled

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Stability analysis and optimal impulsive harvesting for a delayed stage-structured self dependent two compartment commercial fishery model

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Abstract
Due to overexploitation of renewable resources, we have observed that some species are already extinct. So, the time demands conservation, reproduction and optimal utilization of these resources and the study of such problems. In this paper, a delayed stage-structured self-dependent two compartment (compartment-I contains immature fishes and compartment-II contains mature fishes) commercial fishery model with impulsive harvesting is proposed and analyzed mathematically as well as numerically. The aim is to manage the fishery resource system and that to extract maximum profit without the species become extinct. The proposed system is proved to have positive periodic solutions which are bounded, locally stable and permanent with certain conditions. Then by using optimal impulsive harvesting theory, the optimal harvesting time and optimal harvesting level have been obtained. At last, numerical simulation has been done to support the analytic results, along with comparative plots drawn for different values of harvesting effort E, maturation delay τ and impulsive period T.

Keywords Optimal harvesting policy · Impulsive effect · Stage structure · Delay · Stability analysis

1 Introduction

As the need for food and energy is increasing rapidly, the natural biological resources are getting exploited at an alarming rate. So, the time demands an effective and scientific management of biological resources so that the problems related to the renewable resources, fishery resources in particular, are addressed effectively. One of the possible solutions in case of fishery resources is fish farming, i.e. to create and develop fishes in controlled reservoirs or compartments for commercial purposes. Generally, there are two or three ponds/compartments out of which one compartment is used for breeding and fertilization of fishes and the second compartment is used for development of fishes up to adult age and ultimately for the harvesting of fishes.

During the last two decades, a number of Ecologists/Mathematicians have studied the impact of harvesting of one or more species on the complex dynamics of natural fishery resource model. The main objective of their study has been to find the conditions to extract maximum profit without the species being led to extinction. It was also observed that in order to prevent the species from extinction, various agencies/institutions impose certain regulations like fishing quota, taxation, supply of alternate food to predators, restriction on effort, creation of reserve area, lock-in period, switching of harvesting policies etc., and researchers/mathematicians have explored these factors through their models and analysis. Dubey et. al. [1] have suggested and analyzed a fishery

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ORIGINAL RESEARCH ARTICLE

Electrical Conductivity and Dielectric Properties of Zirconia-Based SOFC Electrolytes Processed by Microwave and Conventional Sintering

Amit Sharma[1] · **Payal Sharma**[2] · **Kanchan L Singh**[2]

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Abstract

The study of a.c. conductivity and dielectric properties of materials is important in obtaining new materials with predetermined properties for their various applications in fuel cell technology. In this work, the precursors of zirconia-based ceramic oxides with compositions $Zr_{0.90}Y_{0.06}Ce_{0.02}X_{0.02}O_{2-\delta}$ (X= Ca, Fe, La, Sr, and Mg) were prepared by the mixed oxide method. All the precursors were ball milled for 6 h in an acetone medium. The calcination of these powdered samples was done at 600°C in an electric furnace and calcined powders were then pelletized. Sintering of the sample pellets was done in a microwave furnace at 1400°C for 20 min and in a conventional furnace for 6 h at the same temperature. The structural properties, a.c. conductivity and the dielectric properties of these samples were studied in a frequency range from 20 Hz to 2 MHz. The a.c. conductivity of all the samples was found to increase with an increase in frequency. The variation of dielectric response factors such as dielectric constant and loss tangent with frequency has also been explored in this work. Among all the prepared samples, the microwave sintered $Zr_{0.90}Y_{0.06}Ce_{0.02}Ca_{0.02}O_{2-\delta}$ sample shows maximum electric conductivity at 800 K.

Keywords Microwave processing · solid electrolyte · a.c. conductivity · dielectric loss

Introduction

Excellent electrical, optical, and magnetic behaviors of ceramics are very crucial for their applications in communications, electronics, and energy storage. The fundamental characteristics such as dielectric constant (ε_r) and the dielectric loss factor (tanδ) of ceramics decide their applicability in these different areas. To understand the required properties of dielectric materials, it is necessary to study the physical phenomena occuring in these materials when they are placed in an electromagnetic field. The dielectric measurements explore the motion of local charge carriers, which are responsible for high ionic conduction in a material as well as the dissipation of the electric energy inside it when placed in an alternating field.

Since the defect associates usually contain one or more oxygen vacancies, the dielectric constant value and oxide ion conductivity are primarily controlled by the association energy of the oxygen vacancies. This is because oxygen vacancies connected with the defect associates need to be dissociated from the defect associate pairs for the conduction process. Large defect pairs are formed at higher doping concentrations in singly doped materials. However, small defect pairs are formed in co-doped materials as the co-doping effect hinders the growth of defect clusters.[1] Therefore, the dielectric constant and dissipation factor are the crucial quantities in the design of SOFC electrolytes and the dielectric relaxation studies have their significance to explain the dynamic properties of oxygen vacancies after the dissociation from the dopant-vacancy associates. The study of dielectric constant and dielectric loss as a function of temperature and frequencies is one of the most convenient and sensitive methods of studying the material structure.[2]

In addition to these properties, the a.c. conductivity or frequency-dependent conductivity is another important factor that describes the electrical conductivity of material when placed in an alternating current (a.c.) field.[3-6] For all the solid materials in general, the a.c. conductivity of a solid obeys the Jonsche's power rule given as:

$$\sigma_{ac}(\omega) = \sigma_{dc} + A\omega^n \; for \; 0 < n < 1 \tag{1}$$

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Complex dynamics of sixth order multipoint iterative methods for nonlinear Models

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Abstract

In this paper, iterative methods are analyzed under different approach. A research area that is becoming popular in recent years consists of applying tools of complex dynamics to the associated fixed point operator of iterative methods. The dynamical study of such rational operators when applied on the simplest function (polynomial of lowest degree) provides vital information regarding convergence and stability of the method. Here, we study dynamical behavior of some sixth order iterative methods, designed for nonlinear equations. This study is concerned with the asymptotic behavior of the fixed points (roots, or not, of the equation) and also geometrical behavior by drawing basins of attraction on different polynomials.

Keywords: Nonlinear equations; Iterative methods; Stability analysis; Fixed points; Basins of attraction.

1. Introduction

The application of iterative methods for solving nonlinear equations $f(z) = 0$, where $f : \mathbb{C} \to \mathbb{C}$ gives rise to rational functions whose dynamics are not well known. There is a vast literature available on the study of iteration of rational functions of a complex variable (see, Douady and Hubbard (1985) and Devaney (1989)). The simplest model is obtained when $f(z)$ is a quadratic polynomial and the iterative process is Newton method. The dynamics of this iterative method has been widely investigated (see, Curry et al. (1984), Blanchard (1994) and Fagella (2008)). Vrscay (1986) and Vrscay and Gilbert (1988) studied the dynamics of other well known quadratically convergent iterative functions. This analysis has further been extended to other iterative methods, used for solving nonlinear equations with convergence order higher than two (see, Varona (2002), Amat et al. (2004), Amat et al. (2005), Amat et al. (2010), Gutierrez et al. (2010), Plaza and Romero (2011) and Chun et al., (2012)). More recently, many researchers have analyzed and provided a comparison of iterative methods from dynamical point of view (see, Scott et al. (2011), Chicharro et al. (2013), Neta et al. (2014), Babajee et al. (2014), Behl et al. (2015), Cordero et al. (2015), Lotfi et al. (2015),

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Energy Efficient TABU Optimization Routing Protocol for WSN

Research Articles
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Abstract References How to Cite License

Introduction: This article is the result of the research “Energy efficient routing protocols in wireless sensor network: Examine the impact of M-SEEC routing protocols on the lifetime of WSN with an energy efficient TABU optimization routing protocol”developed in the IKG, Punjab Technical University, India in 2019.

Problem: The task of finding and maintaining routes in WSNs is non-trivialsince energy restrictions and sudden changes in node status cause frequent and unpredictable changes.

Objective: The objective of this paper is to propose an energy efficient heterogeneous protocolwith the help of a hybrid meta-heuristic technique.

Methodology: In the hybrid meta-heuristic technique, the shortest route has been selected and the data forwarded to the sink in a minimal time span,savingenergy and making the network more stable. To evaluate the technique, a new hybrid technique has been created where the data transmission is implemented from the beginning under MATLAB 2013a.

Results: The proposed technique is better than the existing ones since the remaining energy in the network is increased by 62% compared to normal nodes in MSEEC, 65% compared to advanced nodes in MSEEC and 70% compared to super nodes in MSEEC. The network lifetime was also enhanced by 70.8% compared to MSEEC.

Conclusion: The proposed protocol was found to be superior based on the average residual energy.This paper proposes an efficient routing mechanism towards the energy efficient network.

Originality: Through this research, a novel version of MSEEC protocol is carried out using the TABU search mechanism to generate the functions of two neighbourhoods to detect the optimum path with the aim of maximizing the network lifetime in an area of 200×200m2.

Limitations: The lack of other routing techniques falls under swarm intelligence.

Keywords: WSN, MSEEC routing protocol, TABU search, Throughput and Energy efficiency

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Design of novel UWB Antenna with desired band notch characteristics by introducing defects in the antenna geometry suitable for Biomedical and Wireless Personal Area Network Applications

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Abstract

In this paper, two different methodologies are employed to design a novel compact microstrip fed UWB antenna which not only shows good impedance bandwidth from 2.82 to 11.55 GHz but also has dual band notched characteristics. In the proposed design, multi-resonance performance is achieved by using a modified hexagon shaped radiating patch. The notched bands are realized by introducing two different types of modifications in the basic structure of antenna. By modifying the shape of radiator, the proposed design can reject the frequency bands at 3.5 and 5.6 GHz as their central frequencies without any requirement of an additional band-stop filter. The modifications done on the radiating patch, shows that a good band notched characteristics with a considerable level of signal rejection can be achieved for WLAN, HIPERLAN and DRSC systems. In addition to that by introducing defects in the ground structure the other band notched characteristics can be observed for WiMAX and C-band communication systems. To understand the dual band notched characteristics in detail an equivalent circuit model of the proposed antenna is also extracted. A high degree of similarity is observed in the simulated and measured results with reasonable results comprising of good reflection coefficient, gain, VSWR, radiation pattern, and group delay characteristic results suitable for both biomedical and WPAN Applications.

Keywords: *Antenna design, Defected ground structure, Modeling, Wireless Application.*

I. INTRODUCTION

There has been a remarkable demand of research in the area of wireless communication technology, after the allocation of free use of wide band of 3.1 to 10.6 GHz for commercial use. There are a number of applications such as medical imaging system, radar, pulse communication etc which uses UWB radio technology. It is quite challenging to design an antenna that not only radiate in the UWB range but also satisfy the requirements of high radiation efficiency, constant gain, compact size, omnidirectional radiation pattern [1]. After the FCC regulation for using the Ultra wide band for commercial use, there has been a widespread demand for designing compact and high performance antenna while providing wideband characteristic over the whole operating band. Among the different geometries of antenna, planar monopole are usually considered more appropriate for UWB applications due to their numerous merits of easy fabrication, omni directional radiation pattern etc [2].Though there are many advantages of UWB communication system, still there are issues in which the narrowband communication system severely interferes with the UWB communication system such as worldwide interoperability for microwave access (WiMAX) from 3.3 to 3.6 GHz, C-band from 3.7 to 4.2 GHz, wireless local area network (WLAN) from 5.15to 5.35 GHz and from 5.725 to 5.825 GHz, high performance radio LAN (HIPERLAN)/2 from 5.47 to 5.725 GHz, and dedicated short-range communications (DSRC) from 5.85 to 5.925 GHz

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HANET: A REMOTE SENSING AIRBORNE ARCHITECTURE FOR MULTI-FUNCTION ADHOC NETWORKS USING SDN.

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Abstract – Proliferation and advancements for electronic wireless technologies have converged and motivated many researchers to evaluate and design a more scalable, reliable, and secure Ad-hoc network for ordinary civilians. Incorporating wireless technologies in a network always caters to human's life more conveniently, relaxing, and self-driven, where human intervention is challenging and overwhelming. However, available Ad-hoc networks are very rigid, limited to changes, and tough to manage, which doesn't allow flexibility, scalability, security, and performance in many aspects. To address said issues, we have proposed a new promising Ad-hoc network called HANET aim to support scalability and programmability. The primary goal of this model is to maintain the multi-domains state of technologies while acting as a middleware for applications such as battlefield, emergency search, and rescue, border patrol, surgical strike, agriculture monitoring, disaster warning, patient monitoring, and many more. The proposed paradigm targets to reduce the general cost for these applications and customize as per user convenience. The principle architecture and design characteristics of this paradigm have been discussed in the next session of this paper. This model motivates and contributes too many other aspects of the Ad-hoc network. This architecture incorporates the efforts of Airborne (AN) for route discovery and SDN to extended Ad-hoc networks from any corner.

Keywords: HANET, SDN, WSN, FUZZY, Ecosystem.

1. INTRODUCTION

In the era of sensors and wireless communication, terrestrial and airborne communication has become more potency. The evolution of SDN arises to a howling leap, helps defense and other private agencies in a cascade manner. SDN is the hope for any network to re-architect communication and methodology. We also treat the controller as a NOS network operating system. Hence can define the dynamics of the controller, which take precise information inside the network, for example, routes, bandwidth, jitter, and delay to provide a suitable path. Aspects of UAV [1] can be pinpoint as hunter-killer surveillance missions, commercial use, delivery of medicines in the battlefield, and aerial photography.

Similarly, the performance of the wireless sensor network and Adhoc network primarily depend upon the movement of nodes and its parameters associated with the longevity of the connection. One of the critical elements used to enhance the scalability and flexibility in the terrestrial and sky network is by using UAV or RPA drones, such as MQ-9 reaper, DJI Phantom, AltiGator, Tadiran Mastiff first flew in 1973[2]. In paper [3], author Yong Zeng proposed a new promising way to integrate 5G with the UAV network. This author added a tutorial review on areal UAV communication to address critical issues such as LOS dominant, GT [Ground Terminals] and Sky channel interference, quality of service, and SWAP [size, weight, and power] limitation in UAV device. In the desired process of tacking the inherent terrestrial challenges, Software Defined Networking has integrated with small UAVs. FANET recall that it is a particular form of MANET & VANET[4] with high Mobility and low flight z autonomy. FANET, however, inherent problems like small flying duration and unproductive routing protocol[5]. However, since now, no adequate routing protocol has been proposed for such

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A Radical Study of Energy Efficient Hierarchical Cluster-Based Routing Protocols for WSN

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Abstract: For many decades, researchers and vendors are continually developing and designing sensors and wireless network devices for countless applications. These low power wireless sensor network devices have designed to gather and propagate data for applications such as environment, industry, habitat, patient monitoring, and many more to excel humankind—however, these devices also inherent many challenges and drawbacks due to the default hardware design. Subsequently, to mitigate limitations and enhance the capability, authors and researchers have investigated and conferred that minor optimization in modeling or routing techniques gradually elevates the performance of WSN. One of the primary concerns which remain on top of the Domain for discussion is *energy conservation* in WSN devices. Our primary goal is to *analyze and design* a cluster-based routing protocol for WSN, An efficient way to elevate the network performance. Finally, the emanate results showcase that the performance of the proposed protocol is much more optimized and favorable when combined with soft-computing tactics when compared to the conventional paradigm.

Keywords: *LEACH; PEGASIS; SEP; DEEC; BIHP; MGEAR; TDEEC; ZSEP; SPEED; T-SEP; B-SEP; PDFND; NDUD; Energy Hole;*

1. Introduction

WSN is a self-sustain[1], infrastructure-less, spatially distributed low power, sensor network with a centralized sink connect through many MOTE, mote diagram, as shown in Figure 1. Lossy[2] networks consisted of mote hardware for gathering and propagating the required data from the surrounding environment. To operate these sensor networks over a long period or to cater to useful information from the sensor field, researchers and scholars have been looking into creatures or beautiful nature to solve many human complex issues. We study how a network from homogeneity to heterogeneity is beneficial. The cost of transmitting 1kb data over a distance of 100 meters is approximately 3 joules. By contrast, a general-purpose processor with 100MIPS/W power could efficiently execute 8 million instructions for the same amount of energy (1) DPM and DVS are the main two power-saving mechanisms. We are also inclined to technique seeded from biological behavior, one of the sources called the BFO paradigm (Bacteria forging optimization)[3]. As per the conventional methods, such as LEACH[4], PEGASIS[5], SEP[6], BIHP[3] are simulated and compared to compute a better result.

Motivation1: To enhance reliability and performance[7], we incorporated an evolutionary technique for selecting cluster-Head in a conventional routing protocol. The behavior of the BIHP[3] protocol in a homogenous environment is inconsistent as compared to SEP for the assumed parameter, but much better than LEACH and PEGASIS when executed[3]. Also, to tackle the real-time problem of low power devices and to prolong the overall network lifetime SEP Stable Election Protocol showcases better results when blended with BFO.

Motivation2: Another dimension that highlights the scope of the future in WSN or smart management is viral nowadays, called SDN[8][9] (Software Defined Network)[10]. It is computing—typically composed of the controller and switches that overcome the inherent weakness of the traditional network. This novel architecture model was first introduced by Luo[11]to Bridge the gaps of WSN using SDN. This Blended SDN structure offers a scalable and potential approach through programming aspects. Since fortunate to decouples the control plane

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Performance enhancement of ultra-dense WDM over FSO hybrid optical link by incorporating MIMO technique

Rajneesh Kumar and Love Kumar

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Abstract

Free-space optical (FSO) communication is a wireless optical data transmission technology with a high data transmission rate. It has received much attention in recent years as it is cost-effective and has license free operation. It is line of sight free-space communication technique where optical signal severely degraded from atmospheric losses especially due to weather conditions; hence it restricts the link range and data carrying capacity. Therefore, a 16-channel ultra-dense wavelength division multiplexing–free space optics (UWDM–FSO) system each having each 10 Gb/s data rate is proposed to enhance the capacity and performance of FSO system. To authenticate the performance of the proposed system, investigation for different modulation formats such as nonreturn to zero (NRZ), return to zero (RZ), carrier suppressed return to zero (CSRZ) and duo binary (DB) are reported. Further, to reduce the atmospheric interference, multiple input multiple output (MIMO) technique is integrated into the proposed system. The outcomes of MIMO–UWDM–FSO link revealed a significant improvement in the bit error rate (BER), eye diagram and Q-factor, under different weather conditions. It is also observed that NRZ modulation formats perform better than RZ, CSRZ and DB formats.

Keywords: bit error rate (BER); eye diagram; free-space optical (FSO); multiple input multiple output (MIMO); Q-factor; ultra-dense wavelength division multiplexing (UWDM)

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Multi-Hop Relay Based Free Space Optical Communication Link for Delivering Medical Services in Remote Areas

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Abstract: Free Space Optical (FSO) communication links are although extremely vulnerable to atmospheric adversities, multi-hop relay transmission can however, significantly improve the link performance and reliability. This paper proposes 120 Gbps DP-16 QAM modulated multi-hop serial FSO link with coherent reception for delivering medical consultation services in remote and isolated locations. Considering the current situation wherein pandemic of highly infectious nature, COVID-19 has affected millions of people globally; doctors can use the proposed high-speed architecture for "contact-less" supervision of quarantined patients and suspects through video conferencing. Each relay terminal uses an all-optical amplify-and-forward technique with Erbium-doped fiber amplifier (EDFA) and gain optimization as its core elements. As a possible last-mile application for delivering medical/health care services, the proposed link has been evaluated for reliability by exposing the link to varied atmospheric conditions. Our results reveal that at target BER of 10^{-5}, the useful communication link range of proposed multi-hop link increments by 1.8 kms as compared to direct link that operates under similar channel conditions. Furthermore, compared to results from recent literature on high-speed FSO [30], the proposed link shows enhancement in link range by approximately 0.7 km. The analysis also reveals that as the number of relay nodes increases, the error performance of the link for different atmospheric conditions approaches a state of convergence.

Index Terms: Atmospheric turbulence, amplify-and-forward relaying, coherent FSO reception, digital signal processing, last-mile connectivity.

1. Introduction

1.1 Preliminaries

Free space optical communication, often addressed synonymously as optical wireless communication, has received massive attention in recent years as a possible alternative to address the issue of last-mile connectivity. High transmission rates, license-free spectrum, easy deployment/relocation,

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Research Article

Network Selection in Wireless Heterogeneous Environment Based on Available Bandwidth Estimation

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Abstract

Background: With the availability of multiple options in wireless network simultaneously, Always Best Connected (ABC) requires dynamic selection of the best network and access technologies.

Objective: In this paper, a novel dynamic access network selection algorithm based on the real time is proposed. The Available BandWidth (ABW) of each network is required to be estimated to solve the network selection problem.

Methods: Proposed algorithm estimates available bandwidth by taking averages, peaks, low points and bootstrap approximation for network selection. It monitors real-time internet connection and resolves the selection issue in internet connection. The proposed algorithm is capable of adapting to prevailing network conditions in heterogeneous environment of 2G, 3G and WLAN networks without user intervention. It is implemented in temporal and spatial domains to check its robustness. Estimation error, overhead, estimation time with the varying size of traffic and reliability are used as the performance metrics.

Results: Through numerical results, it is shown that the proposed algorithm's ABW estimation based on bootstrap approximation gives improved performance in terms of estimation error (less than 20%), overhead (varies from 0.03% to 83%) and reliability (approx. 99%) with

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Fuzzy Based Adaptive Deblocking Filters at Low-Bitrate HEVC Videos for Communication Networks

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Abstract: In-loop filtering significantly helps detect and remove blocking artifacts across block boundaries in low bitrate coded High Efficiency Video Coding (HEVC) frames and improves its subjective visual quality in multimedia services over communication networks. However, on faster processing of the complex videos at a low bitrate, some visible artifacts considerably degrade the picture quality. In this paper, we proposed a four-step fuzzy based adaptive deblocking filter selection technique. The proposed method removes the quantization noise, blocking artifacts and corner outliers efficiently for HEVC coded videos even at low bit-rate. We have considered Y (luma), U (chroma-blue), and V (chroma-red) components parallelly. Finally, we have developed a fuzzy system to detect blocking artifacts and use adaptive filters as per requirement in all four quadrants, namely up 45°, down 45°, up 135°, and down 135° across horizontal and vertical block boundaries. In this context, experimentation is done on a wide variety of videos. An objective and subjective analysis is carried out with MATLAB software and Human Visual System (HVS). The proposed method substantially outperforms existing post-processing deblocking techniques in terms of YPSNR and BD_rate. In the proposed method, we achieved 0.32–0.97 dB values of YPSNR. Our method achieved a BD_rate of +1.69% for the luma component, −0.18% (U) and −1.99% (V) for chroma components, respectively, with respect to the state-of-the-art methods. The proposed method proves to have low computational complexity and has better parallel processing, hence suitable for a real-time system in the near future.

Keywords: Adaptive deblocking filters; high efficiency video coding; blocking artifacts; corner outliers; bitrate; YPSNR; BD_rate

1 Introduction

There is a requirement for large bandwidth in high-definition video content in the present era of multimedia applications [1–5]. Researchers have an incredibly challenging task to save bandwidth by performing adequate compression without affecting the visual contents over low bandwidth networks. Due to the large bandwidth capacity of video contents, performing a

An efficient post-processing adaptive filtering technique to rectifying the flickering effects

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Data Availability Statement: All the data used in this research is taken from derf's collection (https://media.xiph.org/video/derf/).

Abstract

Compression at a very low bit rate(≤0.5bpp) causes degradation in video frames with standard decoding algorithms like H.261, H.262, H.264, and MPEG-1 and MPEG-4, which itself produces lots of artifacts. This paper focuses on an efficient pre-and post-processing technique (PP-AFT) to address and rectify the problems of quantization error, ringing, blocking artifact, and flickering effect, which significantly degrade the visual quality of video frames. The PP-AFT method differentiates the blocked images or frames using activity function into different regions and developed adaptive filters as per the classified region. The designed process also introduces an adaptive flicker extraction and removal method and a 2-D filter to remove ringing effects in edge regions. The PP-AFT technique is implemented on various videos, and results are compared with different existing techniques using performance metrics like PSNR-B, MSSIM, and GBIM. Simulation results show significant improvement in the subjective quality of different video frames. The proposed method outperforms state-of-the-art de-blocking methods in terms of PSNR-B with average value lying between (0.7–1.9db) while (35.83–47.7%) reduced average GBIM keeping MSSIM values very close to the original sequence statistically 0.978.

Adaptive Logarithmic-Power Algorithm for Preserving the Brightness in Contrast Distorted Images

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***Abstract*—The digital images get distorted due to non-uniform light conditions or improper acquisition settings of the digital camera. Such factors lead to distorted contrast objects. In this work, we proposed adaptive enhancement algorithm to improve the contrast while preserving the mean brightness in the image. The method developed is a combination of discrete wavelet transform and gamma correction. Firstly, the gamma scale is computed from multi-scale decomposition using 2D-discrete wavelet transform. The value of scale parameter in gamma was computed from combination of logarithmic and power function. Secondly, the gamma correction is implemented to improve the contrast in the image. Lastly, bilateral filtering is utilized for smoothness of edges in the image. The approach effectively preserved the brightness and optimized the contrast in the image. The objective quality measures used as Peak SNR, AMBE, entropy, entropy based contrast measure and median absolute deviation is computed and compared with other state-of-the-art techniques.**

***Keywords*—Non-uniform images; gamma correction; multi-scale 2D- discrete wavelet transform; logarithmic-power; quality metrics**

I. Introduction

Due to imbalance of energy in the wavelength between RGB (red, green, and blue) colours, the distortion in the contrast is produced in the images. The contrast is the variation of brightness to discriminate between the features present in the image. The Fig. 1 is the exact illustration of what had been discussed by Qing Zhang et al [1]. The figure displayed an image with the distorted contrast, where most of the pixel values lies at the left extrema of the intensity scale. If the pixel values narrows at the extreme left, right, and middle values of the intensity scale, then the image is termed to be dark, bright, and low contrast images. For high contrast, the requisite amount of pixel should be uniformly distributed over the entire intensity scale [2]. Therefore, contrast is an important parameter to indicate the structural information in the image. With contrast stretching, the spread from a low to a high contrast range can be attained. Such mapping is termed to be the adjustment of dynamic range of intensity scale. Therefore, contrast stretching is a transformation technique utilized through linear or non-linear operations. The histogram equalization (HE) is one of the popular linear transformation technique, known for its simplicity and ease of use. It is an intensity-based transformation which computes the information content based on statistical inference. Fig. 2 shows the full span of range obtained from HE technique. It generates distributed regions all over the intensity scale. But, with the stretch of contrast, contouring artifacts is occurred due to the loss of edges.

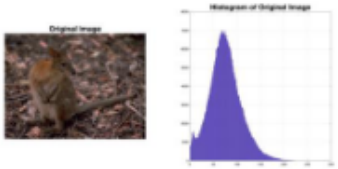

Fig. 1. Original Image.

Moreover, due to poor brightness preservation, the quality of the image is distorted. Hence, it is required to maintain the equilibrium between contrast and brightness in the image.

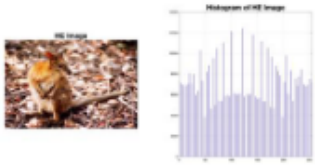

Fig. 2. Enhanced Image using HE Method.

II. Related Work

To overcome the limitation of HE, different techniques were proposed as mentioned in [3][4][5] to improve the quality of the image. The main idea in most of the techniques was to spread the dynamic range of the images. However, the HE does not provide sufficient information on the composition of fine details and edges. Most of the results obtained from the modified approach to HE, produced over enhancement for the darker scale and under enhancement for the lighter scale of the intensity values. The illustration in Fig. 3 was the enhanced image form the algorithm proposed by Kuldeep Singh and R. Kapoor as 'MMSIC' [6]. The modified HE was computed from mean-median based clipped histogram to improve picture quality. With this technique, the large number of pixel values were more towards the left extrema. This effect leads to

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Plant disease detection using ensemble learning – A review

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ABSTRACT

Agriculture is one of the strongest pillars in Indian economy. Plants are important as they are the source of energy supply to mankind. Approximately 70% of Indian economy depends on agriculture for their livelihood. But this is affected by disease which cause the lower agriculture productivity. The farmers encounter difficulties in their detection of plant diseases. Diseases can affect the plant at the time of sowing and harvesting and it leads to low productivity and lowers the economy level. So, there is a need to mitigate this issue by computer techniques and machine learning methods. This paper presents an overview of various classification techniques in machine leaning that helps in plant disease detection. Emergence of accurate techniques leads to impressive results.

Keywords: *SVM, KNN, Decision Tree, Random Forest.*

1. INTRODUCTION

In any developing nations, agriculture plays important role. Agriculture is the spine of economy. Therefore, any harm to harvesting would lead to production loss and ultimately a big loss to economy growth of country. The quantity and quality of crop production is based on the growth of plant. So it is important to detect them at the earlier stage. After detection, some necessary steps should be taken to prevent it to spreading to other regions in field. Dates back ago, the farmers identified diseases by monitoring their changing color and shapes but it is not possible in the large fields. And also it takes more time and much hard work which is not possible now a days. There is a major need to time efficient and automated diagnosis methods for improving the rate of crop production.

2. CLASSIFICATION OF PLANT DISEASES AND THEIR SYMPTOMS

The plant leaves are affected by fungal, bacterial and viral diseases which include rust, powdery mildew, Downey mildew, brown spots etc.[1]. The primary diseases of plants are due to fungus , viral and bacterial diseases like Alternaria, anthracnose, bacterial blight, canker and leaf spot etc[2]. Some common types of diseases appear on vegetables[3] – Spotted Wilt of Tomatoes and Peppers, Southern Blight, Mosaic, Fruit Rot, Rust, Numatode Diseases etc.

1. First type of symptom– These were scattered small and consists of a no. of small lesions or spots spreads over the leaf surface(Fig. 1a). Here, two criteria were used – relatively isolated symptoms were taken individually(Fig.1b), and lesions were part of clusters were taken as group(Fig. 1c)[4].

2.Second type of symptom– These were scattered large and consists of no. of large lesions or spots spread over the leaf surface(Fig. 2a). In half of the cases, the spurious lesions were blacked out(Fig. 2b), and in other half, the spurious lesions were kept unchanged(Fig, 2c). This was done to increase the diversity of conditions[4].

3.Third type of symptom– These were isolated in nature and consists of single lesions or spots(Fig. 3a). In this case, there is only one new figure is spawned from original leaf sample (Fig. 3b). In some cases lesions were split into clearly distinct regions (Fig. 3c)[4].

4.Fourth type of symptom– These are widespread and consists of large lesions that spread over the leaf surface (Fig. 4a). The rest of the subdivisions were done by detecting relatively homogeneous regions within diseased tissues [4](Fig. 4b, 4c).

5.Fifth type of symptom– These are in powdery form and consists of powdery spots on leaf surface(Fig. 5a). When spots were isolated, each one of them generated a new image(Fig. 5b). When disease was more widespread, divisions followed same rule as widespread lesions(Fig. 5c)[4].

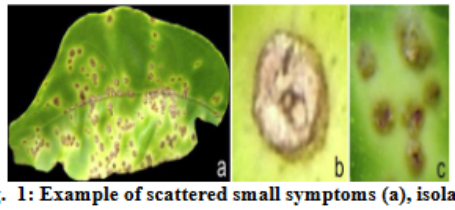

Fig. 1: Example of scattered small symptoms (a), isolated lesion (b), and cluster of lesions (c).

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Visibility restoration of remote sensing images using dynamic multi-objective differential evolution

Vinay Kehar ✉ & Vinay Chopra

Journal of Ambient Intelligence and Humanized Computing (2021) | Cite this article

Abstract

Remote sensing images are generally degraded by scattering of atmospheric particles due to haze, which influences the performance of imaging systems. Thus, the restoration of these hazy remote sensing images becomes a necessary preprocessing step for the analysis of these hazy images. Recently, many visibility restoration techniques have been designed for restoring the hazy remote sensing images. However, these techniques suffer from the initial parameter tuning and texture distortion problems. Therefore, in this paper, initially, we have designed an efficient gain coefficient gradient filter-based dark channel prior to restore the hazy images. Additionally, to tune the initial parameters of the proposed model a dynamic multi-objective differential evolution is utilized. An enhanced restoration model is then utilized to obtain the final images. Various tests are drawn by using the proposed and the existing restoration techniques. It is found that the proposed model restores images with better texture preservation and thus is more suitable for remote sensing image analysis tools.

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Review Article

Efficient Single Image Dehazing Model Using Metaheuristics-Based Brightness Channel Prior

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Haze degrades the spatial and spectral information of outdoor images. It may reduce the performance of the existing imaging models. Therefore, various visibility restoration models approaches have been designed to restore haze from still images. But restoring the haze is an open area of research. Although the existing approaches perform significantly better, they are not so effective against a large haze gradient. Also, the effect of hyperparameters tuning issue is also ignored. Therefore, a brightness channel prior (BCP) based dehazing model is proposed. The gradient filter is utilized to improve the transmission map computed using the gradient filter. Nondominated Sorting Genetic Algorithm is also used to optimize the initial parameters of the BCP approach. The comparative analysis shows that BCP performs effectively across a wide range of haze degradation levels without causing any visible artifacts.

1. Introduction

Images captured in poor environmental conditions, such as haze, fog, and smoggy, suffer from poor visibility issues [1, 2]. The haze attenuates the scene radiance with correspondence to an object's distance from the camera [3, 4]. The haze imaging model is defined as a linear per-pixel consolidation of an original scene radiance and an airlight [5, 6].

Various multiple-images based haze restoration approaches have been implemented [7]. These approaches require physical characteristics of input images in prior [8–10]. But in real life, no physical attributes of input images are available in prior [11, 12].

Many techniques have been designed in the literature to remove haze from still images. Oakley and Satherley [13] designed a physical model to restore weather degraded images. The depth map and atmospheric veil were estimated to remove the visibility degradation from weather degraded images. It discovers the law of weather degraded image formation by considering the visual manifestations under various environmental circumstances [14]. Due to the extensive computational complexity of the physical model, He et al. [15] implemented a novel channel prior, that is, dark channel prior (DCP). It assumes that, for an image taken in a sunny environment, the intensity of at least one-color channel approaches toward zero. However, DCP suffers from a number of problems such as sky-region, halo, and gradient-reversal artifacts, color, edges, and texture distortion issues [16]. Recently, researchers have proposed various channel priors to handle the issues associated with standard DCP such as boosting dark channel [17], bounded optimization-based dark channel prior [18], gradient channel prior [19], adaptive bichannel priors [20], sparse dark channel prior [21], and dark channel prior guided variational framework [22]. However, the existing methods perform poorly especially when images contain a large haze gradient. Most of the existing methods suffer from texture distortion issues [23, 24].

Guo et al. [25] proposed a fusion model to restore the foggy images. It has shown significantly better edge and color preservation. Yoon [26] implemented a variational minimization based haze restoration model. However, [25, 26] are computationally expensive in nature [27].

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Use of Urbanization Index Model by using Multi - Dimensional Aspects for Assessing Urbanization Level

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Abstract

There is need to understand the revise and new role of urban planning especially in context of inclusive planning and harmonious city development programmes. The information of urbanization levels has demonstrated the significance of urbanization for poverty elimination, financial improvement, and modernization. This study tries to assess the growing Urbanization index for different study regions of Jalandhar city, Punjab from nine indicator parameters selected from wide urbanization aspects: demographic aspects, Infrastructural improvement aspects, spatial aspects and economic development aspects. The

1 Introduction

Urbanization is characterized as the increment in extent of individuals living in urban regions. Urbanization is also characterized by the joined together Countries as development of individuals from provincial to urban ranges with population development break even with to urban migration. The urban agglomerations of many countries in Latin America and West Africa have more than 2,000 people. In the United States, Edge has 2,500 people. Urban agglomerations in Italy have a population of

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TECHNICAL PAPER

Consolidation and bearing capacity studies on solid waste ash fill by using hybrid granular piles

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Abstract

The present work is to strengthen the low density, low consolidation, and low load-carrying capacity and higher settlement of industrial solid waste fills (ash). The current research work is on the hybrid confined (HC) stone columns (SC's) in ash fills. The experimental and numerical investigation was carried out on various encased and hybrid confined SC's. The HC SC's increasing stiffness's of geotextile and geogrids and observed the effect of applied pressure–settlement, lateral bulging, and reduction in lateral stresses are studied. The consolidation studies conducted on embankment supported by the various encased stone columns and calculated the amount of pore water pressure generated and dissipated degree of consolidation and settlement with time. This HC system can be suggested for reinforcing the loose decomposed organic soils like peat ground and strengthening the ash dykes to increase the slope of the embankments.

Keywords Hybrid confined · Stone columns · Geotextile & geogrid · Stiffness · Lateral deformation · Reduction in lateral stress and a group of stone columns

Introduction

Thermal power stations (TPS) across the globe use powdered coal as fuel and in return generate a huge quantity of coal ash as a byproduct. These wastes have been ready and disposed of in low-lying areas producing and mixed with water that is ash pond. At present, in India, sixty-five thousand hectares of land have been used to dispose of the coal ash Dadse et al. 2008 [1]. Some proportion of the ash comes out from TPS's electively used in embankments and soil stabilization, etc. Pond ash is fine silt size granular material, it is uniformly graded and rounded, and posse's higher settlement and lower bearing capacity and vulnerable to erosion with wind and water thereby slope failures and liquefaction during an earthquake Pandian. 2004 [2], Perlea et al. 2004 [3].

Solid waste disposal is at a critical stage across the nations. There is a need to develop methods to utilize existing dumpsites. It is estimated that approximately 9233 sq. km area was occupied by waste dumps Gupta et al. 2015[4] in fifty-nine cities in India and this is expected to increase in the future.

The stone columns are known for their larger diameters and higher modulus of elasticity when compared to pvd's (prefabricated vertical drains) and sand drains Han and Ye, 2001 [5].

The vibro-replacement technique Hughes and Withers 1974 [6] is commonly used to strengthen the loose granular grounds for low to moderately loaded structures such as warehouses and residential developments. Application of the technique may be extended to improving the resistance to liquefaction of loose fine sands. The method is also used to improve the foundation stability of embankments on soft soils. It is generally regarded that the effectiveness of a stone column as a successful technique of ground improvement is factored on the denseness and shear strength of the site soil.

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RESEARCH ARTICLE

Design and analysis of a microgrid system for reliable rural electrification

Vijay K. Garg, Sudhir Sharma, Dinesh Kumar

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Summary

Microgrid systems based on renewable energy sources can play a significant role in providing cost-effective, environmentally friendly and reliable electrical supply to the people living in rural areas of India. This assessment aims to design and evaluate the performance of a grid-connected microgrid system comprising of photovoltaic (PV) arrays, wind energy generating units and battery energy storage system (BESS). The realistic load data of a small village, Tandwal, located in Ambala district of Haryana, India, is considered for this assessment. Furthermore, sensitivity analysis is performed to find

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Optimum Sizing and Economic Assessment of Hybrid Microgrid for Domestic Load Under Various Scenario

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Abstract: Electricity price, various duties related to electricity bill and environmental concerns are increasing. Due to technological advancement and mass production, the cost of solar modules and energy storage system is going down. The number of consumers is growing by having the Solar Home System (SHS) transform from consumer to prosumer. The present assessment aims to analyze the techno-economic feasibility of residential households in Karnal, India, under three scenarios: a grid-connected net-metering system without feed-in tariff, feed-in-tariff and an off-grid system. It would help the consumer to choose the best configuration as per their geographical location. The study's outcome shows that a grid-connected system will require less investment, and it will be more economical with a feed-in tariff policy. Government support will motivate the peoples towards SHS to reduce carbon emission along with financial and social benefits.

Keywords Hybrid systems, microgrid, HOMER, solar home system, renewable energy sources, techno-economic analysis.

MPA-SA: Hybrid Marine Predators algorithm with Simulated Annealing for optimization problems.

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Abstract: Marine Predators algorithm (MPA) is an anew proposed swarm-based metaheuristic algorithm. The algorithm is chiefly motivated by widespread hunting approaches of marine organisms, namely L´evy movement and Brownian movement, which are founded on arbitrary approaches. In this paper, we combine the marine predator algorithm with Simulated Annealing (SA) algorithm and propose a hybrid algorithm MPA-SA**.** The hybrid MPA-SA is tested on 7 unimodal and 6 multimodal mathematical benchmark functions. The results compared with MPA algorithm confirm the pre-eminence of MPA-SA in resolving optimization problems.

Keywords: Marine Predators algorithm; Simulated Annealing; hybrid metaheuristic algorithm

I. INTRODUCTION

From last few decades, population based heuristic algorithms have gained popularity for solving variety of difficulties by faking numerous natural phenomena. The absolute generally normal and broadly utilized metaheuristic algorithms are: the genetic algorithm (GA) [1] replicates the evolutionary course of biotic populace genetics, transmutation and usual selection. Particle swarm optimization (PSO) [2] fakes the predation behaviour of birds in nature. Differential evolution algorithm (DE) [3, 4] is similar to GA, but the former has superior crossover and selection approaches. Artificial bee colony algorithm (ABC) [5] mimics the honey-collecting behaviour of bees. Simulated Annealing Algorithm (SA) [6] simulates the high temperature annealing liquid crystallization process of metal materials. In recent years,

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Hybrid local phase quantization and grey wolf optimization based SVM for finger vein recognition

Kanika Kapoor, Shalli Rani, Munish Kumar, Vinay Chopra & Gubinder Singh Brar

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Abstract

As a novelist and the most secure biometric method, finger vein recognition has gained substantial significance and various pertinent researches have been reported in literature. However, it is difficult to extract a more reliable and accurate finger vein pattern due to the random noise, poor lighting, illumination variation, image deformation and blur. Furthermore, improper parameter settings of SVMs lead to poor classification accuracy and apparently, not much relevant research has been conducted on its optimal parameter setting. To alleviate these problems, this paper proposes an efficient finger vein recognition framework consisting of the hybrid Local Phase Quantization (LPQ) for robust feature extraction and Grey Wolf Optimization based SVM (GWO-SVM) to compute the best parameter combination of SVM for optimal results of binary classification. Finger vein features are first extracted by integrating LPQ, which is invariant to motion blur and deformation, with Local Directional Pattern (LDP), which is robust to random noise and illumination variation, to augment the recognition performance and reduce the computational time. Then, GWO-SVM is used for classification in order to maximize the classification accuracy by determining the optimal SVM parameters. The extensive experimental results indicate remarkable performance and

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ROLE OF PRICING, ADVERTISEMENT AND SOCIAL MEDIA IN APPAREL RETAIL SECTOR

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ABSTRACT

Apparel sector in India is one of the fastest growing sectors after food and grocery that has captured the global eye. With globalization and privatization, there is stiff competition among the retailers to capture the market. So, each retailer is trying different and diversified marketing strategies to influence the purchase decisions of the customers. Although there are many personal, economic and social factors that are considered by any consumer. But in this paper an attempt is made to study the role of price, advertisement and social media according to the demographic factors of the respondents belonging to Punjab, affecting their purchase decisions in apparel buying. The population of the study is Punjab because it has become the key indicator in the textile and apparel production of India. Punjab contributes to nearly 38% of total exports of Textile sector. Moreover, Ludhiana has become the biggest manufacturer cluster for textiles in North India. It has been observed from the study that people of Punjab are greatly influenced by the effective advertisement and various social media platforms. Also, price is the main decision factor specially for low- and middle-income group.

INTRODUCTION

Globally, it has been witnessed that textile and apparel industry is growing at a very fast phase. In the near future it is expected to become the most vibrant and developed sector. "The global apparel market size is expected to grow at CAGR of 5% to from US $1.7 trillion in 2016 to US $ 2.6 trillion in 2025" (Punjab apparel and Textile Conclave, 2018). Compared to the other countries globally, India will be the fastest growing apparel market with CAGR of 11% by the year 2025, followed by China with CAGR of 10%. The Global Trade market of apparel and textile was US $ 743Bn in 2016 and it is estimated to touch US $ 1000 Bn by 2025. Among the various categories, apparel has a largest share of 58% in the global textile and apparel trade in the year 2016.The other categories were Fabric (19%), Home Textiles (6%),Fibre (6%), Yarn(4%).(Source: UN Comrade and Wazir Analysis) India has also become the second largest exporter of textiles and apparel after China. At domestic level also there is increase in demand for apparels and fashion clothes. This shift in trend and fashion is mainly because of change in household income, priorities and more working women. People are more fashion conscious and wants to look good. Since 2010 up to 2016 there is a constant increase in Indian Apparel Market from US $ 35 Billion (2010) to US $ 63 Billion (2016) with CAGR @10%. And it is expected that there will be steep rise in Indian apparel market to US$ 160 Billion with CAGR of 11% by the year 2025.Indian consumers affinity towards brands and organized retailing, growing desire to buy premium goods is increasing due which there is rise in the growth of the Indian Apparel Market.Moreover, Punjab is known as the key indicator in Textile and Apparel production of India, among various segments. Punjab's contribution in the total export of textile sector of India is 38%, (state-wise). Textile and apparel sector of Punjab accounts for 19% of total industrial production. Ludhiana is the biggest manufacturer cluster for textiles in North India. As a result, Textile Industry of Punjab is growing at a fast rate. There are various reasons that contributed towards the booming textile sector in Punjab. These are skilled and cheap manpower, abundance of raw material, robust infrastructure, easy market access etc. Beside these, there are various prominent parameters that has attracted the population of all age groups towards apparel market. These are effective advertisement, price of the brand and sales promotion strategies etc. So, in this paper, an attempt is made to study the role of pricing, advertisement and sales promotion techniques in influencing the people of Punjab towards a particular brand preference.

OBJECTIVES

1. The role of advertisement in influencing apparel buying behavior with respect to demographic variables
2. The role of social media in influencing apparel buying behavior with respect to demographic variables
3. The role of price in influencing apparel buying behavior with respect to demographic variables

HYPOTHESES

1. H0: There is no significance difference in advertisement as a factor influencing apparel buying behavior with respect to gender
2. H0: There is no significance difference in advertisement as a factor influencing apparel buying behavior with respect to age
3. H0:There is no significance difference in advertisement as a factor influencing apparel buyingbehavior with respect to income
4. H0:There is no significance difference in social media as a factor influencing apparel buying behavior with respect to gender

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EQUITY ANALYSIS OF AUTOMOBILE INDUSTRY IN INDIAN STOCK MARKET

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Abstract: Indian automobile industry is one of the big and considered as quick developing industry within the world. For developing this sector, automakers have started investing in this sector. Performance of selected companies of automobile industry in equity has been analyzed in this paper. Each person continuously needs to urge return on his speculations since speculator makes the speculations from the difficult earned reserve funds. There are different plans of speculation like value, subordinates, bonds and more but among all equity market is one of the most excellent alternative for each speculator because it gives great return but each venture plans have chance included in them, value advertise too have hazard. Since the value showcase includes exceptionally hazard so, it is critical for each speculator to do value examination that makes a difference. In this viewpoint, a ponder is conducted to analyze the equity shares of companies within the vehicle industry. So the ponder on value investigation of this Sector guide offer assistance the potential financial specialists in taking levelheaded choice. The time period taken in this research is from 2015 to 2020. To ponder the vehicle division stocks 10 vehicle companies have been taken into thought. From this investigation, it is concluded that the Bajaj Auto Ltd has moo beta (0.839781) so it is less unsafe to contribute. Tata have tall beta (1.349615) than other companies but gives negative return (-0.001724). Among of all company Bajaj Auto and TVS Engines are best companies to contribute since its beta esteem is less than one and they too have positive return. Maruti can be great choice because it has beta esteem more than one but less than Tata conjointly has positive return.

Keywords: Risk, Return Analysis, Equity

INTRODUCTION

Automobile division is one of the foremost favored divisions by financial specialist as it is considered to be the quickest developing division.

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EFFECT OF Sr^{2+}DOPING ON THE STRUCTURAL, THERMAL, DIELECTRIC AND ELECTRICAL PROPERTIES OF $La_{1-x}Sr_xCo_{0.50}Fe_{0.50}O_3$ {0.1≤ x≤ 0.4}CATHODE FOR SOFCS

Manokamna[1,✉], Surinder Paul[1], A. Singh[2], K. L. Singh[3], G. Bhargava[1] and A. P. Singh[1]

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ABSTRACT

Solid solutions of perovskite $La_{1-x}Sr_xCo_{0.50}Fe_{0.50}O_3$; {0.1≤ x≤ 0.4} ceramic material have been synthesized by solid-state route. Diffraction technique XRD has been used for structural analysis and results confirm single phase as well ascrystalline behavior of the perovskite. The morphology has been investigated by scanning electron microscopy which undoubtedly indicates a decrease of granule size by Sr^{2+}doping. Archimedes principle used to calculate the density which is observed to be decreasing with Sr^{2+} substitution and also isin good agreement with the microstructure. Thermogravimetric analyzer and dilatometer have been used to study the thermal properties which indicate a reduction of Co/Fe near 600^{0}C or above consequently generate the oxygen vacancies in the prepared material and thermal expansion coefficient value decreased with Sr substitution. The impedance, as well as dielectric properties, has been studied at dissimilar temperatures as well as the frequency which affirm the non-Debye relaxation nature of the prepared cathode perovskite. The electrical conductivity value has been investigated to be larger than 100 S/cm, which recommends it to be anappropriate material for the cathode of solid oxide fuel cells.

Keywords: Fuel Cell, Perovskite, Cathode, XRD, TEC, Dielectric Constant

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INTRODUCTION

The exhausts of fossil fuel sources make it a necessity to locate clean and feasible alternative energy sources. Solid oxide fuel cell (SOFC) is a striking optional energy source due to its reasonable inexpensiveness and elevated efficiency.[1-4]Material fabricates SOFCs play a very important role to achieve such high efficiency and therefore, in the procession of such material perovskite proved its role as a significant cathode material of SOFCs.[5]However, few issues limit the usefulness of these materials which include electrochemical performance as its electrical conductivity decreased with temperature reduction and nonequality of thermal expansion coefficient with the electrolyte.[6-7]The introduction of element P can considerably decrease the resistance of polarization toward ORR.[8-9]Magnetic insulators $LaFeO_3$ have antiferromagnetic ordering and with appropriate ion substitution, it is suggested to be the cathode of SOFCs.[10]In lanthanum ferrite ($LaFeO_3$), Fe^{3+} ion has$3d^5$stable electronic configuration and Sr substituted $LaFeO_3$ cathodes show hopeful performance regarding the stability and power density at 750°C.[11-13]Due to excellent oxygen diffusivity, $La_{1-x}Sr_xCoO_{3-\delta}$has a striking electrode activity and shows marked dissociation ability towards O_2 molecules.[14]But due to the large quantity of Coincrease the coefficient of thermal expansion (TEC) and consequence may be crack in the electrolyte ordel aminating the cathode/electrolyte interface.[15] To eliminate these issues we decided to substitute Sr^{2+} at A siteusing varying content to form the charge inequity and consequently increase conductivity. Another approach is to balance the unequal charge by the creation of O_2 vacancies on substitution of Co at B side with fixed concentration. Therefore in the present work $La_{1-x}Sr_xCo_{0.50}Fe_{0.50}O_3$(0.1≤ x≤ 0.4),solid solutions have been prepared by solid-state process and samples are characterized for thermal, structural, dielectric as well as electrical measurements.

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Bioactivity of microwave and conventionally synthesized 70sr–HA.xZn (30-x)si composites

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HIGHLIGHTS

- Composites sintered by microwave and conventional methods.
- Microwave sintered samples have higher density, hardness and bioactivity.
- Silica enhances the grain growth.
- Microwave processed samples showed high pH change in SBF solution.

ARTICLE INFO

Keywords:
Microwave processing
X-ray diffraction
Scanning electron microscopy
Hardness
Bioactivity

ABSTRACT

The composites of different compositions of 70Sr–HA.xZn (30-x)Si were prepared by two different methods: conventional sintering and microwave sintering. XRD characterized the prepared samples for phase identification, FTIR and Raman for functional groups, SEM for microstructure, hardness for mechanical properties. X-ray diffraction studies showed that multiple phases were present in all the samples. The values of density and hardness of apatite composite samples sintered by microwave processing were higher than the apatite composite samples sintered by the conventional method. Microwave sintered products showed more uniform and higher grain growth in comparison to conventionally sintered products. In vitro bioactivity of the synthesized composites was assessed by the SBF immersion method. It was observed that the bioactivity of the microwave processed apatite was better than the conventionally processed apatite.

1. Introduction

The calcium phosphate group constitutes the largest and most significant inorganic part of bones and dentine materials [1]. Synthetic calcium phosphate resembles natural bone materials, chemically and crystallographically. $CaHPO_4.2H_2O$, $Ca_3(PO_4)_2$ and $Ca_{10}(PO_4)_6(OH)_2$, etc., are the different phases of Calcium phosphate [2]. Among these, the main focus is towards HA, $Ca_{10}(PO_4)_6(OH)_2$ as it constitutes 60–65% as a main inorganic part of the natural bone [3]. Due to its chemical resemblance with bone and biofunctional properties such as bioactivity and biocompatibility, HA can be used for bone applications because it can be slowly substituted by natural bone after implantation [4]. The hexagonal structure of HA comprises of complexes of orthophosphates tetrahedra and Ca^{2+} ions [5]. Calcium and phosphate are key components of the mineralized matrix, acting as the calcium reservoir and plays a vital role to maintain calcium homeostasis across the body [6]. The chemical composition of HA is non-stoichiometric as it is calcium deficient with a mole ratio of Ca/P of 1.67. When it was implanted with the bone, it takes sodium, zinc, magnesium, iron, and carbonate from the body fluid due to bone metabolism [7]. In spite of these useful properties of HA, its use is still limited to a non-load bearing area such as powders, coatings, and porous scaffolds due to its poor mechanical properties and in vivo bioactive properties [8]. The possibility of using HA ceramic as a load-bearing implant is entirely dependent upon the availability of properly sintered hydroxyapatite with improved mechanical properties [9].

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Exploring the impact of HgI_2 doping on optical, structural and morphological properties of pure $CH_3NH_3PbI_3$ perovskite

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ARTICLE INFO

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Doping
Crystallinity
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ABSTRACT

In current work, authors used a single-step spin coating method to fabricate $CH_3NH_3PbI_3$, and $CH_3NH_3Pb_{.97}Hg_{.03}I_3$ perovskite thin films. The influence of Hg doping on optical and structural properties has been investigated systematically. XRD, SEM, and UV–Vis spectroscopy have been used to characterize their structural, morphological, and optical properties. Also, Rietveld refinement has been used to investigate the detailed structural parameters. Morphological analysis unveil crystallinity enhancement and change in surface morphology with Hg doping in the pristine $CH_3NH_3PbI_3$ perovskite. The bandgap of HgI_2 doped perovskite was found to be ~ 1.56 eV, which is ideal for photovoltaic applications. A lower value of lattice strains and stacking faults for doped perovskite also make this material composition ideal for perovskite solar cell applications. UV–VIS spectroscopy has shown the enhancement of absorption energy for 3% HgI_2 doping in pristine perovskite. These outcomes open up the entrance of different perceptiveness of transition metals to terminate the lead-free scheming of novel shielding materials with innovative photovoltaic properties.

1. Introduction

Hybrid lead (Pb) halide perovskite materials have emerged as a crucial point in optoelectronic research. Benefitting from wide absorption of light, tunable bandgap, efficient photoluminescence (PL) and higher absorption coefficient (α), they have shown desirable optoelectronic and photovoltaic (PV) properties [1–5] Generally, hybrid perovskite solar cells (PSCs) exhibit outstanding power conversion efficiencies (PCE) exceeding 22% [6,7]. Out of numerous hybrids lead halide perovskite: methylammonium lead iodide ($CH_3NH_3PbI_3$), with a bandgap of about 1.50–1.60 eV has so far been widely used as a light harvester in solar cells. Unfortunately, Pb contained hybrid perovskites are toxic and less stable. To overcome such restrictions, numerous studies were performed and reported [8]. However, new combinations of cesium (Cs) and formamidium (FA) based perovskite material produced high-performance devices along with advanced stability under ambient conditions [9,10]. Besides this, the substitution of some elements in $CH_3NH_3PbI_3$ makes it feasible that controls structural, morphological, optical, and electronic characteristics prominent for the development of PSCs with high stability and performance.

Surprisingly, much less attention has paid to the substitution of Pb by other divalent elements. Another group 14 elements (Sn^{2+} and Ge^{2+}) belongs to a similar group of Pb^{2+} considered and the most promising replacement for Pb [11]. However, Pb free Sn and Ge based perovskite solar cells (PSCs) have shown inferior PV performances as compared to Pb based PSCs along with poor stability [12,13]. Hence, considering the toxicity of Pb, doping of metal ions (Zn^{2+}, Mn^{2+}, Cd^{2+} etc.) into lead halide perovskites is a general and effective approach to reduce toxicity and obtained distinct optical properties [14,15]. It has been observed that structural deformation takes place on doping of divalent material for Pb^{2+} and also affects the optical properties of lead-based perovskites.

Muscarella and his co-workers clearly show that the shape size and orientation of different elements of perovskite has a wide impact on its optoelectronic properties [16]. Although, doping of metal ions makes no alteration to crystal system & basic properties of host material [17]. No doubt, dopant strategy has emerged as one of the influential techniques for altering key characteristics of halide perovskites and this makes them as famous materials even more striking for real application.

Besides this, the film morphology of the perovskite layer has played an important role in the absorption of light. The rate of light absorption

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Structural, Optical and Thermal Properties of PVC/ Polyaniline Composite Thin Films

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Free-standing thin films of polyaniline (PANI) with polyvinyl chloride (PVC) were synthesized and studied for variations in the structural, optical, and thermal properties with changing polyaniline concentration in the composites. Fourier transform infrared spectra show interactions between polymeric entities. XRD shows an increase in peak intensities with polyaniline with an exception at 50% polyaniline content. SEM micrographs verify the morphological changes of the composites. The reduction in chain length of composites with increased concentration of PANI is supported by the shift in absorption edge of UV-VIS spectra towards longer wavelengths. A reduction in direct and indirect band gaps and Urbach's energy with increasing PANI concentration was observed. A monotonic increase in the intensity of photoluminescence with PANI concentration was observed with an exception for 40% polyaniline content. The glass transition temperature (T_g) for PANI/PVC composites showed a slow reduction with increased PANI concentration.

INTRODUCTION

Among the wide range of organic materials developed for a number of optical and electronic applications, a new field of conducting polymers was launched after the discovery of polyacetylene by Heeger, MacDiarmid, and Shirakawa. Conducting polymers (CPs) are similar to metals and semiconductors due to their electrical and optical properties, while retaining the properties of common polymers, such as easy and inexpensive synthesis and flexibility.[1–3] Polyaniline (PANI) is one of the most promising intrinsically conducting polymers (ICPs) as it is not only a conducting polymer but also possesses redox activity, non-linear optical properties and paramagnetism.[4–8] The conductivity of PANI can be controlled depending on its oxidation states and mode of conductivity. Charge propagation in PANI is based on the movement of delocalized electrons through inter-chain conjugated systems and defects, and leads to reorganization of the bonds.[9–13] Nanostructured PANI offers the possibility of enhanced performance for the fast transfer of electrons, and can be utilized for potential applications such as supercapacitors,[14,15] biochemical sensors, bio-medicine and tissue engineering,[16–22] microelectronic devices, rechargeable batteries,[23,24] organic LED display devices, and photovoltaic cells.[25–30] PANI composites are also utilized in catalysis and anti-corrosive coating,[31–36] EMI shielding, electronic packaging, and microwave absorption.[37,38] However, the manageability of PANI has two limitations: the powdered form of the polymer does not dissolve in its doped form in any common organic solvents, and the polymer is degraded at high temperature, which results in poor mechanical strength.[9–11] An effective way to improve the mechanical stability of ICPs is to form their composites with nanoparticles or blend them with other polymers that have better mechanical properties for their intended applications than their pristine analogs.[11,39] Conducting polymer

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Role of Ba^{2+} substitution on structural, thermal, dielectric and electrical properties of $La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$ {$0.10 \leq x \leq 0.40$} cathode for SOFCs

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ABSTRACT

$La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$ {x = 0.10,0.20,0.30 and 0.40} perovskite fabricated by use of solid-state method and the prepared ceramic has been characterized to find the influence of Ba^{2+} on its thermal, structural, dielectric and electrical behavior. Result of X-ray diffraction noticeably shows single phase crystalline behavior and hexagonal crystal structure. Density calculation confirmed that Ba^{2+} addition decreased its value. TGA confirm weight gain above 300 °C temperature in the material. Thermal expansion coefficient have been measured for x = 0.10 and 0.40 sample and its value is 10.3×10^{-6} °C^{-1} and 9.2×10^{-6} °C^{-1} respectively up to 800 °C temperature. Electric and dielectric behavior confirmed non-Debye relaxation behavior of the material. The highest conductivity is found to be 126.44 Scm^{-1} and 143.38 Scm^{-1} for x = 0.10 at 600 °C and 291.86 Scm^{-1} and 349.25 Scm^{-1} at 800 °C temperature for x = 0.40 which confirm that with Ba^{2+} doping conductivity increases. Activation energy falls with Ba^{2+} content. Results verified that the present fabricated perovskites are suitable to be used as cathode for intermediate temperature SOFCs.

Second International Conference on Aspects of Materials Science and Engineering (ICAMSE 2021).

1. Introduction

Increasing demand of energy and reduction of conventional energy sources directed the present research to develop non conventional energy sources. Substitute source of energy is solid oxide fuel cell (SOFCs) which is portable, clean and renewable [1,2]. Solid oxide fuel cells produce hydrogen and also reasonably inexpensive, highly efficient and low sensitive to impurities [3–7]. Its efficiency is about 60% and on heat recovery enhance to 80% [8]. Efficiency of the cell is much affected by electrode or electrolyte material used in SOFCs [9–11]. Electronic conductivity more than 100 Scm^{-1}, matched value of thermal expansion coefficient with other component (especially electrolyte), good chemical compatibility among the components, higher catalytic activities, adequate porosity and low cost are main requirement of the SOFCs [4]. Perovskite materials like $LaFeO_3$, $LaMnO_3$ and $LaCoO_3$ with suitable ion doping are well studied cathode of SOFCs [12]. Size of Sr atom is comparable to La atom, therefore Sr addition in $LaMnO_3$ raise the extent of charge carrier (electrons and holes) in $La_{1-x}Sr_xMnO_{3\pm\delta}$ (x is less than 0.80) (LSM) and improve the electronic conductivity [13]. On decreasing the working temperatures, higher polarization resistance and activation energy (Ea) is shown by LSM and affect the performance of SOFCs [14]. Charge imbalance is created by substitution of alkaline earth metal at La site in $LaFeO_3$ compensated moreover by creation of Fe^{4+} ion or O_2 vacancy and thus raise the conductivity [15–17]. Therefore in this research work, Ba^{2+} is doped at La site of $LaMnFeO_3$ to synthesized new ceramic material $La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$; {x = 0.10, 0.20, 0.30, 0.40} for cathode of intermediate temperature SOFCs and the as prepared ceramic samples has been characterized for study the thermal, structural, dielectric and electrical behaviour.Table 1 Table 2.

2. Experimental

$La_{1-x}Ba_xMn_{0.50}Fe_{0.50}O_3$; {x = 0.10, 0.20, 0.30, 0.40} perovskite (LBMF) synthesized via solid state reaction process. 99.9% pure $BaCO_3$, MnO, Fe_2O_3 and La_2O_3 from sigma Aldrich has been used as raw material. Powders of raw materials in stoichiometric ratio are taken in a bottle containing zirconia oxide balls and acetone

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Harmonic generation by an interaction of laser with an array of anharmonic carbon nanotubes

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Keywords:
Harmonic generation
CNTs
Anharmonicity
Silica

ABSTRACT

A scheme of second and third harmonic generation from laser irradiated anharmonic carbon nanotubes (CNTs) embedded in silica is proposed. An intense ultra short laser pulse interacting with the array of CNTs displaces its electrons. When this displacement becomes comparable to the radius of electrons of CNTs, the restoring force of electrons varies nonlinearly with the displacement. As a result, plasmon resonance gets broadened and the large resonance absorption of the laser by the electrons of CNTs occurs. The power conversion efficiency of harmonic generation due to the anharmonicity of CNTs is much higher than that due to the ponderomotive force nonlinearity. The effect of amplitude modulated parameter on the amplitude of second and third harmonic is studied. The high amplitude of generated harmonics can be realized with the amplitude modulated laser as compared to ordinary unmodulated laser.

1. Introduction

In laser-plasma interaction, harmonic generation is an important nonlinear process and has attained great attention from both fundamental and applicative points of view. It has applications in frequency up-conversion, signal processing and a valuable diagnosis in short-pulse laser plasma experiments. Different approaches have been used by various researchers to generate the second and third order harmonics of high power and high amplitude of the fundamental laser beam in plasma.

Second harmonic generation in planar optical waveguides was studied by Bratz et al. [1]. They developed a general formalism for the calculation of mode generation by a planar antenna embedded in the waveguide. Harmonic generation in a self-sustained plasma channel has been the major issue to understand among various nonlinear phenomena [2]. Rax et al. [3] studied the phenomenon of third harmonic generation in density modulated plasma via interaction of an intense plane polarized laser pulse.

Carbon nanotubes (CNTs) and carbon nanofibers (CNFs) have recently achieved significant scientific attention owing to their extraordinary and useful properties, such as compact size, exceptional combination of transverse and longitudinal dimensions, exceptional tensile strength, elastic modulus and electrical and thermal conductivity [4, 5]. The study of carbon nanotubes (CNTs) is now an active area of research in the field of nanoelectronics, which could lead to the development of advanced tech nology devices. Due to this, nowadays various researchers have focused their research on harmonic generation via interaction of laser with CNTs [6-14]. Akimov et al. [6] experimentally studied the generation of the second and third harmonics by femtosecond pulses of a Cr: forsterite laser in a layer of single-walled carbon nanotubes produced by low-velocity spraying. Third harmonic generation of the

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THE EUROPEAN PHYSICAL JOURNAL PLUS

Regular Article

Resonant terahertz generation from laser filaments in the presence of static electric field in a magnetized collisional plasma

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Abstract A new scheme of terahertz (THz) generation from laser filaments in plasma in the presence of static electric and magnetic fields is proposed. Two femtosecond laser pulses of different frequencies (ω_1, ω_2) and wave numbers (k_1, k_2) are co-propagating under the action of filamentation in a magnetized collisional plasma. THz wave is generated due to the nonlinear coupling between nonlinear velocity and electron density in magnetized collisional plasma. For suitable laser and plasma parameters, the nonlinear coupling results in enhanced nonlinear current density which leads to resonant THz waves. The external D.C. electric and magnetic fields are applied perpendicular to each other and mutually perpendicular to the direction of co-propagating lasers. We have obtained the expression of a dielectric tensor with anisotropic nature, and it is found very useful in the study of THz generation. The applied magnetic field also aids to enhance the transverse components of nonlinear current. This nonlinear current is responsible to generate enhanced terahertz waves at frequency ($\omega_1 - \omega_2$). We have found that the normalized THz amplitude increases significantly with the increase in applied D.C. electric field from 10 to 30 kV/cm and magnetic field from 10 to 50kG. Our scheme with numerical analysis may open the door for efficient and cost-effective way to generate THz radiation.

1 Introduction

In modern days, compact and efficient THz sources have great importance in the field of science and technology because of their numerous applications in industrial manufacturing and packaging units [1], security and safety [2], broad band communication [3], biological and pharmaceutical sciences [4–6], remote sensing [7]. Due to this, various researchers have studied the schemes of THz wave generation by using different mechanisms to enhance the normalized THz amplitude like optical rectification [8], cross-focusing [9], optical mixing [10] and filamentation [11–13], etc. Among them, the mechanism of THz generation by laser filamentation produces THz pulses of very high order energy. Femtosecond laser filamentation is a distinctive, dynamical and unique phenomenon in which laser beam breaks up

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Resonant Terahertz Generation by the Interaction of Laser Beams with Magnetized Anharmonic Carbon Nanotube Array

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Abstract

In this novel scheme, a theoretical analysis of resonant terahertz (THz) generation in the array of magnetized anharmonic carbon nanotubes (CNTs) is presented. Two laser beams with frequencies (ω_1, ω_2) and wavenumbers (k_1, k_2) propagate through the array of vertically aligned anharmonic CNTs in the presence of an applied static magnetic field. It provides different displacements to the various electrons of CNTs. Due to this, restoration force varies nonlinearly with the displacements of electrons and hence results in anharmonicity. This anharmonicity plays a significant role in the enhancement of absorption of laser beams by the electrons of CNTs. The nonlinear restoration force produces the current which is responsible for the THz generation. It is observed that the applied magnetic field (170 to 235 kG) helps in the enhancement of the THz generation by increasing the nonlinearity of the system. The impact of dimensions, inter-tube separation, and density of CNTs on the THz amplitude has also been analyzed.

Keywords Carbon nanotube · Nonlinear restoration force · Anharmonicity · Inter-tube separation · Magnetic field

Introduction

In this modern world, THz technology has attained great importance due to compact and highly efficient THz sources for various applications in many fields like security protection [1], medical sciences [2–4], and broadband communication [5]. The various researchers have proposed several schemes for THz wave generation to provide compact, efficient, and reliable THz sources. For this purpose, they have used different mechanisms to enhance the amplitude of THz radiation. Some of these are by beating of two chirped-pulse laser beams in spatially periodic density plasma [6], the interaction of laser filaments in the presence of a static electric field in a magnetized collision plasma [7], laser coupling to an anharmonic CNT array [8], nonlinear mixing of laser beams [9], and by applying a magnetic field on an array of CNTs [10–12]. The CNTs are considered very reliable and effective sources for THz generation, due to their compact size, large current density, high electrical conductivity, and excellent combination of transverse-longitudinal dimensions. The CNTs are considered a more favorable medium for the efficient generation of terahertz radiation [13]. Moreover, CNTs are also helpful in the strong absorption of the laser beam [14] due to which generated THz amplitude is enhanced. Titova et al. [15] have proposed the generation of THz radiation by using single-walled CNTs, excited by femtosecond laser beams. Batrakov et al. [16] and Portnoi et al. [17] have explained and reviewed THz generation processes in CNTs to increase the efficiency of THz generation. Wang and Wu [18] studied the properties of THz radiation experimentally, emitted by CNT antenna. Dragoman and Dragoman [19] have studied the characteristics of metallics, single-walled CNTs as a THz antenna. Dagher et al. [20] have studied the amplification of THz radiation in metallic CNTs under the influence of the D.C. magnetic field and observed enhancement in the normalized amplitude of THz radiation.

In the present paper, we propose a new scheme for THz generation by irradiating two co-propagating laser beams of nearly equal frequencies on vertically aligned hollow anharmonic CNTs in the presence of an external static magnetic field. In this, we are using an array of CNTs to ease the propagation of THz radiation. A single-walled

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Stability analysis and optimal impulsive harvesting for a delayed stage-structured self dependent two compartment commercial fishery model

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Abstract
Due to overexploitation of renewable resources, we have observed that some species are already extinct. So, the time demands conservation, reproduction and optimal utilization of these resources and the study of such problems. In this paper, a delayed stage-structured self-dependent two compartment (compartment-I contains immature fishes and compartment-II contains mature fishes) commercial fishery model with impulsive harvesting is proposed and analyzed mathematically as well as numerically. The aim is to manage the fishery resource system and that to extract maximum profit without the species become extinct. The proposed system is proved to have positive periodic solutions which are bounded, locally stable and permanent with certain conditions. Then by using optimal impulsive harvesting theory, the optimal harvesting time and optimal harvesting level have been obtained. At last, numerical simulation has been done to support the analytic results, along with comparative plots drawn for different values of harvesting effort E, maturation delay τ and impulsive period T.

Keywords Optimal harvesting policy · Impulsive effect · Stage structure · Delay · Stability analysis

1 Introduction

As the need for food and energy is increasing rapidly, the natural biological resources are getting exploited at an alarming rate. So, the time demands an effective and scientific management of biological resources so that the problems related to the renewable resources, fishery resources in particular, are addressed effectively. One of the possible solutions in case of fishery resources is fish farming, i.e. to create and develop fishes in controlled reservoirs or compartments for commercial purposes. Generally, there are two or three ponds/compartments out of which one compartment is used for breeding and fertilization of fishes and the second compartment is used for development of fishes up to adult age and ultimately for the harvesting of fishes.

During the last two decades, a number of Ecologists/Mathematicians have studied the impact of harvesting of one or more species on the complex dynamics of natural fishery resource model. The main objective of their study has been to find the conditions to extract maximum profit without the species being led to extinction. It was also observed that in order to prevent the species from extinction, various agencies/institutions impose certain regulations like fishing quota, taxation, supply of alternate food to predators, restriction on effort, creation of reserve area, lock-in period, switching of harvesting policies etc., and researchers/mathematicians have explored these factors through their models and analysis. Dubey et. al. [1] have suggested and analyzed a fishery

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ORIGINAL RESEARCH ARTICLE

Electrical Conductivity and Dielectric Properties of Zirconia-Based SOFC Electrolytes Processed by Microwave and Conventional Sintering

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Abstract

The study of a.c. conductivity and dielectric properties of materials is important in obtaining new materials with predetermined properties for their various applications in fuel cell technology. In this work, the precursors of zirconia-based ceramic oxides with compositions $Zr_{0.90}Y_{0.06}Ce_{0.02}X_{0.02}O_{2-\delta}$ (X= Ca, Fe, La, Sr, and Mg) were prepared by the mixed oxide method. All the precursors were ball milled for 6 h in an acetone medium. The calcination of these powdered samples was done at 600°C in an electric furnace and calcined powders were then pelletized. Sintering of the sample pellets was done in a microwave furnace at 1400°C for 20 min and in a conventional furnace for 6 h at the same temperature. The structural properties, a.c. conductivity and the dielectric properties of these samples were studied in a frequency range from 20 Hz to 2 MHz. The a.c. conductivity of all the samples was found to increase with an increase in frequency. The variation of dielectric response factors such as dielectric constant and loss tangent with frequency has also been explored in this work. Among all the prepared samples, the microwave sintered $Zr_{0.90}Y_{0.06}Ce_{0.02}Ca_{0.02}O_{2-\delta}$ sample shows maximum electric conductivity at 800 K.

Keywords Microwave processing · solid electrolyte · a.c. conductivity · dielectric loss

Introduction

Excellent electrical, optical, and magnetic behaviors of ceramics are very crucial for their applications in communications, electronics, and energy storage. The fundamental characteristics such as dielectric constant (ε_r) and the dielectric loss factor (tanδ) of ceramics decide their applicability in these different areas. To understand the required properties of dielectric materials, it is necessary to study the physical phenomena occuring in these materials when they are placed in an electromagnetic field. The dielectric measurements explore the motion of local charge carriers, which are responsible for high ionic conduction in a material as well as the dissipation of the electric energy inside it when placed in an alternating field.

Since the defect associates usually contain one or more oxygen vacancies, the dielectric constant value and oxide ion conductivity are primarily controlled by the association energy of the oxygen vacancies. This is because oxygen vacancies connected with the defect associates need to be dissociated from the defect associate pairs for the conduction process. Large defect pairs are formed at higher doping concentrations in singly doped materials. However, small defect pairs are formed in co-doped materials as the co-doping effect hinders the growth of defect clusters.[1] Therefore, the dielectric constant and dissipation factor are the crucial quantities in the design of SOFC electrolytes and the dielectric relaxation studies have their significance to explain the dynamic properties of oxygen vacancies after the dissociation from the dopant-vacancy associates. The study of dielectric constant and dielectric loss as a function of temperature and frequencies is one of the most convenient and sensitive methods of studying the material structure.[2]

In addition to these properties, the a.c. conductivity or frequency-dependent conductivity is another important factor that describes the electrical conductivity of material when placed in an alternating current (a.c.) field.[3-6] For all the solid materials in general, the a.c. conductivity of a solid obeys the Jonsche's power rule given as:

$$\sigma_{ac}(\omega) = \sigma_{dc} + A\omega^n \; for \; 0 < n < 1 \tag{1}$$

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Dynamics of a power hacksaw mechanism, contact interaction with the workpiece, and material removal

Aman Kumar Maini, Anand Vaz & Geneviève Dauphin-Tanguy

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ABSTRACT

During the metal cutting process, dynamics of a mechanism influence the cutting phenomenon at the contact interface while the contact interaction also has its reciprocal effect on the mechanism. Modeling the dynamics and the contact interaction between the cutting tool and workpiece, causing material removal, is a complex and challenging task. The mechanism of a machine involves a number of interconnected rigid bodies that interact with each other dynamically. Modeling dynamics of such mechanisms is necessary from the point of view of design and analysis. In this paper, the multibond graph approach has been used fxor modeling the dynamics of a power hacksaw machine. The power hacksaw machine is quite commonly used for cutting materials in industries. This graphical approach offers scope for analysis of causality, which is an important aspect of physical systems, and its application, a feature not offered by the energy-based formulations, such as the Euler-Lagrange's method and Hamilton's method. These energy-based formulations, commonly used for modeling dynamics of physical systems, also tend to be too mathematically inclined. MATLAB coding for simulation has been done directly from the multibond graph model without explicitly deriving system equations. The simulation results have been presented, analyzed, and discussed.

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EVALUATION OF IMPROVED FUZZY INFERENCE SYSTEM TO PRESERVE IMAGE EDGE FOR IMAGE ANALYSIS

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Abstract

There are numerous applications based on edge detection have been used in the area of image analysis. The technique of edge detection is an important step towards the visual system reliability and security that delivers a better understanding in many applications like object recognition classification, photography, and many more others computer vision application such as pedestrian detection for a vehicle on the road, face detection in biometric, and video surveillance. We know that detection of edge detection is a scientific technique that is practiced to provide better image analysis and towards this purpose, lots of edge identification approach was already implemented by the researchers in the image processing era, but they do not achieve acceptable results for all types of the image that can help in the image analysis. In this research, we introduced a comparative evaluation of edge detection algorithms for instance Sobel, Canny, and Fuzzy logic-based edge detector with an Improved Fuzzy Inference (IFI) system is presented to preserve image edge for image analysis. The key contribution of this research is developing a new hybrid edge mechanism by utilizing the gradient and standard deviation based fuzzy logic approach to achieve better edge detection efficiency. To provide a better edge or non-edge region from an image the proposed IFI has its impact on quality parameters, for instance, Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), Entropy and Structural Similarity (SSIM) with the execution time. At last, the performance parameters of the proposed IFI system is compared with other edge technique and we observed that the achieved results justify the proposed work in image processing.

Keywords:

Edge Detection, Fuzzy Logic, Fuzzy Inference, Gradient, Standard Deviation

1. INTRODUCTION

We know that an image is a collection of pixels in terms of two dimensional array that depicts the visual perception artifacts. One of the most important artifacts of an image is its edges and the edges of the image are directly connected or related with the shape of objects and their variations in the distribution of pixel intensities [1]. For the analysis of an image briefly, the edges are carrying significant substantiation about available objects in an image [2]. So, for better image analysis edge detection technique persistently considered as an elementary and initiative operation to achieved better performance of the various computer vision applications in day to day human life. There are two basic image edge detection approaches are available such as [3]:

- Thresholding-based edge detection approach
- Pixels fitting-based edge detection approach

The first method of edge detection is developed by utilizing the concept of the ideal edge pixels of an image and based on the threshold value, edge pixels and non-edge pixels are separated. After that the concept of pixels fitting-based edge detection approach is developed by the researcher but, the thresholding-based edge detection approach is still superior and the most useful approaches and the involved steps in these techniques are demonstrated in Fig.1.

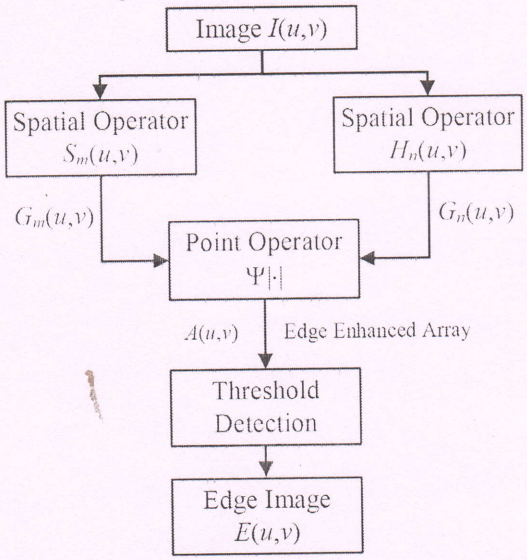

Fig.1. Thresholding-based Edge Detection System

In 1998, the first fuzzy logic-based edge detection was developed by the F. Russo [4] for the successful finding of edges from an image without being misled by the noises using the concept of reasoning rule sets. Thereafter lots of research and improvement were made by the time by utilizing the concept of threshold-based as well as pixel fitting-based method for the elimination of noise and edge detection from the image. At this time, lots of researchers have committed their efforts to design an effective edge detection technique for better analysis of an image [5]. The edge of an image and object available in the image depending on the angle of image viewers and the results may vary from angle to angle for an image. So, researchers used the concept of the rule-based fuzzy logic algorithm to solve this problem, where a lot of rule is designed to detect the edge of an image according to many factors like viewer angle, pixel intensity, object shapes, etc. There are lots of traditional edge detection methods (Sobel, Canny, Prewitt, etc.) are available but they are limited for images or image with noise [6]. Edge is the unexpected variations of gaps in an image and the detection of the edge is a challenging task for research without losing the exact information or object's shape [7]. Generally, edges may be of three types in an image:

- *Horizontal Edges*: It is produced by using the value of gradient in the image based on the vertical analysis, and can be enhanced with a vertical gradient detector.

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Research Article

Image Demosaicing: A Roadmap to Peculiarity Imaging

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Abstract: Image demosaicing is the process of reconstruction of full color image on the basis of various methods from the data samples obtained by acquisition devices. This paper deals with the various techniques that can be utilized to achieve demosaiced image by suitably classifying it into various categories. Moreover, it also provides an insight into the evaluation metrics used for confirming the performance of demosaicing techniques. Besides, the potential areas are also investigated for realistic applications where image demosaicing is found to be highly beneficial for healthcare and forensics.

Keywords: Image demosaicing, Bayer pattern, Learning-based algorithms, Medical imaging, Image forgery, Healthcare

1. Introduction

Owing to the rapid advancements in technology as well as the easy availability of digital cameras and mobile phones, the usage of images and videos has increased manifolds in the various regimes such as education, healthcare, surveillance, etc., [1-5].Despite the technological advancements, there is still need to improve the quality of an image. Image quality is dependent on various factors ranging from features of cameras such as its resolution, sensitivity to light, sensor's dynamic range, etc. to the conditions that occur while capturing the images such as adjustment of white balance, focus adjustment, color interpolation, color correction, compression, etc. However, Color Filter Array (CFA) interpolation is an indispensable part of image pipeline which is used to recover full resolution image from its CFA data [6-8]. The requirement of CFA in color images is that there must be a minimum of three color samples at pixel location. One way is to use beam-splitters along the optical path, so as to project the image on all three sensors individually. Afterwards, color filter is placed before each sensor in order to obtain three color component images. It is challenging approach not only in terms of cost but also in alignment. Since, it needs three Charge Coupled Devices (CCD) sensors which need precise alignment that may otherwise lead to a phase delay. Another way is that the color sensors can be stacked on top of one another as in Foveon cameras [9] but it escalates the exposure time as the light requires penetrating the three Silicon levels. Hence, the most cost effective method is to use CFA before the sensor to acquire one color component at a pixel and then, restoring other two color components [10-11]. This process of reconstruction of a full color image from the single color component is commonly referred to as demosaicing. Although there are various CFA patterns but widely used Bayer pattern among them [8] is that where the green component is sampled by quincunx grid while red and blue components are attained using the rectangular grid. The density of the green components is two times the red and blue color components as the human eye is more sensitive to it. Several other CFA arrangements can also be used such as utilizing the subtractive primary colors cyan, magenta, and yellow (CMY), Emerald filter, cyan, magenta, yellow, and green (CMYG), panchromatic pixels, linear combination of red, green, and blue for decreasing aliasing introduced by the sampling, quantitative theory for optimal pattern that reduces the reconstruction error, etc. [12-15].The presented work is generally focused on the reconstruction of images that can be obtained using CFA arrangement.

Image demosaicing is basically the reconstruction of the color image by utilizing the interpolation techniques that are especially devised to reconstruct the images sampled using a CFA otherwise it may lead to the artifacts such as false colors and zippering effect in some portions of an image, thereby reducing the image visual quality [12]. Moreover, most of these algorithms are complex, time-consuming and have high computational cost. It is worth noting that there is tradeoff between accuracy and computational cost for various image demosaicing algorithms. Thus, it is required that the demosaicing algorithms must be less prone to the artifacts, low computational cost as well as able to preserve the image resolution.

This paper is structured in the following manner: Section 2 provides a detailed analysis of the demosaicing algorithms. Section 3 provides various assessment parameters for the demosaicing algorithms. Section 4 provides the applications associated with it. Finally, the conclusion is presented in Section 5.

2. Image Demosaicing Methods

The plethora of image demosaicing approaches are available but they are broadly classified into six categories as depicted in Figure 1.

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Contention resolution in dense WDM-PON networks by incorporating fiber temporal delay approach

Shippu Sachdeva[1,2] · **Jagjit Malhotra**[3] · **Manoj Kumar**[3]

Received: 29 April 2021 / Accepted: 18 August 2021

Abstract
With the propelling high capacity demands, passive optical networks (PONs) are getting extra consideration nowadays. Problem: Burst blocking in wavelength division multiplexed (WDM) PON system increase with the contention period > burst time. Motivation: In the absence of optical random memory in optical communication networks, contention resolution using temporal delays is prominent work and can be accomplished using Fiber temporal delay paths. Burst blocking becomes high in the network at larger contention period such as time between two bursts is larger. Methods: Therefore, in this work, a 40 Gbps × 10 WDM channels based PON system with 50 GHz channel spacing over 20 km is investigated by incorporating switches, switch controller, buffers and Fiber temporal delay paths to decrease the bursts blocking in the system. In order to assign delay to bursts, an algorithm is proposed and calculated amount of delay are assigned to demanding wavelengths for bursts which inturn decrease the blocking. Analysis: Proposed WDM-PON system is simulated in the simulation tool and investigated for different FTD delays, burst loss probability, burst arrival rate, buffering delay and performance is also analyzed in terms of log BER. Results: Bursts blocking probability increases with the increase in burst arrival rate, lesser buffering delays, and more no. of input ports. Further investigation reveals that higher extinction ratios can provide better log BER.

Keywords WDM-PON · FTD · Burst contention · Buffer architecture · Log BER

1 Introduction

Data traffic in cloud computing and big data application is exponentially increasing due to ever increasing demands of internet access among the majority of people all over the world, Wavelength division multiplexing (WDM) based passive optical networks achieves (PONs) their maximum capacity rapidly (Kaur et al. 2019a). E-governance, video on

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https://doi.org/10.1007/s11082-021-02944-6

Energy efficient hybrid WDM-TDM passive optical networks with access-load difference between ONUs using FBGs, SOA and DWS

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Received: 6 February 2021 / Accepted: 20 April 2021 / Published online: 12 June 2021

Abstract

The rapid increase in internet services demands high capacity and brings high energy dissipation. For broadband access networks, energy efficient passive optical networks (PONs) are ubiquitously demonstrated to conserve energy. However, high cost components for monitoring, complexity, delays and synchronization issues in active/passive optical network unit (ONU) status are the utmost issues to be addressed. Energy efficient symmetrical Wavelength division multiplexed (WDM) and Time division multiplexed (TDM) hybrid passive optical network using Access-Load Difference between ONUs (ALD) approaches with dynamic wavelength switches has been proposed. Dual capacity providing system is presented where 2 Gbps and 12 Gbps sources are operated according to traffic at ONUs. Total capacity of individual low data rate transmitter are 8 Gbps (2 Gbps × 4) and 48 Gbps (12 Gbps × 4) for each ODN serving 64 ONU. Proposed approach is competent to only use specific transmitter module based on load at ONU and keep rest of the transmitters inactive. Design of ALD DWS is such that there is no service interruption even when any transmitter stops working. Moreover, nonlinear carrier generation eliminate the requirements of lasers for upstream transmission which saves cost as well as energy. It is observed that proposed system save 400% energy below 10 Gbps, 300% between 10–20 Gbps, 200% between 20–30 Gbps, 100% between 30–40 Gbps and 0% for beyond 50 Gbps. Therefore variable transmitters (Bandwidth) are operational in this architecture and provide economical in initial operational expenditure (OPEX).

Keywords WDM-TDM-PON · Dynamic wavelength selection (DWS) · Access load difference (ALD) · ICT · SOA

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Improved tweet Sentiment Classification Using Convolution Neural Network and Random Forest

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ABSTRACT

With over 319 million monthly active users, Twitter has developed into a goldmine for organizations and people with a strong political, social, or economic incentive to retain or enhance their clout and reputation. Sentiment analysis enables these firms to conduct real-time surveys on numerous social media platforms. Twitter sentiment analysis technology enables the measurement of public attitude toward certain events or products. The majority of current research is devoted to extracting sentiment traits through the analysis of lexical and syntactic variables. These characteristics are openly stated using emotional words, emoticons, and exclamation points, among others. In this research, effective feature extraction is accomplished via the use of convolution mapping and an attention layer. These features are then learned by random forest.

Keywords— *Convolution Neural Network, Twitter*

1. INTRODUCTION

Sentiment analysis is a process which deals to identifying the feelings, emotions, attitude of a person towards some product, entity, or any political and personal issue. Sentiment analysis is a method to extract the hidden information from the web data. This hidden information gives a lot of information related to user's view and opinion. Sentiment analysis performed on the basis of subjective and objective nature of text. The subjective data defines the sentiment part of the text and rest part that is objective part does not contain sentiment information in it. The most important part of the sentiment analysis is extracting the features from the text and classify the data according to these features. Here is an example of subjective and objective data.
Subjective: The flavor of appy fizz is best and it is like original apple.

1.1 Objective: I taste this last Sunday

On the basis of this text is also divided into three categories positive, negative, neutral which express its view or opinion. The rapid generation of web it leads to a huge amount of data generated by the user. There are different kinds of users which interact to each other on web and generate the content in various forms like:

- **Weblogs:** Weblogs are basically a collection of blogs and their list mainly in the form of hyperlinks which are used to recommend the other website of blog.
- **News:** These are the daily events and activities happened around the world. The news also contains the new research and discovery all over the world.
- **Reviews:** These are the feedback from the users of product or services from the web. The reviews are mostly used in the e-commerce and entertainment industry to give the feedback and feeling related to the services of the e-commerce company.
- **Social Networking Sites:** the biggest boom in the technology is social media platforms like Facebook, Twitter, and Google +, etc. on these platforms users text each other's, share their day to day events and also mention about their special days.

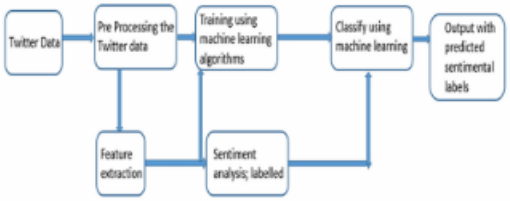

Figure 1: Basic method of sentiment analysis

In the era of internet and technology the e-commerce growing with very high rate because it provides an effective platform to the customers and manufacturers to interact with each other. The reviews of the product plays and important role in its overall sale and it depend on its quality. The review helps to the new consumers in deciding whether the product is good or not. It also helps the manufacturer to know about the status of the product in the market after its sale. This thing helps to improve the product sale by quantitatively as well as qualitatively. Tweet analysis according to its sentiment is a challenging process

Original Paper | Published: 20 November 2020

Loose Ash Fills Reinforced With the High Confined Encased Stone Columns: Experimental and Numerical Investigation

Sudheer Kumar Jala, Saurabh Rawat & Ashok Kumar Gupta

Geotechnical and Geological Engineering **39**, 2503–2520 (2021) | Cite this article

Abstract

The use of industrial waste (ash) in large-scale earthworks for civil engineering applications such as construction of highway embankments, the rise of ash dykes, the filling low-lying areas, fillings of buildings, solves the problem of waste disposal besides in addition to the conservation of the natural soils. It is has a low density, low consolidation, lower potential for bearing and higher settlement. To use these areas for construction purposes, it is necessary to reinforce them at deeper depths. The present study uses highly confined stone columns to investigate the strengthening of ash fills. A total of six cases are investigated, including slope reinforced with an encased stone column. Model tests were conducted with pond ash at 40% relative density with a circular footing on untreated and treated ash fills. The enhanced cases include ordinary stone columns,vertically encased columns with geotextile, vertically encased columns with geogrid, highly confined vertically encased columns with both geotextile and geogrids (HC-1) and highly encased columns with both vertical encased geotextile and horizontal geogrid (HC-2) layers. The parametric study includes an examination of load-settlement behavior, load-carrying ratio, settlement reduction ratio, and stiffness factor, modulus of subgrade reaction and post-failure behavior of slopes reinforced with encased stone columns. In all cases, the high confined encased system yields better results. In each case, the stone column failure pattern of was observed at a distance range of 1–3 times the stone column diameter. Post-failure behavior indicates that for steep slopes where massive slip failures are expected, highly confined encased stone columns can be useful. Results are validated by the numerical modelling analysis of Plaxis.

Published: 02 February 2021

Hybrid local phase quantization and grey wolf optimization based SVM for finger vein recognition

Kanika Kapoor, Shalli Rani ✉, Munish Kumar, Vinay Chopra & Gubinder Singh Brar

Multimedia Tools and Applications **80**, 15233–15271 (2021) | Cite this article

Abstract

As a novelist and the most secure biometric method, finger vein recognition has gained substantial significance and various pertinent researches have been reported in literature. However, it is difficult to extract a more reliable and accurate finger vein pattern due to the random noise, poor lighting, illumination variation, image deformation and blur. Furthermore, improper parameter settings of SVMs lead to poor classification accuracy and apparently, not much relevant research has been conducted on its optimal parameter setting. To alleviate these problems, this paper proposes an efficient finger vein recognition framework consisting of the hybrid Local Phase Quantization (LPQ) for robust feature extraction and Grey Wolf Optimization based SVM (GWO-SVM) to compute the best parameter combination of SVM for optimal results of binary classification. Finger vein features are first extracted by integrating LPQ, which is invariant to motion blur and deformation, with Local Directional Pattern (LDP), which is robust to random noise and illumination variation, to augment the recognition performance and reduce the computational time. Then, GWO-SVM is used for classification in order to maximize the classification accuracy by determining the optimal SVM parameters. The extensive experimental results indicate remarkable performance and significant enhancements in terms of recognition accuracy by the proposed framework compared to the existing techniques and prove the effectiveness of the proposed framework on four tested finger vein datasets. It has outperformed the typical SVM approach and kNCN-SRC two-stage methodology via achieving the recognition accuracy of 98% and equal error rate as low as 0.1020%.

INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

RESEARCH ARTICLE

Hybrid Watermarking Scheme with Dual Encryption and Channel Coding in YCbCr Color Space

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Abstract

Objectives: This study aims to Improve and Secure the watermarking scheme with dual encryption (chaotic maps and Arnold transform) and channel coding in YCbCr color space with embedding and extraction procedure. **Methods:** In this scheme, the cover watermarked image is encoded and the singular value is decomposed by singular value decomposition (SVD). The four levels of Discrete Wavelet Transform (DWT) are applied after that, the singular value matrixes are embedded into the Y, Cb, Cr components of the host image. The embedding factor for each component is calculated with singular vectors of the hl sub-band of DWT with bit selection automatically by Gray level co-occurrence matrix (GLCM). In this paper, the GLCM technique is used to enhance the performance of a watermarked image affected by degradation with the DWT method. An inefficient approach is chosen randomly for image embedding which is bit selection. There is degradation in the quality of the watermark image when randomly selecting the bits. To dynamically choose the embedding bit, this research applies the Grey Level Co-occurrence Matrix method. **Findings**: Different performance parameters like Mean Squared Error (MSE), Peak Signal to Noise ratio (PSNR), Bit Error Rate (BER), Normalized correlation coefficient (NCC), and Mean Structural Similarity Index Measure (MSSIM) has been used to compare the effectiveness of the proposed scheme. The achieved outcomes show that when applying dual encryption and FFT (Fast Fourier Transform) with the GLCM, around 10 to 15 percent improvement in the results can be obtained. **Novelty**: We have proposed a hybrid watermarking scheme with Chaotic maps, Arnold transform and Fast Fourier transform in YCbCr color space.

Keywords: Encryption; Discrete wavelet transform; Singular value decomposition; Chaotic map; Arnold transforms; Channel coding

1 Introduction

Digital watermarking is the most commonly used technique for securing the data against attacks. Visible or Invisible watermarking are the two different types of watermarking approaches used [(1)]. The watermarking performed defines how the

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Optics Communications

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Resonant terahertz generation by cross-focusing of Gaussian laser beams in the array of vertically aligned anharmonic and magnetized CNTs

Sandeep Kumar [a], Shivani Vij [b], Niti Kant [a], Vishal Thakur [a]

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Resonant excitation of THz radiations by the interaction of amplitude-modulated laser beams with an anharmonic CNTs in the presence of static D.C. electric and magnetic fields

Sandeep Kumar [a], Shivani Vij [b], Niti Kant [a], Vishal Thakur [a]

J. Astrophys. Astr. (2022)43:30
https://doi.org/10.1007/s12036-022-09805-y

Combined effect of transverse electric and magnetic fields on THz generation by beating of two amplitude-modulated laser beams in the collisional plasma

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Abstract. In this paper, we have provided a theoretical analysis on enhanced terahertz (THz) generation by beating two amplitude-modulated laser beams in the collisional plasma under the effect of static electric and magnetic fields. Two amplitude-modulated laser beams of slightly different frequencies (ω_1, ω_2) with wavenumbers (k_1, k_2) are propagating along the same direction under the effect of these fields. The coupling between the various nonlinear terms like the nonlinear velocity and electron density in the collisional plasma results in the THz generation. The electric field, magnetic field, and propagation direction of lasers are mutually perpendicular to each other. The applied static magnetic and electric fields assist to enhance the nonlinear current density and normalized THz amplitude. The normalized THz amplitude shows notable enhancement with the increase of applied static electric and magnetic fields. This scheme can be employed to generate and detect the THz radiations for making interesting astronomical observations.

Keywords. Collisional plasma—terahertz waves—amplitude—modulated laser beams.

1. Introduction

In the present era, compact and efficient THz sources can provide numerous applications in industrial manufacturing, anti-terrorism, and safety techniques, (Siegel 2002; Orlando & Gallerano 2009; Ishigaki *et al.* 2012) remote sensing, satellite communication (Pickwell & Wallace 2006; Hoffmann & Fulop 2011; Kawase 2012) physical, chemical, biological, pharmaceutical (Lui & Hegmann 2001; Dragoman & Dragoman 2004; Sizov 2010), and astronomical sciences (Liu *et al.* 2010; Kulesa 2011; Graf *et al.* 2015). It is well-known fact that the interstellar radiations lie in the sub-millimeter wavelengths, namely the THz regime. THz spectroscopy contains in-depth information about the star formation process and the interstellar medium. Therefore, more interesting astronomical observations can be acquired by using THz detection technology. Many researchers put their efforts to provide various schemes of THz generation and detection by using different mechanisms to enhance the normalized THz amplitude like optical rectification mechanism (Singh *et al.* 2017; Gupta 2021), carbon nanotubes materials (Kumar *et al.* 2021a,b) cross-focusing (Thakur *et al.* 2020a,b; Thakur & Kant 2021) and self-focusing of laser beams (Thakur & Kant 2019, 2021) optical mixing of laser beams (Kumar & Tripathi 2012), two-color laser interaction (Saxena *et al.* 2021), short-pulse laser interaction (Gurjar *et al.* 2021a,b) filamentation (Kumar *et al.* 2021a,b) and amplitude modulation (Wang *et al.* 2011), etc. Some of the researchers have noticed a significant enhancement in the normalized THz amplitude by beating amplitude modulated laser beams and using filamentation under the effect of the suitable external magnetic field, electric field or both (Braun *et al.* 1995; Löffler *et al.* 2000; Houard *et al.* 2008; Varshney *et al.* 2014). In this scheme, we have considered two amplitude-modulated laser beams having electric fields, $\vec{E}_1(\omega_1, k_1)$ and $\vec{E}_2(\omega_2, k_2)$. These

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Electrical conductivity of gadolinium and yttria co-doped ceria with Ca, Fe, La, & Sr addition: as electrolytes for solid oxide fuel cells

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ABSTRACT

This paper reports the alternating current (AC) conductivity and dielectric behavior of $Ce_{0.90}Gd_{0.06}Y_{0.02}M_{0.02}O_{2-\delta}$ (M = Ca, Fe, La, & Sr) systems for their application as electrolytes for solid oxide fuel cells (SOFCs). The mixed oxide method was used for the preparation of these compositions. The samples of all the prepared compositions were sintered by both conventional and microwave heating at 1400 °C. The AC conductivity and dielectric behavior of the prepared samples were studied in the temperature range from room temperature to 500 K. The AC conductivity was found to be higher for the microwave-sintered samples than the conventionally sintered samples. The microwave processed samples have shown lower activation energy too. Further, the microwave sintered composition of lanthanum doped ceria has shown the maximum AC conductivity, dielectric constant, and minimum activation energy among all the prepared samples, making it an excellent candidate for SOFC electrolyte.

1 Introduction

The world's primary energy demand is ever increasing and until now, this is mainly fulfilled by fossil fuels like coal and petroleum. With the oil crisis and growing environmental worries, the use of our limited fossil fuels has become a worrisome matter not only to preserve resources and the environment but for the economic benefits also. Due to the inadequacy of the conventional resources and for universal demand to decrease the production of greenhouse gases like CO_2, there is a rising concern to promote the use of renewable energy resources, which have a less harmful ecological effect. Solid oxide fuel cells are being used in electricity production, transport, and automobile applications, due to their high-energy competence, fuel flexibility, and lesser ecological pollution. The fuel cells are well-planned technology to transform one form of energy to the other and are a noble alternate of the conventional power resources. These are very efficient (> 65%) and environmentally friendly devices that can deliver power in transportable and still power applications [1, 2].

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A COMPARATIVE FRAMEWORK FOR BLOCKING ARTIFACTS REMOVAL OF DIGITAL IMAGES USING HYBRID MECHANISM

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Abstract

The restoration of an image with blocking artifacts due to compression at low bit rates is a challenging task and blocking artifact measurement algorithms have an important role to play in the computer vision field. An artifacts removal technique is an important step towards the reliability and security of image processing area that delivers a better understanding in many applications like pattern recognition, object classification, surveillance system and many more. We know that the removal of art objects is a scientific method used to provide better image analysis and for this purpose many methods of removal of art objects were already made by researchers during the processing of images such as line, motion, pattern, and hair. But in availability of group of artifacts in an image, they do not achieve an acceptable result. In this research, we proposed a comparative framework for blocking artifacts removal of digital images using hybrid mechanism. The main contribution of this research is developing a new neuro-fuzzy system-based hybrid artifacts removal mechanism to achieve better blocking artifacts efficiency. To remove artifact from an image the proposed framework has its own impact in quality parameters such as Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), and Structural Similarity (SSIM) with the execution time. At last, the performance parameters of proposed framework is compare for all five techniques such as line, motion, pattern, hair and combination of all with each other and we observed that the achieved results justify the proposed hybrid artifact removal method in the field of image processing.

Keywords:

Artifacts, Line, Motion, Pattern, Hair, Neuro-Fuzzy, Image processing, PSNR, MSE, SSIM, Execution Time

1. INTRODUCTION

The image manipulation process such as image compression, decompression, watermarking, hiding, enhancement, medical imaging etc. causes image quality degradations such as blocking and ringing artifacts [1]. There are lots of artifacts are generated in an image such as line, motion, pattern, hair removal, and many more hybrid. Our goal is as follows: we would like to removal different kind of artifacts from images using different mechanisms that would be beneficial for image analysis toolboxes [2]. Basically, an artifact of an image is any element from an image that is not in the original image and sometimes the result of improper functioning of the image, and sometimes the result of natural processes or structures of the human body [3]. It is important to get acquainted with the appearance of antiquities because antiquities can be obscure, disrupted by pathology. Therefore, graphic art can lead to false positives and false benefits. To achieve the improvement of image quality in photography, many techniques to reduce art have been proposed and these methods can be divided into five stages as in Fig.1.

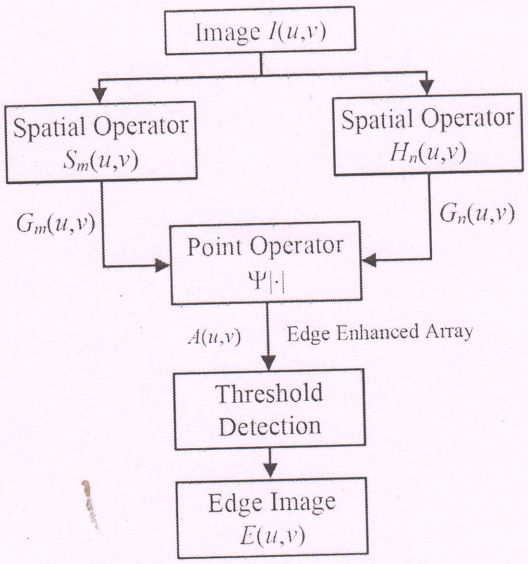

Fig.1. Image Artifacts

The image is a collection of pixels according to a tow size list that shows visual art objects as shown in the image above. One of the most important artistic elements of an image is its edges and the edges of the image are directly connected or related to the shape and contrast of the pixel distribution [4]. Overall, our contribution to the reduction of graphic arts is mainly in three areas:

A comparative artifacts reduction framework is designed to take advantage of the information in image to achieve effective removal outcomes.

In the framework, total five models are considered for the artifact's removal such as line, motion, pattern, hair removal, and hybrid of them. This hybrid model can not only effectively remove the line, motion, pattern and hair effects between but also be helpful for removing all blocking artifacts together.

To validate the proposed comparative model, a comparative analysis with the all strategies is performed in the name of performance parameters such as Peak Signal to Noise Ratio (PSNR), Mean Square Error (MSE), Entropy and Structural Similarity (SSIM) with Execution Time.

The rest of this research article is organized as follows. Section 2 will introduce work related to the analysis of the existing framework for the reduction of art objects. In Section 3 we will introduce a detailed process and the test results are shown to test the proposed method in Section 4. Finally, we conclude the work in section 5 with some future possibilities.

Content based Adaptive Image Demosaicing using Random Forest Algorithm.

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Abstract

Health care, forgery and engineering are just a few of the many industries that rely on the content of images. Mobile phone cameras use image sensors with Bayer patterning. It is necessary to use a demosaicing algorithm to extract the fullcolour image with requisite quality. Content-based adaptive demosaicing utilising random forest algorithm is proposed in this article, as it has the advantage of being easy to train and evaluate. Interaction curvature was used as the predictor. Interpolation techniques: linear, closest, cubic, rational v4 precede this section. For each pixel, 50 learning cycles are utilised, and all of this work is done using MATLAB software. Using random forest algorithms, ten pictures are used to calculate PSNR, SNR, SSIM, and MSSIM. All of the test photos were more efficient when using Random forest as a filter.

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In Press, Corrected Proof ?

Estimation of optimized window size for hybridized kNN-random forest algorithm based image demosaicing

Gurjot Kaur Walia [a, c], Jagroop Singh Sidhu [b]

Show more

https://doi.org/10.1016/j.matpr.2022.07.017

Abstract

Image Demosaicing is gaining popularity in the field of image processing as it helps in identifying the missing elements by using already known value of surrounding pixels obtained from color filter array overlaid on bayer pattern. The proposed work aims at calculating the image quality metrics (Signal to Noise Ratio and Peak Signal to Noise Ratio) for finding the optimized window size by performing image demosaicing based on two machine learning algorithms i.e. hybrid kNN and random forest algorithm with 20 learning cycles. To pick out the best out of many possible window sizes (3×3, 5x3, 5x5, 7x5), a set of standard images from Kodak database have been taken into consideration. The proposed work of hybrid algorithm has been implemented in MATLAB tool. The findings of the proposed work show that 7x5 window size outperforms the other window sizes for almost all the images as well as from its counterpart kNN only.

Keywords

Demosaicing; kNN; Random Forest; SNR; PSNR

Proofs

ELSEVIER

Advances in Engineering Software

Volume 170, August 2022, 103149

A hybrid swarm intelligence approach for resolving reactive power dispatch issues in power system: Optimal placement and sizing of UPFC

Sudhir Sharma [a], B. Sabitha [b], Anush Prabhakaran [c], Meena Chavan [d], Rajat Srivastava [e]

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A boosted chimp optimizer for numerical and engineering design optimization challenges

Ch. Leela Kumari, Vikram Kumar Kamboj, S. K. Bath, Suman Lata Tripathi, Megha Khatri & Shivani Sehgal

Engineering with Computers (2022) | Cite this article

Abstract

Chimp optimization algorithm (ChoA) has a wholesome attitude roused by chimp's amazing thinking and hunting ability with a sensual movement for finding the optimal solution in the global search space. Classical Chimps optimizer algorithm has poor convergence and has problem to stuck into local minima for high-dimensional problems. This research focuses on the improved variants of the chimp optimizer algorithm and named as Boosted chimp optimizer algorithms. In one of the proposed variants, the existing chimp optimizer algorithm has been combined with SHO algorithm to improve the exploration phase of the existing

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Analysis of a Fuzzy Based Security Approach for SIoT based Large-Scale Smart Environment

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ABSTRACT

Large-scale smart environments (LSEs) are distributed systems that covers wide geographical area characterized by a large number of possibly heterogeneous, interacting Internet of Things (IoT) devices. Their deployment aims to provide enhanced cyber-physical services to its users, IoT allows the physical objects in daily life connect to internet and by creating an environment where these object can identify and communicate with each other through different communication methods including Wi-Fi and sensor technologies. But with LSEs there is new concept included which is Social Internet of Things (SIoT), SIoT moderates the challenges of IoT like trust,entity discovery and management by developing" social-like" relationships between the objects that search only those nodes with mutual social relations then the complexity and the time duration of the search could be drastically reduced. Now due to less approaches to develop a efficient LSEs and issues like Security and Trustworthiness are still to conquer incase of SIoT. The system includes implementation of a security system that is user friendly and can be used commercially which comprises of LSE Sensor, LSE End User, LSE Edge, where LSE Gateway(Server) acting as mediator .This paper proposed to resolve the security issues and reduction of maliciousness resulting in the increasing trustworthiness. In Proposed system there is usage of Fuzzy Logic rather than Crisp Logic that provide the user with better results and overcome the related issues by improving parameters like latency, trustworthiness factor and no of nodes detection in the system ,by addition of Fuzzy Logic and Artificial Intelligence(AI) there is analysis of sound(alerts)coming from a particular sensor thereby increasing the reliability and removing congestion.

Keywords *- IoT, Smart Environment, Security, Cloud Computing, Edge Computing, LSEs, SIoT, Fuzzy Logic, AI.*

1. INTRODUCTION

IoT is a new concept that gained huge attention from miscellaneous sectors, which improves automotive, infrastructure, telecommunications, and intelligent environmental applications [1,2]. Sensor information provides essential data in smart environment applications. The data should be accurate for better results. But as with any IoT device, data reliability can be erratic, because of sensors behavior, hardware failures, minimized nodes ,untrue positives, unusual values.. While taking into account the context of critical applications such as health care [3]. Security approaches are difficult to be implemented; security and privacy policies must be incorporated in smart environment applications that process sensitive data without effecting quality.

LSEs are distributed systems that cover a wide geographical area characterized by interacting IoT devices.They provide enhanced cyber-physical services to users. LSEs are recognized as highly dynamic systems. They should add, update, and remove functionalities depending on the available devices and services. Within an LSE, native objects, that are directly deployed, owned, and managed by LSE, other two kinds of entities are considered, namely foreign and external objects which are following, first are objects that enter and exit an LSE and don't belong to the LSE itself private mobile devices are examples of this type of objects. The other ones are located outside the LSE, that provide exploitable functionalities. In the considered open and dynamic scenario, issues like trustworthiness, Data processing, entity discovery and management need to be addressed. Furthermore, it is necessary to have methodological guidelines and tools to foster the development of LSEs By dealing with their complexity.

NO ACCESS

Design and analysis of SRRC filter in wavelet based multiuser environment of mobile WiMax

Harpreet Kaur, Manoj Kumar, Ajay K. Sharma and Harjit Pal Singh

Published Online: April 12, 2022 · pp 374-390

Abstract

Spectrally efficient pulses has been recognised to mitigate the effect of inter-symbol interference (ISI) as well as satisfy the bandwidth limitations imposed by the multipath fading channels in wireless communication systems. Moreover, by allowing multiple users to utilise the transmission channel at the same time aspires towards achieving optimal spectral utilisation with acceptable error rates considering undesirable effects of correlated fading in the channel. In this paper, multi user environment is simulated in wavelet based OFDM system for WiMmax with square-root-raised-cosine (SRRC) filters employed as transmit and receive filters to perform matched filtering. The performance analysis in terms of BER as a function of signal to noise ratio (SNR) is investigated by varying the number of users for the purpose of comparing their relative performances to validate optimal resource allocation and meet higher data rate demand for various modulation schemes under AWGN channel. This simulation model is developed in MATLAB.

Keywords

DWT-OFDM, square root raised cosine, pulse shaping filter, multiuser, mobile WiMax

Previous Article

A NOVEL APPROACH FOR TWITTER SENTIMENT ANALYSIS USING HYBRID CLASSIFIER

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Abstract - *Twitter is a micro blogging site that allows users to communicate and debate their ideas and opinions in 140 characters or less, with no regard for space or time constraints. Every day, millions of tweets on a wide range of topics are sent out. Sentiments or views on various subjects have been identified as a significant feature that characterizes human behavior. Sentiment analysis models think about extremity (good, negative, or nonpartisan), yet in addition feelings and sentiments (irate, satisfied, tragic, and so forth), desperation (critical, not dire), and even aims (intrigued, not intrigued). Therefore, the primary goal of this Endeavour is to examine and analyze Twitter sentiment analysis during important events using a Bayesian network classifier. Also, to implement the principal component analysis (PCA) algorithm for extraction of best features and combining hybrid approach consisting of Linear Regression, Xgboost and Random Forest classifiers. Finally, the results of the trained and tested datasets are based on accuracy, precision, recall and F1-score.*

Key Words: ***Sentiment Analysis, Bayesian Network, Twitter, Principal Component Analysis, Feature Extraction, Linear Regression, Random Forest, XGBoost.***

1.INTRODUCTION

Different people from varied areas of life may hold the same perspective on a variety of problems. When these individuals form a group, they are referred to be similar wavelength communities or groupings. That is, same wavelength communities are organizations created on the basis of similar thoughts and feelings expressed by different individuals on a variety of themes. People in critical and intentional teams are basically related by such similar recurrence organizations. Many social network research projects are largely concerned with either analyzing sentiments at the tweet level or studying the features of tweeters in a linked context. People from diverse areas of life may have the same perspective on different problems, but they do not have to be related. Furthermore, automated detection of such implicit groups is useful for a variety of applications [1].

With the assistance of technology, the web has become an extremely valuable place where concepts can be quickly interchanged, online learning, audits for an assistance or item, or movies can be found. It is complex to interpret as well as record the user's emotions since reviews on the internet are accessible for millions of services or products. Sentiments are user feelings about things like products, events, situations, and services that might be excellent, terrific, bad, or neutral. Sentiment analysis [2] is the study of people's emotions and reactions based on online comments. Sentiment analysis is insinuated by an arrangement of names, including evaluation mining, believing mining, appraisal extraction, subjectivity examination, feeling examination, impact assessment, review mining, and others.

SA is a very new area of study that uses Linguistics as well as text analytics, NLP, Computational as well as categorized the polarity of the emotion or opinion to gather subjective information from source material. SA is a language understanding task that employs a computational model to evaluate the user's opinion as well as categorize it as positive, negative, or neutral. The primary goal of SA is to determine a writer's or speaker's attitude toward a given topic. This article's or speaker's attitude could be their assessment, affective state (the author's emotional state when writing), or the intentional emotional communication (intends to produce an emotional impact on the reader). With the assistance of opinion mining, authors can differentiate between low-quality & high-quality content

1.1 Sentiment Analysis in Twitter

An online social networking service is a service or platform that allows individuals who similar interests, hobbies, backgrounds, and real-life relationships to create social networks or social interactions. Twitter is an online person-to-person communication Twitter is an internet based individual-to-individual correspondence and micro blogging administration that enables its customers to send and read text-based communications known as tweets. Tweets are clear, of course, but senders can limit the message conveyance to a certain group. Since its inception in 2012, Twitter has grown to become one among the most often used micro blogging systems, with over 500 million registered users. According to Info graphics Labs5 measurements, 175 million tweets were sent each day in 2012.

Twitter is used by a tremendous number of people to bestow musings, choosing it an enthralling and endeavoring choice for evaluation. When so much consideration is being paid to Twitter, why not screen and develop strategies to investigate these feelings. Twitter has been chosen considering the accompanying purposes.

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A REAL-TIME FACE RECOGNITION ATTENDANCE SYSTEM BASED ON KERNEL PRINCIPAL COMPONENT ANALYSIS AND SINGULAR VALUE DECOMPOSITION

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***Abstract*— Attendance is an essential component of every organization. Keeping an attendance register daily is a challenging and time-consuming task. There are numerous automated ways available such as Biometrics, Eye Detection, Speech Recognition, etc. for human verifications. This paper outlines a simple and effective way for tracking attendance. Face recognition provides an accurate system that solves ambiguities such as fraudulent attendance, excessive cost, and time consumption. For facial identification and attendance storage, this system employs a face recognition library in Open CV (Python). The camera captures the image and sends it to a database folder containing images, which identify faces and calculate attendance. The goal of creating this automated attendance system utilizing Artificial Intelligence was to reduce the errors that occur in the traditional attendance-taking system. A face recognition system has been presented that has robustness toward user recognition and the result is transformed into an Excel Sheet in Real-Time.**

***Keywords*— Face Recognition, Open CV, Numpy, DLIB, Cmake, Face Detections.**

I. INTRODUCTION

As humans, our minds are built to do all of this naturally and rapidly, but Computers are incapable of this order of accuracy, as each stage of face recognition must be taught or programmed independently. Pattern recognition is the process by which a machine can recognize and discern a pattern from perceptual input based on its surroundings, and make reasonable and acceptable classification decisions. Typically, facial recognition does use a large database of photos to determine a person's identity; rather, it simply identifies and recognizes one person as the device's sole owner, while denying access to others. The technologies employed include statistical, probability, computational geometry, and algorithm design. Understanding how patterns are represented and recognized in nature has a big impact on building a pattern recognition system. Face detection and Face recognition are one of the major biometric categories. Generally, this facial detection and facial recognition reduce the amount of physical labor required by humans. Images are taken via the camera, and face detection techniques are used. In photographs, we usually observe the nose, hair, ears, lips, and eyes, as well as varied poses of faces.[1] It is possible to conclude that no single biometric is ideal. When we consider facial recognition, it appears to be a better strategy. It has the significant advantage of being the only biometric capable of identifying people at a distance without subject complicity or awareness. It is also a useful technique for people who have difficulty touching the sensors, such as in fingerprint recognition.[2] It cannot injure any physical portion of the body.

According to the Previous Studies, there are a variety of application sectors where it plays an important function.[3] Face biometrics are measured using a variety of face recognition technologies. Security systems, authentication, access control, surveillance systems, smartphone unlocking, and social networking services all make excellent use of facial recognition. Face recognition, unlike fingerprinting or other security measures does not require any physical contact, making it a quick, automatic, and seamless verification experience in the post-COVID era.[4] Businesses require both secure and fast technologies in an era of cyber-attacks and advanced hacking tools. Facial recognition allows you to verify someone's identity quickly and easily. Security software and facial recognition software are generally compatible. It's

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Modified Energy Efficient Transmission State MAC Protocol for improving link Stability in MANET- A Review

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Abstract: *Mobile adhoc network are flexi-mobile, they use wireless connections to connect to various networks. An ad-hoc network is a collection of wireless mobile hosts forming a network without central epicentre. The automated factor means that any mobile nodes can join or leave the network at any point of time when they want which causes many prob like Qos parameters is affected The EETS is the improved version of AODV protocol for path recovery in mobile adhoc networks. In the EETS protocol, when the mobile node change its location then link failure occurred in the network. The EETS protocols works on the node connectivity factor for the link recovery. When any node detects link failure in the network, then the node with which maximum number of nodes is connected is selected as the best node for link recovery. The EETS protocol performs well in terms of certain parameters but for the link recovery it donot include quality of service parameters. In this research work, improvement in the EETS protocol will be proposed by applying quality of service parameters for path recovery & Better Link Stability in mobile adhoc networks. The quality of service parameters are like Overhead, Energy consumption and delay.*

Keywords: AODV, EETC MAC, Modified EETC MAC.

I. INTRODUCTION & CHARACTERSTICS OF MANET NETWORK

To resolve the problems like power consumption of a device in MANETs and improve the overall network quality, a routing technique is applied [3]. Having an up-to-date route to all the nodes at all times is the major attempt of the various outing solutions proposed by different researchers. The routing control information is exchanged periodically and as per the topological changes in case of proactive routing protocols.

Following are the important characteristics of MANETs that distinguish them from other networks:

1) Infrastructure-less Nature: For performing communication among the nodes, collaboration among the independent peer-to-peer nodes generates MANET [2]. There is no definition of prior base station and all the devices have similar role to perform.

2) Dynamic Topology: The mobility of MANET nodes is free. Therefore, the links and topology of network will change constantly when the nodes move in and out of the network. Either unidirectional or bi-directional links could be generated among nodes. Higher user density and large level of user mobility are however, caused by this feature in MANETs.

3) Multi-Hop Communications: MANETs require multi-hop communication since they have the signal propagation properties of wireless transceivers. Thus, MANETs perform multi-hop routing for mobile nodes in case when a source node is out of the radio range of a destination node. Due to the limited transmission radius, a message is passed across multiple nodes from source to destination node.

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Smart Attendance Monitoring System Based on Kernel Principal Component Analysis and Singular Value Decomposition.

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Abstract: Advances in programming face recognition have made numerous impacts in the evolving scene. A PC framework in my face recognition project will want to locate and recognize human faces in images or recordings captured by an observation camera quickly and precisely. Various calculations and procedures have been developed for working on the presentation of face recognition, but the idea to be implemented here is Deep Learning movements. Today, recording someone's presence is the most important thing for any organization. Someone's attendance at an office or association indicates that they are fulfilling their obligation to attend. This paper explains how to track participation in a simple and effective way. Face recognition provides a precise framework for dealing with ambiguous situations like fake participation. This framework uses an Open CV face recognition library for facial distinguishing proof and participation storage (Python). The picture is captured by the camera and sent to an information base organizer, which contains pictures that distinguish faces and calculate participation.

Keywords: OpenCV, Numpy, DLIB, Cmake, Face Detections, Face Recognition

I. INTRODUCTION

Face acknowledgment, we believe, can help individuals confirm their collaboration by incorporating these features. Face recognition is extremely essential in today's electronic environment. A few segments may be reliant on development to determine participation at this time. Nonetheless, some people engage in traditional techniques that consume a significant portion of their day.[8] Face recognition is perhaps the most heavily focused area of the PC vision development, with new approaches and enabling outcomes being introduced on a regular basis. Face recognition techniques are primarily divided into two types: based and sweeping. A face acknowledgment framework is an excellent way to address these concerns. Students can also be cautious without worrying about completing desk work for their investment and losing some of the information provided by the instructor. [2] As far as the educator is concerned, everything appears to be in order with the structure saving all of the students' investment registrations for future reports. The Automated Attendance System (AAS) is a program that uses face recognition technology to determine whether or not a student is present in the homeroom. Because the presence of students cannot be established by continuously recording their appearances on a large-screen video, the system should detect the presence of all students in the review lobby. It has the particular benefit of being the only biometric that can discern proof from a distance without subject involvement of consciousness. A finger impression is a suitable option for clients who do not want to contact the sensors with their fingertips. It's probable that it won't hurt any real biological components, like the retina or iris. The getting method is likewise complicated in the iris recognition framework. Eyelids, lashes, spectacles, contact focal points, eyes, and hair should all be occluded. [5]

1. Use a systematic strategy.
2. A wonder-based strategy

The essence of a single person will be used to determine cooperation. Face recognition is becoming increasingly common these days, and it is widely used. In this research, we offer a system that recognizes student characters from live continual videos of homeroom and stamps investment if the recognized face is found in the database. Unlike traditional techniques, this new system will necessitate considerable investment. [1]The main goal is to develop a strong and secure facial recognition technology for individual approval, as well as to evaluate the introduction of the ideal construction by comparing it to other existing systems determined from the manual and other traditional

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Improved link Stability using Energy Efficient Transmission State MAC Protocol in MANET

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Abstract: *A MANET can be defined as an autonomous system of nodes or MSs(also serving as routers) connected by wireless links, the union of which forms a communication network modeled in the form of an arbitrary communication graph. The self configuring means that any mobile nodes can join or leave the network when they want .It is the decentralized type of network in which mobile nodes can move from one location to another. Due to random movability of the mobile nodes, the two factors route establishment, route maintenance becomes the major problem of MANET networks. This main Spotlight of this research paper is the route establishment & route maintenance which are properties of MANET network. The EETC protocol is the route establishment and route maintenance protocol in which broker route will be recovered on the basis of node connectivity. The node, which has maximum connectivity, is selected as the best node for route recovery in EETC Protocol. In this research work, the EETC protocol is further improved by adding buffer size parameter for route recovery which also maintains & improves quality of service like better throughtput, Less Energy Consumption, High Packet Delivery Ratio , Low End to end delay and Less Packet loss & Less Overhead in the network The proposed IEETC protocol simulation results perform well as compared to existing EETC protocol in terms of certain parameter*s.

Keywords: AODV, EETC, IEETC, LINK STABILITY, OH, PL, E2E DELAY, EC PDR.

I. INTRODUCTION

Mobile adhoc Network may process on an independently or they can be part of larger internet. They form a highly adaptive autonomous topology with the presence of one or multiple different transceivers between nodes. The major problem for the mobile adhoc network is to equip each device to continuously maintain the information required to properly route traffic. These networks face various problems the reason is they do not have any central maintainer within them. There are many resources present within these networks and a very cryptic line of defense if present [1]. Another issue that arises within these networks is the reliability of radio link in several cases there is a link breakage found. In order to forward the data packets to other nodes, each node acts as a router within MANETs. There is a need of higher security within these networks due to the self-organization of nodes within these networks. However, security within these networks is difficult to be provided because of the limited communication and communication resources available. Due to the rapid change in topology, the links broke as well as re-establish within these networks. It is to be proved that the immediate change within the topology is responded by the routing protocol [2]. Each node acts are a router within these networks. The source and destination might communicate through the intermediate nodes due to the limited bandwidth available within the nodes. Asymmetric links, routing overhead, interference as well as dynamic topology are the major issues arising within routing. There are various advances being made within the routing techniques provided within MANETs and many new routing

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A simple, low-cost modified drop-casting method to develop high-quality $CH_3NH_3PbI_3$ perovskite thin films

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Highlights

- First time, pinhole free uniform and compact thin films of CH3NH3PbI3 were fabricated by modified drop casting.
- X-ray diffraction and Rietveld refinement approved the tetragonal phase and high crystallinity of films.
- Modified drop cast method enhanced the optical light absorption of CH3NH3PbI3 perovskite thin film.
- SEM and AFM further confirm the homogeneous films formation for films.
- Electrical properties and photoluminescence properties were found to be very high.

Abstract

To make perovskite solar cells competitive and efficient, it is necessary to control the crystallinity along with full coverage of the used substrate. Nowadays, numerous

ORIGINAL ARTICLE

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Adaptive Image Demosaicing Algorithm Based On K-Nearest Neighbor for Improved Visual Quality

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Abstract

Demosaicing extracts a high quality, full-color image from the incomplete data samples obtained through image sensors via bayer pattern. Healthcare, image forensics, low light photos, etc. use this technique. For a major consideration, this work provides an adaptive demosaicing approach that uses gradient corrected linear interpolation along with k-Nearest Neighbor algorithm to learn from the labelled training set, with the output based on a distance measurement. Signal to Noise Ratio, Peak Signal to Noise Ratio were determined in order to justify the effort and the findings showed that the mentioned method produced better results.

Keywords: Bayer pattern, Demosaicing, kNN, PSNR, SSIM.

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Introduction

Every person in his daily life has come across images on his smartphone or iPad. Digital images have worthier than analog images. Digital images have higher resolution and are more suitable for processing computers and smartphones.[1] Digital images play a vital role in medical technology, sensor networks, and even intelligent transportation.[2] Every digital camera has an RGB color image and has different pixel components. The demosaicing algorithm estimates the missing features in the pixel in every color plane. This article proposes a demosaicing algorithm which estimates the missing pixels by interpolating them with fewer color artifacts. Filter bank methods can reduce the aliasing effect problem by applying filter bank methods to the two-dimensional interpolation.[3]

The Bayer pattern filters are still using in digital cameras. Even the Mastcam imaging system used by the Mars rover designed by NASA is to capture the images on the planet mars are used by the Bayer pattern filters.[4] Another algorithm works in iterative mode finds the color difference in image domains and has spatial adaptation criteria for compressing color misregistration. Further, adaptive demosaicing algorithm where the missing green samples are estimated first based on color variance difference with different edge directions and later on the red and blue color components are calculated depending on interpolated green plane and have resulted in best average demosaicing performance subjectively.[5] The different manufactures of camera models have different color demosaicing strategies.

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An article proposed an identified strategy that re-processes the analyzed image with eigen algorithms and builds a set of identifying features for the algorithm.[6]

The demosaicing algorithms have the most efficient and quality results for color image acquisition, especially in noisy images. Researchers' challenges in the demosaicing algorithm are false-color artifacts, edge blur in images, and zippering. To overcome such challenges, an architecture to overcome the image restoration problems using two operations jointly, the first one being denoising, and the other is demosaicing on the camera sensors and when assessed on the Microsoft demosaicing dataset relating to Peak Signal to Noise Ratio (PSNR) has resulted in 2.6 dB improvement over conventional state art algorithms.[7] In other article, the spatial adaption technique with a jacobian matrix with color maps is presented, and it requires only arithmetic operations such as additions, subtractions, and circular shifts.[8]

The demosaicing with color filter array will help restore the full-color image, exploit the spatial image values, and