



Materials Today: Proceedings
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Synthesis and evaluation of reduced graphene oxide for supercapacitor application




Mohammed Saquib Khan ^a, Rohit Yadav ^a, Rishi Vyas ^b, Atul Sharma ^a, M.K. Banerjee ^a, Kanupriya Sachdev ^a  

^a Malaviya Natinal Institute of Technolgy, JLN Marg, Jaipur, 302017, India

^b Swami Keshvanand Institute of Technology, Jaipur, 302017, India

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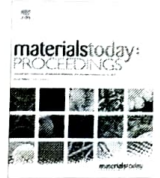
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Abstract

The paper reports synthesis of graphene oxide (GO) using modified Hummer's method and its hydrothermal assisted reduction to produce reduced graphene oxide (rGO) for supercapacitor applications. Synthesized GO and rGO were characterized using Raman spectroscopy and their I_d/I_g ratio was found to be 0.94 and 0.87, respectively. Scanning Electron Microscopy (SEM) was also performed on samples for detailed surface morphology information. UV-Vis spectroscopy was employed to investigate optical properties. FT-IR spectroscopy was utilized to get the information of attached functional groups and electrochemical characterization (cyclic voltammetry) was used to test the charging discharging behavior of the material. The specific capacitance of synthesized rGO was found to be 105F/g.



Toluene-filled photonic crystal fiber with flat dispersion

Yazusha Sharma^a, Rukhsar Zafar^b, Shruti Kalra^a, Ghanshyam Singh^c

^a Jaipur Engineering College & Research Centre, Jaipur, Rajasthan, India

^b Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur, Rajasthan, India

^c Malviya National Institute Of Technology, Jaipur, Rajasthan, India

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ABSTRACT

In this paper the proposed PCF core is filled with toluene (R.I. = 1.497) for designing a refractive index sensor. The proposed photonic crystal fiber (PCF) core is filled with toluene to get a flat dispersion and near zero loss characteristics. A metallic gold layer is deposited in the inner wall of two large holes, of the first ring of cladding to achieve the flat dispersion. The remaining air holes are filled with different type of liquid having different refractive index. The various properties like guiding properties of proposed PCF are normally investigated by OPTI-FDTD. This PCF exhibits flat dispersion of 205.19 at refractive index $N = 1.4$ at $1.87 \mu\text{m}$ with low confinement loss which can be used for non-linear technologies as well as in bio-medical diagnosis.

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1. Introduction

An excellent control of fiber parameter through robust engineering technique mode photonic crystal fiber on great demand for wide range of application (bio-medical diagnosis, non-linear optical communication). Photonic crystal fiber (PCF) is an excellent psurge fiber technology was backbone of communication system as it provides reliable and flexible optical communication channel as compared to that of free space medium. Depending on guiding mechanism, PCF can be characterized as step index fiber and hollow core fiber. PCF have numerous unique properties such as low confinement loss, high linearity, flat dispersion high birefringes. Flat dispersion PCF is eminent in numerous practical applications because of having low losses [1–3].

The demand of photonics has drastically increased in the recent years and extensive research work is carried out on photonic crystal fiber (PCF). In recent era, LIPCF has achieved a great demand in the field of optoelectronics. Optoelectronics is that branch of photonics in which micro-fluidics and photonics are combined together, to enhance new research and advancements. When tiny holes in cladding or may be in core in PCF are filled with selective liquids, then characteristics of PCF are changed to large extent [9]. Hence with such kind of liquid infiltrated fibres we are able to achieve reconfigurable and dynamic optical properties.

In PCF, there are broadly two types of transmission possible in PCF: Solid core PCFs in which the guiding is done by Total Internal Reflection phenomenon and hollow core PCFs, in which the light is guided by photonic band gap. In the solid core PCFs, light is guided by total internal reflection phenomenon with the properties of broadband, single mode and low loss. The light can confine in hollow core PCFs in low refractive index and sub-wavelength air hole. The propagation mechanism of the hole is studied by evanescent field coupling and electromagnetic theory of optical transmission.

In 2019, Hai Lui presented a methane sensor based on liquid filled photonic crystal fiber. It provides high sensitivity and temperature compensation with high degree of accuracy in results. In 2015, Y. E. Monfared presented a survey based on nonlinear liquid infiltrated fibers. Six nonlinear liquids of different refractive index were used under his investigation. These include methanol, chloroform, benzene, toluene, nitrobenzene and carbon disulphide with refractive index values of 1.317, 1.433, 1.476, 1.477, 1.524 and 1.59. Obtained results reveal that highest nonlinear properties are recorded for carbon disulphide filled photonic fibre with tighter mode confinement [4]. Few years later liquid infiltrated fiber with toluene liquid was investigated by him to design a sagnac interferometer with higher values of sensitivity and temperature compensated applications [5]. He could achieve a polarization maintaining photonic crystal fiber with a value of approx 26%

ARTICLE TYPE

Hardware implementation of IIR anti-notch filter for Exon region identification in Eukaryotic genes

Vikas Pathak^{*1,2} | Satyasai Jagannath Nanda¹ | Amit Mahesh Joshi¹ | Sitanshu Shekhar Sahu³

¹Malaviya National Institute of Technology,
J. L. N. Road, Jaipur-302017, Rajasthan,
India

²Swami Keshvanand Institute of Technology,
Jagatpura, Jaipur-302017, Rajasthan, India

³Birla Institute of Technology, Mesra,
Ranchi-835215, Jharkhand, India

Correspondence

*Vikas Pathak, 2013rec9567@mnit.ac.in

Present Address

Ph. D. Research Scholar, MNIT, Jaipur
(Raj.), India

Summary

The discrimination of exons from introns in the DNA sequence of a Eukaryotic gene is important to understand the functionality of protein formation inside a living organism. Several signal processing techniques involving transforms and filtering have been used to identify the exon regions by exploring the periodicity-3 property. Fast processing of massive DNA sequences is desirable to detect the disease-causing mechanism, which is helpful to prepare individual-centric drugs. In this manuscript, a hardware implementation is carried out for the direct form-II structure of the IIR anti-notch filter to achieve the fast processing of the DNA sequence. Implementation result on Zynq-series (Zybo board) FPGA reveals that the proposed implementation is capable to identify the exon regions of five benchmark Eukaryotic genes. The FPGA implementation has achieved a maximum clock frequency of 34.629 MHz, which is further improved to 54.41 MHz using the retiming concept. Compared to MATLAB 2014a simulation the proposed FPGA implementation has achieved similar accuracy with 39 to 43 times faster computing time for the five benchmark datasets. Further, an ASIC implementation is carried out in the CADENCE RTL compiler tool with GPDK 90nm technology, due to which the hardware anti-notch filter is 120 to 133 times faster compared to its MATLAB counterpart while maintaining the comparable accuracy.

KEYWORDS:

Period-3 property, FPGA implementation, ASIC design, Anti-notch IIR Digital Filter, Eukaryotic genes, Retiming, Exon region identification.

1 | INTRODUCTION

In the last decade, the area of Genomic Signal processing (GSP)¹ has gained a lot of attention due to the multi-disciplinary researcher's involvement in determining the solution of complex problems (ex. Identification of Hereditary diseases, classification of varieties of diseases based on genetic information, to reduce the time frame involved in the innovation of new drugs, the design of individual-centric drugs and much more narrated in the literature²). The research in this field is relatively young and needs exploration as it covers several applications in diversified areas of medicine, bioinformatics, and agriculture. Determining significant information-carrying regions (exons) in a Eukaryotic gene is very important. The Eukaryotic gene comprises of both exons and introns (non-coding regions). The exons are the protein-coding regions responsible for the generation of proteins from DNA (Deoxyribonucleic acid) sequence. A DNA sequence consists of genes (functional regions) and inter-genetic spaces.

¹Abbreviations: ANA, anti-nuclear antibodies; APC, antigen-presenting cells; IRF, interferon regulatory factor

VLSI implementation of anti-notch lattice structure for identification of exon regions in Eukaryotic genes

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Vikas Pathak^{1,2}, Satyasai Jagannath Nanda², Amit Mahesh Joshi², Sitanshu Sekhar Sahu³

¹Department of Electronics and Communication Engineering, Swami Keshvanand Institute of Technology, Jaipur-302017, India

²Department of Electronics and Communication Engineering, Malaviya National Institute of Technology, Jaipur-302017, India

³Department of Electronics and Communication Engineering, Birla Institute of Technology, Mesra-835215, India

✉ E-mail: 2013rec9567@mnit.ac.in

Abstract: In a Eukaryotic gene, identification of exon regions is crucial for protein formation. The periodic-3 property of exon regions has been used for its identification. An anti-notch infinite impulse response (IIR) filter is mostly employed to recognise this periodic-3 property. The lattice structure realisation of anti-notch IIR filter requires less hardware over direct form-II structures. In this study, a hardware implementation of IIR anti-notch filter lattice structure is carried out on Zynq-series (Zybo board) field programmable gate array (FPGA). The performance of hardware design has been improved using techniques like retiming, pipelining and unfolding and finally assessed on various Eukaryotic genes. The hardware implementation reduces the time frame to analyse the DNA sequence of Eukaryotic genes for protein formation, which plays a significant role in detecting individual diseases from genetic reports. Here, the performance evaluation is carried out in MATLAB simulation environment and the results are found similar. Application-specific integrated circuit (ASIC) implementation of the anti-notch filter lattice structure is also carried out on CADENCE-RTL compiler. It is observed that the FPGA implementation is 31 to 34 times faster and ASIC implementation is 58 to 64 times faster compared to the results generated by MATLAB platform with similar prediction accuracy.

1 Introduction

DNA molecules store digital information that constitutes the genetic blueprint of any living organism [1]. A single DNA sequence is a biomolecule, which consists of four linked smaller components (Adenine (A), Thymine (T), Cytosine (C) and Guanine (G)) termed as nucleotides. The DNA sequence is divided into two parts: Genes (which are the functional regions and responsible for protein formation from DNA sequence) and Intergenic spaces (regulatory regions). Proteins are responsible for the functionality of any living organism, which is also a biomolecule consisting of 20 - linked, smaller components called amino acids. The amino acids are made up of triplets (called as codons) of 4-possible DNA nucleotides (A, T, C & G), whose total combinations = $4^3 = 64$ possible codons of DNA. Any protein has a particular genetic code, which maps each of the 64-possible codons of DNA character into one of the 20-possible amino acids [2]. Genes are of two types: Eukaryote (cells that have nucleolus) and Prokaryote (have no nucleus). The Eukaryote genes consist of two regions: Exons (protein coding regions responsible for protein formation from a gene of any DNA sequence) and Introns (non-coding regions). The Prokaryote genes do not have any such classification (they possess only exons-regions). In every Eukaryote gene, the Introns need to be identified and eliminated before actual protein coding (or beginning of the synthesis process). Thus there is a need to identify the exons and intron regions accurately for production of proteins from DNA sequence. The processing and analysis of DNA sequence data is helpful for discovering families of genes or gene products that can be used to classify disease, thereby leading to molecular-based diagnosis and prognosis [3].

The Exon regions reflect a period-3 property due to the existence of codon structure in protein synthesis process [4]. Several Digital signal Processing (DSP) methods have been reported by researchers to explore this period-3 property, such as: Fast Fourier Transform (FFT) [5-10], digital filtering [11-15], continuous wavelet transform [16-18], discrete wavelet transform [19, 20] and wavelet transform [21]. In this paper, the focus is given on digital filtering method.

Vaidyanathan and Yoon [11] used second-order digital filters like anti-notch and multi-stage filters for protein-coding region identification. Ramachandran *et al.* [12] implemented the narrow band-pass digital filter and low pass filter for exon region detection and reported lower computational time compared to STDFT [10] based approach. An improved comb filter-based approach is reported in [13] for detection of Exon region with better prediction accuracy and less computational complexity. For the same problem, Hota and Srivastava [14] had used three anti-notch IIR filters: conjugate suppression anti-notch filter (suppresses the conjugate frequency component), anti-notch filter followed by moving average filter (decrease the background noise) and harmonic suppression anti-notch filter (removes the harmonic frequency component). This model improved the prediction accuracy of proteins Exon coding regions identification. Recently, the modified conjugate suppression anti-notch IIR filter and linear predictive coding model are combined by Farsani *et al.* [15] to propose an efficient algorithm for improving the performance of conventional Goertzel algorithm in determining the protein-coding regions.

Lattice filter structures are generally used to implement the finite and infinite impulse response (FIR and IIR) filters. They have several advantages over direct form structures, such as [22]: lesser sensitivity to coefficients quantisation and roundoff errors; architecture is modular in nature (i.e. an extra stage can be easily added if the order of the filter is increased [23]); in the hardware implementation, there is a requirement of the lower number of multipliers. The lattice structures are also effective as predictors/identifiers (as the structure simultaneously generates the forward and backward prediction errors). Vaidyanathan and Yoon [11] have also shown the cascaded lattice structures [24, 25] of IIR anti-notch digital filters. Designing of lattice structures (with minimum multipliers) of notch filter from all-pass digital filters is explained by Regalia *et al.* [26].

In the literature, this Exon region identification problem has been simulated with MATLAB software by many authors, but sufficient work has not been done in its hardware implementation. The hardware design is necessary to identify the gene

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


Utilization of non-metalized plastic bag fibers along with fly ash in concrete

Abhishek Jain ^a✉, Namrata Sharma ^b, Rakesh Choudhary ^b, Rajesh Gupta ^b✉, Sandeep Chaudhary ^c^a Department of Civil Engineering, Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur, Rajasthan, India^b Department of Civil Engineering, Malaviya National Institute of Technology, Jaipur, Rajasthan, India^c Department of Civil Engineering, Indian Institute of Technology Indore, Simrol, Indore 453552, India

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Highlights

- Sustainable concrete was produced using non-metalized waste plastic bag fibers (NMWPF) and fly ash (FA).
- The addition of NMWPF in concrete augmented tensile strength, and resistance to impact and drying shrinkage.
- The resistance to water-based durability characteristics enhanced on addition of NMWPF along with FA.





Structures

Volume 33, October 2021, Pages 971-985

Permeation, corrosion, and drying shrinkage assessment of self-compacting high strength concrete comprising waste marble slurry and fly ash, with silica fume

Rakesh Choudhary^a, Rajesh Gupta^a  , Thamer Alomayri^b, Abhishek Jain^c, Ravindra Nagar^a^a Department of Civil Engineering, Malaviya National Institute of Technology, Jaipur 302017, India^b Department of Physics, Faculty of Applied Science, Umm Al-Qura University, Makkah 21955, Saudi Arabia^c Department of Civil Engineering, Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur 302017, India

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Abstract

Production of self-compacting high-strength concrete (SCHSC) needs a colossal quantity of cement, which is perilous for the environment and economy. Researchers are intended to lower down the dependency on this cement and seeking for alternate green materials. The incorporation of industrial by-products together with mineral admixtures has been found suitable to minimize aforesaid problems. This investigation is, therefore, aimed to study the durability performance of SCHSC by comprising silica fume and fly ash (mineral admixture), and waste marble slurry (WMS) as an alternative to cement. The durability of such SCHSC mixes was evaluated by performing water permeability, chloride penetration, carbonation

Knowledge-Based Systems
Volume 219, 11 May 2021, 106859


Development and application of Quantum Entanglement inspired Particle Swarm Optimization


Rujuta Vaze ^a, Nagraj Deshmukh ^a, Rajesh Kumar ^a, Akash Saxena ^b  




^a Department of Electrical Engineering, Malaviya National Institute of Technology Jaipur, India

^b Department of Electrical Engineering, Swami Keshvanand Institute of Technology, Management & Gramothan, Jaipur, India

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Abstract

Particle Swarm Optimization has been extensively researched and applied to tackle optimization problems due to the ease in implementation and less number of parameters to be tuned. But particle swarm optimization (PSO) algorithm gets trapped into local optimum in high-dimensional space and it is inefficient in solving optimization problems which show high dependency. To overcome the above problems without compromising the advantages of PSO, this paper proposes Quantum Entanglement inspired Particle Swarm Optimization (QEPSO). QEPSO incorporates entangled states in its Q-bits to efficiently solve high-dependency problems and uses quantum local search to accelerate the optimization process. The proposed algorithm is tested on several standard benchmark functions and is also further benchmarked on IEEE Congress of Evolutionary computing (CEC 2017) benchmark set. The performance of QEPSO is compared with existing variants of PSO and some o

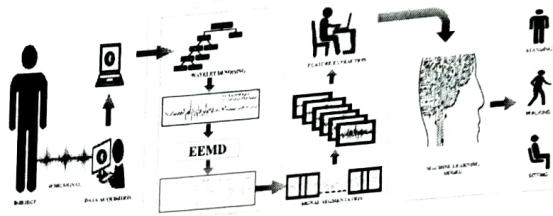
FEEDBACK 

A Hybrid WD-EEMD sEMG Feature Extraction Technique for Lower Limb Activity Recognition

Ankit Vijayvargiya¹, Student Member, IEEE, Vishu Gupta², Member, IEEE,
Rajesh Kumar³, Senior Member, IEEE, Nilanjan Dey⁴, Senior Member, IEEE,
and João Manuel R. S. Tavares⁵, Member, IEEE

Abstract—Classification and analysis of surface EMG (sEMG) signals have been of particular interest due to their numerous applications in the biomedical field. They can be used for the diagnosis of neuromuscular diseases, kinesiological studies, and human-machine interaction. However, these signals are difficult to process due to their noisy nature. To overcome this problem, a hybrid of wavelet with ensemble empirical mode decomposition pre-processing technique called WD-EEMD is proposed for classifying lower limb activities based on sEMG signals in healthy and knee abnormal subjects. First, Wavelet De-noising is used for filtering out white Gaussian Noise (WGN) and unwanted signals (contribution of other muscle signals). Next, an Ensemble Empirical Mode Decomposition is used for filtering out power line interference (PLI) and baseline wandering (BW) noises, followed by extraction of a total of nine time-domain features. Finally, the performance parameters of the Linear Discriminant Analysis (LDA) classifier are calculated with a 3-fold cross-validation technique. This study involves 11 healthy and 11 individuals with a knee abnormality for three different activities: walking, flexion of the leg up (standing), and leg extension from sitting position (sitting). Different pre-processing techniques similar to that of WD-EEMD were compared. It was observed that the proposed method achieves an average classification accuracy of 90.69% and 97.45% for healthy subjects and knee abnormal subjects, respectively.

Index Terms—Biomedical signal analysis, EMG classification, WD-EEMD, ensemble empirical mode decomposition, wavelet denoising, linear discriminant analysis, gait activities.



I. INTRODUCTION

KNEE problems are defined as a sensation of discomfort in the knee that are caused by lack of proper warm-up, poor form during physical activities, or osteoarthritis. According to [1], one out of every four individuals have joint symptoms or arthritis because of an underlying condition

such as degenerative arthritis of the knee. The knee joint is a synovial joint that is formed with several surrounding structures, including ligaments, bones, cartilage and tendons, to perform its functions [2]. Any external harm to any of these can result in knee abnormality [3]. Knee osteoarthritis, cerebral palsy are some knee abnormalities that cause knee pain and reduce the quality of daily life of a person [4], [5].

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Ankit Vijayvargiya and Rajesh Kumar are with the Department of Electrical Engineering, Malaviya National Institute of Technology Jaipur, Jaipur 302017, India (e-mail: ankitvijayvargiya29@gmail.com; rkumar.ee@mniit.ac.in).

Vishu Gupta is with the TensaX Innovation Lab, Jaipur 302017, India (e-mail: vishu.gupta0607@gmail.com).

João Manuel R. S. Tavares is with the Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial, Departamento de Engenharia Mecânica, Faculdade de Engenharia, Universidade do Porto, 4200-465 Porto, Portugal (e-mail: tavares@fe.up.pt).

Nilanjan Dey is with the Department of Computer Science, JIS University, Kolkata, West Bengal 700109, India (e-mail: neelanjan.dey@gmail.com).

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Assistive devices can be used to enhance the quality of the daily life of an unhealthy person. These devices are categorized into: orthosis and prosthesis. The prosthesis is an artificial limb for a missing body part while orthosis is used to improve the functionality of moving body parts for weak person. These devices are also classified based on power: active and passive. An active assistive device uses a power source to activate the actuators while a passive device has no power source. So, automatic control is possible with active devices while passive devices cannot be similarly controlled. As usual, the active devices could be body-powered, or electric-powered. Electric-powered lower limb assistive devices have been widely used, and may be operated by a pressure resistor, strain gauge, micro-switch, electroencephalogram signals (EEG), electromyogram signals (EMG), etc. In recent years, EMG signals have widely been



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Low-cost novel designed receiver heat exchanger for household solarized cooking system: development and operationalization

Hemant Raj Singh ^{a, b, g, ✉}, Dilip Sharma ^b, Dinesh Kumar Sharma ^{b, c}, Sonali Chadha ^d


^a Manipal University Jaipur, Rajasthan 303007, India




^b Malaviya National Institute of Technology Jaipur, Rajasthan 302022, India

^c SKIT, Rajasthan 302022, India

^d JECRC, Rajasthan 302022, India

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Abstract

Solar energy is widely regarded as the most promising renewable energy source available, and it is used for a variety of purposes. Out of various applications of solar energy, it has predominantly been suggested for cooking in the last three to four decades. High cost and non-customer focus design of the solar cooker is predominantly suggested as it acts as a barrier to actualization of solar cooking as a usual cooking practice. To keep in mind, this paper presents a proposed part design of a custom ^{ized solar}

FEEDBACK 



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Study on some aspects of adoption of Solar Cooking System: A review

Hemant Raj Singh ^{a, b} ✉, Dilip Sharma ^b, Rahul Goyal ^a, Dinesh Kumar Sharma ^{b, c}, Sonali Chadha ^d

^a Manipal University Jaipur, Rajasthan 303007, India

^b Malaviya National Institute of Technology Jaipur, Rajasthan 302017, India

^c SKIT, Rajasthan 302017, India

^d JECRC, Rajasthan 302022, India

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Abstract

In developing and under-developed nations, the cooking industry is one of the most energy-intensive industries. Although cooking methods have been vastly improved, society has depended heavily on biomass for its kitchen needs since the dawn of civilization. Innovative cooking technology (methods) is now becoming progressively common because of the negative effects and energy wastages in traditional biomass cooking systems. Because of our reliance on rapidly depleting fossil fuels, we have been pressured to turn to alternative energy sources, and solar energy is often the best solution due to its

FEEDBACK

Design of Wearable UWB Microstrip Patch Antenna for Breast Cancer Tumor Detection

Monika Mathur¹, Harshal Nigam², D.Mathur³, G. Singh³, S K Bhatnagar⁴, Mukesh Arora⁵

^{1,2,5,6} Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur

³Rajasthan Technical University, Kota

⁴Malviya National Institute of Technology, Jaipur

ABSTRACT

A novel approach to detect breast cancer tumor is proposed in this paper. The UWB antennas are designed in the frequency range 3.3-10.6 GHz. The antennas show a return loss S_{11} less than -10 dB for the UWB frequency range and a maximum gain of 3.49 dB in this range. The designed UWB antennas can be placed on both sides of breast such that the signal scattered by the breast tumor can be detected by the receiving antenna. A breast model is designed which is simulated with UWB antenna on both sides. The variation of E field, H field and current density is shown with and without tumor for various position and size of the tumor. The difference between these values will detect the presence of tumor. The SAR is also simulated for different frequencies in UWB range with variation in size and position of the tumor. The simulated results can be observed and the presence of tumor can be detected.

Keywords:

E-field, H-field, SAR, Tumor, Ultra-Wide Band

1. Introduction

Breast cancer is a major cause of death among women nowadays [1]. It should be detected at a very early stage so that it can be treated otherwise the conditions can be very severe. It is basically a cell that grows very fast, the cancer cells can go to other parts of body also and affect them, these cells become longer and uncontrolled thus it becomes a tumor [2-3]. There are traditional methods to detect the cancer like ultrasound, X-ray, MRI, microwave imaging [4-5] but all these methods have certain restrictions and there is a need of such devices which can be implanted in the breast and which detect as soon as a tumor starts growing in the breast tissues. There can be a transmitting and receiving antenna. The transmitting antenna transmits electromagnetic signal which travels through skin, breast tissues and fat layers while the receiving antenna receives the scattered waves. The presence of tumor will affect the received signal on receiving antenna, thus it can be detected. [6-7] The scattered signal in the presence of tumor as compared to a normal breast will vary thus detecting the tumor presence. There are many approaches to detect the tumor in literature. The UWB is nowadays of great interest in biomedical applications [8-10]. The UWB antennas should be planar, compact with high radiation efficiency over the whole band. In this paper, a compact UWB antenna is designed, the antenna works for the entire UWB range which is obtained by using a partial ground plane. The designed UWB antennas are placed in a cover that can be worn such that the two UWB antennas are placed on both sides of breast. The transmitting and receiving antennas work in pair, the breast model is designed and it is simulated with antennas on its both sides. The electrical parameters including E field, H field current density and SAR values are simulated. The results are compared with and without tumor and this approach can be used for tumor detection. The variation in results with size and positions of tumor is also discussed.



Plasmonic Grating-Based Refractive Index Sensor with High Sensitivity

Hardik Mathuriya¹, Rukhsar Zafar² and Ghanshyam Singh³

¹Department of Electronics and Communication Engineering, Malviya National Institute of Technology, Jaipur, India; ²Department of Electronics and Communication Engineering, Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur, India; ³Department of Electronics and Communication Engineering, Malviya National Institute of Technology, Jaipur, India

ABSTRACT

This paper proposes a plasmonic grating-based Refractive index sensor. A defect region is set up in the plasmonic grating. A special transmission mode near $\lambda = 1550$ nm is excited in the stop band of the plasmonic grating. When a nano-metallic slit is introduced in the defect region, a special resonance phenomena, Fano resonance, emerges. The tuning of Fano resonance can be observed by engineering the structural parameters of the device. The sensing principle is analyzed through the numerical investigation FDTD (Finite difference in time-domain) method. This sensor's performance is quantified using sensitivity. The proposed sensor reports high sensitivity ($S = 1250$ nm/RIU) with an ultra-narrow line width of 10 nm. The study opens a means for the designing of on-chip optical sensors that will be viable in bio-sensing and chemical sensing.

KEYWORDS

Fano resonance; line-width; plasmonic grating; sensitivity

1. INTRODUCTION



The technological advances in the recent era have expanded the range of functionalities for integrated photonic circuits. A new branch of Photonics, Plasmonics, proves to be quite helpful in realizing optical integrated circuits. Plasmonics deals with the basic phenomenon of Electromagnetic (EM) interaction with metals [1–3]. This phenomenon can be broadly divided into two categories owing to the geometry of metal. One is related to propagating plasmons *i.e.* Surface Plasmon Polariton (SPP) and the other is related to non-propagating plasmons *i.e.* Localized Surface Plasmon. SPP is an EM wave that propagates along with the interface between a noble metallic portion and dielectric. It has a unique property of sub-wavelength confinement of light [4, 5]. It has promoted the advancement of ultra-compact photonic integrated devices. These waves originate due to interaction of the incident electromagnetic fields with the oscillations of electron plasma in the metal. To support wave-guiding feature in SPPs, two waveguide geometries are used: insulator–metal–insulator (IMI) and metal–insulator–metal (MIM). The former is characterized by less loss and longer length of propagation, but has the demerit of poor light confinement [6–9]. The latter overcomes the mentioned shortcoming and confines the light beyond the diffraction limit [10–12]. This waveguide also offers smaller amounts of losses. Owing to all the merits of MIM waveguide, it is considered as an optimum choice for designing photonic integrated circuits.

An optical filter is an integral part of any photonic integrated circuit. Lin *et al.* proposed multiple teeth-shaped plasmonic filters using MIM waveguide [13]. Also, Neutens *et al.* numerically and experimentally demonstrated filtering operation using plasmonic grating [14]. When it comes to the filtering operation, the quality factor and Full width at half maximum (FWHM) are critical parameters for performance measurement. Fano resonance is considered as one of the promising solutions for better filtering operation as it exhibits an asymmetrical response with very abrupt phase change [15, 16] and, therefore, it offers high-quality factor Q with narrow line-width (FWHM) [15]. Fano resonance is traditionally excited or observed in the region where the symmetry of the perfect photonic or plasmonic structure is marginally broken [15–17]. But, recently it is also reported that asymmetrical structure or symmetry breaking is not a necessary condition for Fano resonance. It will be observed in the region when there is interplay between dark (sub-radiant) mode and bright (super-radiant) mode *i.e.* Fano resonance is excited due to resonant interaction between super-radiant broad or bright (continuum) mode and sub-radiant narrow (discrete) mode [17–19]. Due to this intriguing feature of Fano resonance of having a narrow line-width, it's quite appealing in different applications such as switching [20], sensing [18], gates [21], etc.

This paper also presents a Plasmonic grating-based sensor in which Fano resonance is excited. A defect region is

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Optimization of sliding and mechanical performance Ti/Ni metal powder particulate reinforced Al 6061 alloy composite using preference selection index method

Ashiwani Kumar ^a  , Mukesh Kumar ^b, Amar Patnaik ^b, M.J. Pawar ^c, Akhileshwar Pandey ^d, Anil Kumar ^e, Vikas Gautam ^f

^a Mechanical Engg. Dept., Feroze Gandhi Institute of Engg. & Tech., Rae Bareilly, U.P. 229316, India

^b Mechanical Engg. Dept., Malaviya National Institute of Tech., Jaipur, Rajasthan 302017, India


^c Mechanical Engg. Dept., K.J. Somaiya College of Engineering, Mumbai 400007, India




^d Mechanical Engg. Dept., Government Engineering College, Bharatpur 321001, India

^e Mechanical Engg. Dept., Kamla Nehru Institute of Technology, Sultanpur 228118, India

^f Mechanical Engg. Dept., Swami Keshvanand Institute of Technology Management & Gramothan, 302021, India

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Abstract

In this study, Ti/Ni reinforced in AA6061 composites were prepared via a high vacuum stir casting method. The fabricated composite specimens are prepared for experimental studies as per ASTM standard and then physical, mechanical, and sliding wear characterization was conducted on different equipment. The higher confidence level (95%) obtained via experimental studies. The experimental results of the specimen have been used for optimization, and the ranking order of composite are computed via using the preference selection index method. Many researchers' results have been reported and easily computed to rank of composite composition using optimization properties such as void contents, density flexural strength, tensile strength, impact strength, wear resistance etc. The results reveal that the base matrix included with the equal presence of both particulates exhibits most excellent properties hence to obtained best ranked of

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


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Investigation on mechanical and tribological characterization of Gr filled AA7075 alloy composite using Taguchi method

Ashiwani Kumar ^a ✉, Mukesh Kumar ^b, Vikas Kukshal ^c, Akhileshwar Pandey ^d, M.J. Pawar ^e, Vikash Gautam ^f^a Mechanical Engineering Department, Feroze Gandhi Institute of Engineering and Technology, Raebareli 2299316, UP, India^b Mechanical Engineering Department, Malaviya National Institute of Technology, Jaipur 302017, Rajasthan, India^c Mechanical Engineering Department, National Institute of Technology, Uttarakhand, Srinagar, Garhwal 246174, India^d Mechanical Engg. Dept., Government Engineering College, Bharatpur 321001, India^e Mechanical Engg. Dept., K J Somaiya College of Engineering, Mumbai 400007, India^f Mechanical Engg. Dept., Swami Keshvanand Institute of Technology Management, Gramathan 302021, India

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Abstract

Current research work emphasis on the mechanical and tribological characteristics of the graphite reinforced AA7075 alloy composite. The samples were developed with various proportions (0, 1, 3, 5, and 7 wt%) of Gr particulate in Al alloy matrix using the high vacuum casting machine. The physical and mechanical characterization like density, void content, hardness, impact strength, flexural strength, and compressive strength were experimentally estimated. The dry sliding wear performance of the composite specimens was also estimated. The various samples were ranked based on the wear rate performance using the Taguchi method. The experimental results reveal

FEEDBACK 



[International Journal of Swarm Intelligence](#) > [2020 Vol.5 No.2](#)

Title: Application and development of improved meta-heuristic for making profitable bidding strategy in a day-ahead energy market under step-wise bidding scenario

Authors: Pooja Jain; Akash Saxena; Rajesh Kumar

Addresses: Department of Electrical Engineering, SKIT M&G, Jagatpura, Jaipur, Rajasthan, India ' Department of Electrical Engineering, SKIT M&G, Jagatpura, Jaipur, Rajasthan, India ' Department of Electrical Engineering, MNIT, Jaipur, Rajasthan, India

Abstract: In this paper, a hybrid model of whale optimisation algorithm (WOA) and sine-cosine algorithm (SCA), i.e., HWOASCA is proposed to solve optimal bidding problem of restructured power system with the aim of profit maximisation of generating company. First, HWOASCA algorithm is validated on 22 standard benchmark functions. After getting it supremacy over benchmark functions, it is verified on bidding problem of 7 GENCO's participating in an electricity market. By suggested approach, the optimal solution for market clearing price (MCP), load dispatch and tender cost under different capacity and price blocks are calculated. After meaningful comparison from other state of the art approaches, it is observed that the profit obtained by the proposed approach is significantly higher for single-hourly and multi-hourly trading trends. The mathematical and experimental results confirm the supremacy of proposed hybrid version of algorithm which is extremely useful for framing the bidding strategies for a generation company.

Keywords: strategic bidding; HWOASCA; whale optimisation algorithm; WOA; sine cosine algorithm; SCA; market clearing price; MCP.

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An efficient teaching-learning-based optimisation algorithm for the resource-constrained project scheduling problem

Dheeraj Joshi*

Department of Mechanical Engineering,
Swami Keshvanand Institute of Technology Management
and Gramothan,
Jaipur, India
and

Malaviya National Institute of Technology,
Jaipur, India

Email: dheerajjoshi25@gmail.com

*Corresponding author

M.L. Mittal and Manish Kumar

Department of Mechanical Engineering,
Malaviya National Institute of Technology,
Jaipur, India

Email: mlmittal.mnit@gmail.com

Email: m81manishkumar@gmail.com

Abstract: This work proposes a teaching-learning-based optimisation algorithm as an alternative metaheuristic to solve the resource-constrained project scheduling problem (RCPSPP). A precedence feasible activity list is employed for encoding the solutions whereas serial schedule generation scheme (SGS) is used as the decoding procedure to derive the solutions. In order to have good initial population, we employ a regret-based sampling method with latest finish time (LFT) priority rule. In addition to teacher and learner phase in basic TLBO, the proposed work also applies two additional phases namely *self-study* and *examination* for improving its exploration and exploitation capabilities. The algorithm is tested on well-known instance sets from literature. The performance of the algorithm is found to be competitive with the existing solution approaches available to solve this problem.

Keywords: resource-constrained project scheduling; teaching-learning-based optimisation algorithm; metaheuristics.

Reference to this paper should be made as follows: Joshi, D., Mittal, M.L. and Kumar, M. (2020) 'An efficient teaching-learning-based optimisation algorithm for the resource-constrained project scheduling problem', *Int. J. Industrial and Systems Engineering*, Vol. 34, No. 4, pp.544–561.

Biographical notes: Dheeraj Joshi is an Associate Professor in the Department of Mechanical Engineering, Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur, India. He is also a Research Scholar at the Department of Mechanical Engineering in Malaviya National Institute of Technology Jaipur, India. He received his BE and ME in Production and



A survey – Energy harvesting sources and techniques for internet of things devices

Pooja Choudhary^a, Lava Bhargava^a, Virendra Singh^b, Manju Choudhary^a, Ashok kumar Suhag^c

^a Department of Electronics and Communication Engineering, MNIT Jaipur, 302017, India

^b Department of Electrical Engineering, IIT Bombay, 400076, India

^c Department of Electronics and Communication Engineering, BML Munjal University, 122413, India

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ABSTRACT

Internet of Things (IoT) is a broad platform where various technologies help everyday devices to become smarter, more informative, communicative and intelligent. IoT devices need batteries to be powered and the lifetime of batteries is limited. Due to which there is a huge demand for energy sources that are competent enough to power IoT devices. Energy harvesting, accumulating and converting surrounding energy into usable energy, has emerged as a strong alternative to power devices. This paper discusses the need for harvesting the energy that arose in IoT devices. The methodology of different architectures and techniques used in energy harvesting systems can be improved by understanding the survey on energy harvesting sources and techniques. The paper compiled various energy harvesting sources and techniques in tabular form which will act as a major input for researchers prior art pursuing in this field.

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1. Introduction

With every shift in our devices, IoT has become a widely spread technology. It has become a prominent need in our world. Due to IoT, there is a firm connection between the physical and digital worlds. It relies on the 3A concept: anytime, anywhere and any media. With the rapid development in IoT, it is expected that more than 20 billion devices will be connected to the internet. With growing demand, it is crucial for scientists and researchers to refine the characteristics of IoT like self-adapting, self-configuring, self-sustaining. IoT can be represented as a network of surrounding things that are connected to the internet such as vehicles, various sensors, devices that can communicate with each other directly or indirectly by sending/receiving data. An ample number of functional blocks are included in IoT devices to facilitate various services to other systems which require continuous monitoring, controlling, and identification, management, filtering and processing of data [1]. Most of the IoT devices are battery-powered. Batteries' main disadvantage is its limited life span and finite capacity to power devices. There are many solutions available but the most promising fuel to the next revolution is shifting

from battery-powered systems to self-powered systems. Technology that takes advantage of environmental or other sources e.g. solar, wind, kinetic energy, body heat, foot strikes etc. is called Energy harvesting. This harvested energy saves energy, increase the lifetime of the devices [2,6]. There are many papers discussing available energy, their management [39–41] and energy harvesting technologies [41,42]. However, there is a need to consolidate the sources, designs, and techniques for the efficient use of energy harvesting in devices.

The paper is organized as follows. Section 2 covers energy harvesting architectures and associated techniques used. Section 3 focuses on different solar energy harvesters available for various applications. Section 4 gives a deep insight view of energy harvesting sources. There is also a discussion on the different energy sources and energy harvesting techniques in tabular form. Finally there is a conclusion in Section 5.

2. Energy harvesting techniques and harvesters

Various energy harvesting architectures are classified into 1. Harvest-store-use 2. Harvest-use [3].

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REVIEW ARTICLE

Zero Accident Vision: Literature Review and Future Directions in Indian Context

Jai Narain^a, Yogesh Mishra^b, Manoj Kumar Sain^c, M.L. Meena^d, G.S. Dangayach^e, P.N. Rao^{*f}^{a, b, d, e} Department of Mechanical Engineering, Malaviya National Institute of Technology, Jaipur, Rajasthan, 302017, India^c Department of Mechanical Engineering, Swami Keshvanand Institute of Technology, Management and Gramothan, Jaipur, India^f Department of Technology, University of Northern Iowa, Cedar Falls Iowa, USA

Abstract: Industrial accidents are grave mishaps that result in injuries and fatalities to people, and damage to property as well as environment. The impact of accident is exorbitant and a society has to pay for decades. In most of the developed countries, wellbeing of people and environment is a top priority. The noble mission for every nation should be to reduce the level of accident to "Zero" by adopting the Zero Accident Vision (ZAV) to prevent the same. The Zero Accident Vision is the spirit and commitment to create and ensure safe workplace and prevent significant accidents in order to achieve safety excellence. This review paper aims to explore the research work performed towards ZAV and to study the status of present safety regulatory mechanism in details, safety culture and awareness in the Indian context. In the first stage of study, a systematic review approach was adopted using Scopus database to explore past research on ZAV. In the second stage, various policy documents available from government regulatory bodies including their functions and adequacy of accident prevention have been studied. Literature revealed that no significant research has been carried out on ZAV in India. From the study of various policy documents, it is evident that the country is far behind to achieve the ZAV and it will require efforts from government, private and non-government organizations to reduce the same. The planned and phase wise efforts are needed to reduce the accidents and finally to achieve the ZAV. The Changes in national safety policy, various acts regulating the occupational health and safety are need to be amended suitably to incorporate the core values of ZAV. The mechanism of motivation by giving suitable grading to the industries adopting ZAV as vision in their safety policy need to be devised and followed.

Keywords: accident prevention, hazards, safety culture, safety management, zero accident vision.

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1. INTRODUCTION

Accidents are unforeseen events, which not only cause harm to human and environment, but also reduce the productivity of the nation. Initially it was deemed that the accidents are inevitable during the works, but now various theories established that all accidents could be avoided by establishing proper safety management system. As per the reports of the International Labour Organization (ILO), about 2.34 million deaths are caused by work-related problems every year. Among them, 321,000 are due to accidents whereas the remaining 2.02 million deaths are caused by various types of work-related diseases, which correspond to a daily average of more than 5,500. The ILO states "The inadequate prevention of occupational diseases has profound negative effects not only on workers and their families but also on society at large due to the tremendous costs that it generates; particularly, in terms of loss of productivity and burdening of social security systems". According to the International Social Security Association,

*Address correspondence to this author at the Department of Technology, University of Northern Iowa, Cedar Falls Iowa, USA; E-mails: posinasetti.rao@uni.edu

270 million workers meet non-fatal workplace accidents every year with 160 million new cases of occupational illnesses. The financial burden of compensation, health care, rehabilitation and invalidity is a huge amount, equivalent to four percent of world GDP. Moreover, in some developing countries, the cost is as high as 10 percent of GDP.

The costs of occupational accidents may not be measured only in financial term but can be better judged by grouping into three categories: direct costs, indirect costs, and human costs. Direct costs consist of medical costs. Direct cost data are usually quite easy to obtain and do not require the use of special estimation methods. Indirect costs are considered costs related to the lost opportunities for the injured employee, the employer, the co-workers, and the community. They consist mainly of salary, administrative costs, and loss of productivity. Comparison with direct costs, indirect costs are usually more difficult to measure and are

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Musculoskeletal health problems and relationship of risk factors among manual clay brick sector workers

Manoj Kumar Sain, M.L. Meena, G.S. Dangayach

Abstract PDF

Abstract

Adverse working conditions with prolonged awkward postures and traditionally designed hand tools result in musculoskeletal health problems among brick kiln workers. The occurrence of musculoskeletal problems depends on various physiological and work-related factors. The present cross-sectional study aims to determine the prevalent musculoskeletal health issues among 150 manual clay brick sector workers and the relationship of risk factors with these issues. Random sampling survey using modified Nordic questionnaire and postural assessment methods, rapid entire body assessment (REBA) and rapid upper limb assessment (RULA) were used for data collection. The association between prevalence of MSDs and risk factors was determined by binary logistic regression. Most prevalent musculoskeletal issues were found in shoulder (56.15%), wrist (50.77%) and lower back (50%) regions. Musculoskeletal issues were found to be associated with personal and work-related factors. The average REBA and RULA scores for all tasks indicated high postural risk. The outcomes of the study pointed out the need for ergonomic interventions to reduce the issues among kiln sector workers.

Keywords: brick, business, health, musculoskeletal, posture, regression, risk factors, workers

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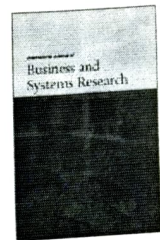
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