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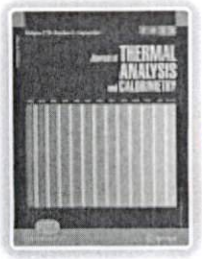

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Published: 13 January 2022

Effects of on MnO_2 nanoparticles behavior of a sardine oil methyl ester operated in thermal barrier coated engine

C. Sivakandhan, P. V. Elumalai, M. Murugan, A. Saravanan, P. S. Ranjit & Bhemuni Varaprasad

Journal of Thermal Analysis and Calorimetry **147**, 8919–8931 (2022)

Abstract

In the present study, an experimental investigation has been carried out with a single-cylinder four-stroke conventional engine using sardine oil methyl ester (SOME) and diesel with MnO_2 nanoparticle at different load conditions. MnO_2 nanoparticles of 25 ppm concentration were mixed with SOME and diesel with the aid of ultrasonication. Because of its long life and low heat conductivity, partly stabilized zirconium with a thickness of 0.5 mm is used as the coating material. Plasma spraying was used to coat the piston top face, as well as the inlet and outflow valves. MnO_2 has a lot of promise, as well as good physical and chemical qualities, and it reduces emissions in diesel engines. The outcome of results showed that the performance was improved while using nanoadditive along with SOME. Break Thermal Efficiency, rate of heat release, and in-

experimental investigation with enzymatic lipase based methyl esterified biodiesel. Heat Mass Transf und Stoffuebertragung. Heat and Mass Transfer; 2019;55:3613–31.

39. Elumalai, PV., Sivakandhan, C., Parthasarathy, M. et al. Investigation on the mitigation of environmental harmful emissions by incorporating nanoparticles to biofuel water nano emulsion in low heat rejection engine. Heat Mass Transfer; 2021;57:1235–1250. https://doi.org/10.1007/s00231-021-03028-z.

Author information

Authors and Affiliations

Department of Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni, Tamil Nadu, 625531, India

C. Sivakandhan

Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

P. V. Elumalai, A. Saravanan, P. S. Ranjit & Bhemuni Varaprasad

Department of Mechanical Engineering, Aditya College of Engineering and Technology, Surampalem, India

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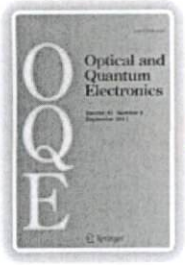

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Published: 09 January 2022

Antimonene-gold based twin-core SPR sensor with a side-polished semi-arc groove dual sensing channel: an investigation with 2D material

Shivam Singh & Yogendra Kumar Prajapati

Optical and Quantum Electronics **54**, Article number: 114 (2022)

Abstract

We propose surface plasmon resonance (SPR) based single-side polished photonic crystal fiber (SSP-PCF) sensor for low as well as high refractive index (RI) sensing. To achieve this, an active metal gold (Au) is deposited on the PCF's flat narrow channels to form a dual-sensing channel. Following that, a thin nanolayer antimonene is deposited on Au, as its buckled honeycomb lattice structure aids in the trapping of numerous biomolecules. For the sensing range of 1.27 to 1.39, numerical results show that the wavelength sensitivity (WS) and amplitude sensitivity (AS) mounted on 77,000 nmRIU^{-1} and 1320.41 RIU^{-1}, respectively, with wavelength resolution (RW), and amplitude resolution (RA), as high as 1.298×10^{-6} RIU, and 8.6×10^{-7} RIU. The promising results obtained from the proposed SSP-PCF sensor offers improved

sensors Sens. Actuators B, Chem. **202** 557–567(2014).

Zhu, C., Du, D., Lin, Y.: Graphene and graphene-like 2D materials for optical biosensing and bioimaging: A review. 2D Materials **2**, 032004 (2015)

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Author information

Authors and Affiliations

Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, 533437, India

Shivam Singh

Department of Electronics and Communication Engineering, Motilal Nehru National Institute of Technology Allahabad, Prayagraj, UP, 211004, India

Shivam Singh & Yogendra Kumar Prajapati

Corresponding author

Correspondence to Yogendra Kumar Prajapati.

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7 December 2021

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Sustainable Energy Technologies and Assessments
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Performance evaluation of artificial neural networks in sustainable modelling biodiesel synthesis

Mark Treve [a], Indrajit Patra [b], P. Prabu [c] ✉, S. Rama Sree [d] ✉, N. Keerthi Kumar [e] ✉, Yousef Methkal Abd Algani [f], B. Kiran Bala [g], S. Balaji [h]

[a] School of Languages and General Education, Walailak University, Thailand
[b] An Independent Researcher and Ex-research Scholar at NIT Durgapur, West Bengal, India
[c] Department of Computer Science, CHRIST(Deemed to be University),Bangalore, India
[d] Professor in CSE Dept., Aditya Engineering College, Surampalem, Andhra Pradesh, India
[e] Department of Mechanical Engineering, BMS Institute of Technology and Management, Avalahalli, Doddaballapur Main Road, Yelahanka, Bangalore 560064, India
[f] Department of Mathematics, Sakhnin College, Israel, Department of Mathematics, The Arab Academic College for Education in Israel-Haifa, Israel
[g] Department of Artificial Intelligence and Data Science, K. Ramakrishnan College of Engineering, Trichy, Tamil Nadu, India
[h] Department of CSE, Panimalar Engineering College, Chennai, Tamil Nadu, India

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Multimedia Tools and Applications (2022) 81:11605–11619
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Adaptive tamper detection watermarking scheme for medical images in transform domain

Prasanth Vaidya Sanivarapu[1]

Received: 20 April 2021 / Revised: 10 August 2021 / Accepted: 14 January 2022 /
Published online: 18 February 2022

Abstract

A novel robust tamper detection medical watermarking scheme is proposed in the transform domain for authentication and detecting tamper pixels of medical images. In this scheme, 2-level Discrete Wavelet Transform is applied to a significant image to produce four sub-bands (SB) ($C_{LL}, C_{LH}, C_{HL}, C_{HH}$). Coefficients of LL sub-bands are considered in embedding the watermark. The SB is partitioned into blocks to overcome image processing attacks. LSB is set to zero for each block and then Schur decomposition is applied in generating Authenticated Block Bits (ABB). In developing confusion to the intruders, the watermark is scrambled using Quantum Hilbert Image Scrambling. Watermarking helps in authentication and tamper detection of the significant image after tampering. The scheme is tested with image processing attacks for robustness. Peak signal to noise ratio (PSNR) and Normalized Cross-Correlation (NCC) metrics are utilized as metrics in evaluating the proposed scheme with PSNR greater than 30dB and NCC values nearer to 1 without attacks and even with attacks, NCC values are greater than 0.95, which shows the robustness of the proposed scheme.

Keywords Medical images · DWT · Tamper detection · Schur decomposition · Digital watermarking

1 Introduction

With the rapidly increasing number of electronic commerce websites and applications, intellectual property protection is a highly significant concern for content owners who exhibit digital representation of photographs, books, manuscripts, and original artwork on the internet [17]. Besides accessing the data it is easily manipulated with different types of tools available today. Digital data can be like a business, organizational, e-commerce, stock-market, and any multimedia data [32, 33]. Among all types of digital data, medical data has its own significance. Medical data consists of digital content like X-rays, CT scans,

✉ Prasanth Vaidya Sanivarapu
vaidya269@gmail.com

[1] Aditya Engineering College, Surampalem, India

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ORIGINAL ARTICLE

Fingerprint-based robust medical image watermarking in hybrid transform

S. Prasanth Vaidya[1]

Accepted: 7 January 2022

Abstract
To protect the medical images integrity, digital watermark is embedded into the medical images. A non-blind medical image watermarking scheme based on hybrid transform is propounded. In this paper, fingerprint of the patient is used as watermark for better authentication, identifying the original medical image and privacy of the patients. In this scheme, lifting wavelet transform (LWT) and discrete wavelet transform (DWT) are utilized for amplifying the watermarking algorithm. The scaling and embedding factors are calculated adaptively with the help of Local Binary Pattern values of the host medical image to achieve better imperceptibility and robustness for medical images and fingerprint watermark, respectively. Two-level decomposition is done where for the first level LWT is utilized and for the second level decomposition DWT is utilized. At the extraction side, non-blind recovery of fingerprint watermark is performed which is similar to the embedding process. The propounded design is implemented on various medical images like Chest X-ray, CT scan and so on. The propounded design provides better imperceptibility and robustness with the combination of LWT–DWT. The result analysis proves that the proposed fingerprint watermarking scheme has attained best results in terms of robustness and authentication with different medical image attacks. Peak Signal to Noise Ratio and Normalized Correlation Coefficient metrics are used for evaluating the proposed scheme. Furthermore, superior results are obtained when compared to related medical image watermarking schemes.

Keywords Medical image watermarking · Lifting wavelet transform (LWT) · Discrete wavelet transform (DWT) · Local binary pattern (LBP) · Non-blind watermarking · Electronic patient record (EPR)

1 Introduction

The corona virus COVID-19 pandemic is the defining global health crisis of our time and the greatest challenge we have faced since World War Two. The WHO formally declared the novel corona-virus severe acute respiratory syndrome corona-virus 2 [1]. To reduce the risk of person-to-person viral transmission during the COVID-19 pandemic, government introduced social distancing and other measures. Many hospitals have closed their doors to patients who have been trying to avail the facilities and doctors are not encouraged to meet the patient directly [7]. With all these considerations, now-a-days every doctor is meditating the patients through online only. Previously many metropolitan cities and multi-specialty clinics are only maintaining online data of patients reports and records. Due to the present situation, every doctor is asking the patients and hospital management to send the record online to diagnose the patient report. Transfer of medical records of patients over a communication channel is known as telemedicine. American Telemedicine Association (ATA) defined telemedicine as the medical data that are transferred from one location to another location through electronic communication channel for improving the patients health status [32]. During the communication channel, the patients data should not be corrupted or modified or morphed at the receiver side; it may lead to serious trouble to patient while diagnosis. For small hospitals, maintaining and storing Electronic Patient Record (EPR) is of great concern [25]. The EPR data containing patient details, like diagnosis, disease, treatment and so on, have to be maintained confidentially [35]. For this reason, security to the medical image is required, which can be achieved with watermarking tech-

✉ S. Prasanth Vaidya
vaidya269@gmail.com

[1] Department of Computer Science and Engineering, Aditya Engineering College (A), Surampalem, Andhra Pradesh 533437, India

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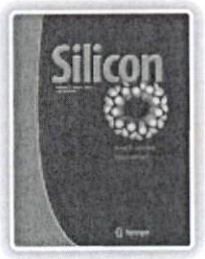

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Mobile FD-CR with High-Speed VTFET CMOS SOI Switch Under Channel Estimation Error

Ashish K. Rao, Santoshkumar Sabat, Neelam Srivastava & Rajiv K. Singh

Silicon (2022)

Abstract

In this paper, Silicon-on-Insulator vertical TFET based CMOS high-speed switch is implemented on Full-duplex Cognitive Radio (FD-CR), and the impact of cognitive radio (CR) node mobility on the performance of a full-duplex (FD) system is investigated under imperfect channel estimation. In this regard, a vertical SOI CMOS structure is designed, and its performance parameters are investigated, and then it is employed in the FD system. The mobile CRs are considered, and the channel between primary transmitter (PT) and CRs is time selective due to node mobility. Jake's model is used to model CR node mobility. Here, the energy detection (ED) technique is used for spectrum sensing. The expressions for the false alarm and detection probabilities have been obtained, considering the sensing and residual self-interference (RSI) channel as Nakagami-m

material gate vertical T-shaped tunnel FET. Silicon 13:1139–1150

Author information

Authors and Affiliations

Department of Electronics Engineering, Institute of Engineering and Technology, Lucknow, Uttar Pradesh, India

Ashish K. Rao, Neelam Srivastava & Rajiv K. Singh

Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, India

Santoshkumar Sabat

Contributions

All authors have equally participated in preparing the manuscript during the implementation of ideas, findings, results, and manuscript writing.

Corresponding author

Correspondence to Santoshkumar Sabat.

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All procedures performed in studies involving human participants were in accordance with the ethical standards.

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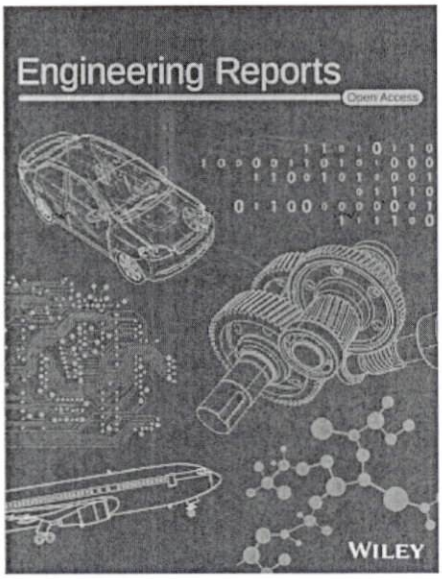

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International Journal of Communication Systems / Volume 35, Issue 7 / e5099

RESEARCH ARTICLE

Transmit antenna selection strategies for spectrally efficient spatial modulation techniques

Vishnu Vardhan Gudla, Vinoth Babu Kumaravelu ✉, Asha S, Arthi Murugadass

Vishnu Vardhan Gudla
Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India

Jawaharlal Nehru Technological University Kakinada, Kakinada, East Godavari District, India

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cted to offer unprecedented amounts of spectral
n (SM) techniques have the capability to achieve
onflicting design parameters. Fully generalized SM (FGSM) and fully quadrature SM (FQSM) are the recent high-rate SM variants, where the spectral efficiency is linearly proportional to the number of transmit antennas. The transmit antenna selection schemes can efficiently improve the average bit error rate (ABER) performance of SM techniques. The main objective of this work is to investigate the employment of transmit antenna selection schemes to FGSM and FQSM. Initially, Euclidean distance optimized antenna selection (EDAS) scheme is employed to FGSM and FQSM. It offers superior performance than conventional FGSM/FQSM without transmit antenna selection at the cost of higher computational complexity. In order to reduce the complexity cost, four suboptimal schemes based on channel capacity, correlation and combination of them are proposed and employed to FGSM and FQSM. The suboptimal transmit antenna selection based on capacity and correlation (TAS-A-C) offers a minimum gain of ~6 dB over conventional FGSM/FQSM with significantly lower complexity. In addition, the performance of all schemes is investigated for increased number of available transmit antennas. As the proposed schemes address the spectral and energy efficiency trade-off effectively, while corroborating better ABER performance, they have the potential to become a competing candidate for next-generation networks.

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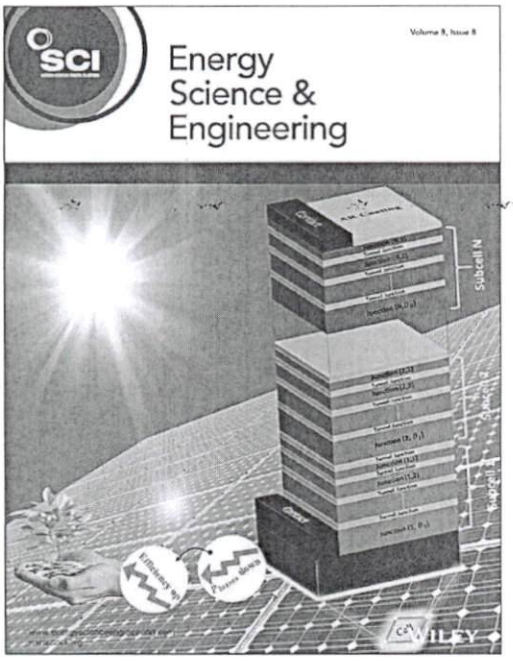

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Influence of cobalt chromium nanoparticles in homogeneous charge compression ignition engine operated with citronella oil

N.S. Senthur, C Anand, M Ramesh Kumar, P.V. Elumalai, Mohamed Iqbal Shajahan, Ali Cemal Benim, Emad Abouel Nasr, H.M.A. H

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CORRESPONDING AUTHOR
P.V. Elumalai
elumalaimech89@gmail.com

orcid.org/0000-0002-7536-8200

Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

Correspondence

N.S. Senthur, Department of Mechatronics, Bharath Institute of Higher Education and Research, Chennai, 600073, Tamil Nadu, India.

Email: senthur.ns@gmail.com

P.V. Elumalai, Department of Mechanical Engineering, Aditya Engineering College, Surampalem 533437, Andhra Pradesh, India.

Email: elumalaimech89@gmail.com

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Abstract

Stringent emission standards and gr o develop an advanced combustion technology on; HCCI) useful in internal combustion engine d through transesterification process v e CI engine. Cobalt chromium nanoparti m with the help of an ultrasonicator. The preser d to analyze various performance (brake fuel consumption (BSFC)), combustion (p mission (unburnt hydrocarbon (UBHC), CO, N gine with neat diesel, CBD 5% (citronella biodi iodiesel 10% + 90% diesel), CBD 15% (citrone tronella biodiesel 20% + 80% diesel), and CBD diesel +30 ppm cobalt). To carry out the ex 5.2 kW, 1500 rpm, single-cylinder, four-strok Nanoparticles were used to improve , and heat transfer rate within the oil layer en better results than the other citronella bioc treased the BTE and HRR by 5.49% and 6.8% y and greater cetane number of the fuel. T d smoke was decreased by 33.33%, 34.32%, 5.1%, and 17.34%, respectively, compared to neat biodiesel in the HCCI engine at 80% load.

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Research Article

Horse herd optimization algorithm for economic dispatch problems

Subhamay Basu, Sajjan Kumar & Mousumi Basu

Received 24 Feb 2021, Accepted 29 Nov 2021, Published online: 03 Mar 2022

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Abstract

This article applies the horse herd optimization (HHO) algorithm to convoluted economic dispatch (ED) problems. HHO mimics the social behaviour of horses of different ages using six significant traits: grazing, hierarchy, sociability, imitation, defence mechanism and roam. The efficacy of the HHO method is demonstrated on five different ED problems, namely, valve-point effects, prohibited feasible area, ramp rate limits and multiple fuels. The simulated outcomes of the recommended method are comparable to those obtained by established artificial intelligence methods. Comparative and statistical analyses demonstrate that the proposed HHO algorithm performs well and can produce superior results to some other well-

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Research Article

Horse herd optimization algorithm for economic dispatch problems

Subhamay Basu | Sajjan Kumar

Received 24 Feb 2021,

b Department of Electrical & Electronics Engineering, Aditya Engineering College (A), Surampalem, India

https://orcid.org/0000-0002-7321-278X

Abstract

This article applies the horse herd optimization (HHO) algorithm to convoluted economic dispatch (ED) problems. HHO mimics the social behaviour of horses of different ages using six significant traits: grazing, hierarchy, sociability, imitation, defence mechanism and roam. The efficacy of the HHO method is demonstrated on five different ED problems, namely, valve-point effects, prohibited feasible area, ramp rate limits and multiple fuels. The simulated outcomes of the recommended method are comparable to those obtained by established artificial intelligence methods. Comparative and statistical analyses demonstrate that the proposed HHO algorithm performs well and can produce superior results to some other well-known and established algorithms, namely, differential evolution (DE), success-history based adaptive differential evolution with linear population size reduction

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Autonomous detection of malevolent nodes using secure heterogeneous cluster protocol

C. Kotteeswaran [a], Indrajit Patra [b], Regonda Nagaraju [c], D. Sungeetha [d], Bapayya Naidu Kommula [e], Yousef Methkal Abd Algani [f, g], S. Murugavalli [h], B. Kiran Bala [i]

[a] Department of CSE, Sri Indu College of Engineering and Technology, Sheriguda, Ibrahimpatnam, Rangareddy District, Hyderabad 501510, India
[b] NIT Durgapur, West Bengal, India
[c] Department of Information Technology, St.Martin's Engineering College, India
[d] Department Electronics and Communication Engineering, Saveetha School of Engineering, SIMATS, Chennai, India
[e] Department of EEE, Aditya Engineering College, Surampalem, India
[f] Department of Mathematics, Sakhnin College, Israel
[g] Department of Mathematics, The Arab Academic College for Education in Israel-Haifa, Israel
[h] Professor and Head, Department of CSE, Panimalar Engineering College, Chennai, Tamil Nadu, India
[i] Department of Artificial Intelligence and Data Science, K.Ramakrishnan College of Engineering, Trichy, Tamil Nadu, India

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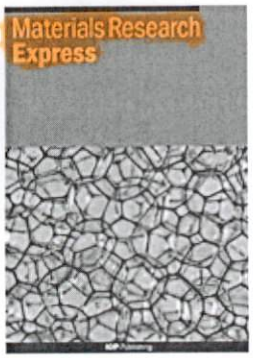

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Materials Research Express

PAPER

Effects of asna fibre reinforced with epoxy resin with and without steel wire mesh and simulation of car bumper

P V Elumalai[1,2,*], N R Dhineshbabu[2,3], Pragna Varsala[1,2], S Anjani Devi[1,2], Adduri S S M Sitaramamurty[1,2], C Ahamed Saleel[4] and Nasim Hasan[5,*]

[1] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India
[2] Jawaharlal Nehru Technological University Kakinada, Kakinada, East Godavari District, Andhra Pradesh, India
[3] Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India
[4] Department of Mechanical Engineering, College of Engineering, King Khalid University, PO Box 394, Abha 61421, Saudi Arabia
[5] Mechanical Engineering, Mettu University, Mettu, Oromia, PO Box 318, Ethiopia
* Authors to whom any correspondence should be addressed.

E-mail: elumalaimech89@gmail.com **and** nasim.hasan@mcu.edu.et

Keywords: hybrid fiber composites, steel wire mesh, SEM Analysis, material characteristics, ANSYS simulation

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Abstract

The utilization of natural fiber composites has been increased in replacing various parts in the automobile sector made up of synthetic fiber due to its degradability nature and environment friendliness. In this work, the naturally available Asna fiber was processed and the composites were prepared without and with steel wire mesh in various volume fractions (v_f) of the fiber. In the present experimental investigation, the influence of different composite on the thermal, mechanical, and water absorption characteristics. Various properties such as tensile, flexural and impact strength were tested for the multiple composites. Subsequently, a simulation model of a car front bumper was prepared using ANSYS to test it while defining the determined properties of the composites. The test results showed that when v_f was increased from 0.4 to 0.5%, the tensile and flexural were decreased by 0.72% and 59%, respectively, whereas impact strength was increased by 5.9% for the composite without wire mesh. The tensile and flexural strengths were decreased by 18.2%, whereas impact strength was increased by 1.6% for 0.5 v_f of the composite when steel wire mesh was added to the composite. The investigation of composite's thermal behavior showed that when the temperature range comes within 330 °C–370 °C, the composites started decomposing. Various images were captured using Scanning Electron Microscope to investigate the fibers' dispersion in epoxy polymers and its interfacial bonding. The simulation results showed that the bumper made up of the composite with wire mesh provides a better impact strength as compared to other composites and steel.

1. Introduction

At this moment, the thrive of utilizing natural fibers instead of synthetic fibers has been increased due to increasing environmental concerns. Animals, plants or geological processes produce natural fibers due to the presence of cellulose and protein in plant and animal fibers, respectively. It offers several advantages such as renewable and decomposable within a short span of time compared to synthetic fibers and thus exhibits an environmentally friendly characteristic. Natural fiber production results in the reduction in greenhouse gas emission and energy requirement as compared to the production of synthetic fiber such as glass fiber [1, 2]. Utilizing natural fiber provides the required property of a material to reinforcements such as recyclability, lower density, better strength, lower cost, non-toxic, required toughness, flexibility, ease to process, fatigue resistance and non-corrosive [3]. All these properties make natural fiber pose a great potential to substitute synthetic fibers to manufacture eco-friendly composites. Natural fiber composites, also known as bio-composites, can be utilized as insulation, the body of an automobile, noise-absorbing panels, furniture, building and body of

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A simple method for functionalization of polypyrrole-coated cotton fabrics by reduced graphene oxide for UV screening

Dhineshbabu N. R., Raghavendra Babu B., Arunmetha S., Arivanandan M. & Jayavel R.

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Abstract

Here, the modified Hummer's method was used to prepare reduced graphene oxide (RGO) nanostructures. The functional properties of the prepared RGO nanostructures were studied by using the X-ray diffraction method (XRD), and scanning electron microscopy (SEM). Using the *in situ* polymerization process, polypyrrole (PPy) was prepared. During polymerization, an ultrasound-assisted

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A simple method for functionalization of polypyrrole-coated cotton fabrics by reduced graphene oxide for UV screening

Dhineshbabu N. R. ✉ Babu B., Arunmetha S., Arivanandan M. &

a Centre for Nano Science and Technology, Anna University, Chennai, India;b Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, India

Correspondence
✉ babudhinesh2009@gmail.com
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Abstract

Here, the modified Hummer's method was used to prepare reduced graphene oxide (RGO) nanostructures. The functional properties of the prepared RGO nanostructures were studied by using the X-ray diffraction method (XRD), and scanning electron microscopy (SEM). Using the *in situ* polymerization process, polypyrrole (PPy) was prepared. During polymerization, an ultrasound-assisted coating process was used to coat the cotton fabrics. In addition, the Nafion@RGO composite mixture was deposited on the surface of PPy- coated cotton fabric by dip and dry method. The presence of cellulose crystal structure was confirmed by conducting a structural study of the coated and uncoated (UC) cotton fabrics. The

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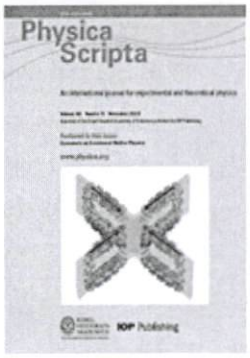

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PAPER

A comprehensive study of large negative dispersion and highly nonlinear perforated core PCF: theoretical insight

Shivam Singh[1], Anurag Upadhyay[5,2], Divya Sharma[3] and Sofyan A Taya[5,4]

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shivams20@gmail.com
anurag.upadhyay009@gmail.com
divya.fgiet@gmail.com
staya@iugaza.edu.ps

[1] Department of Electronics & Communication Engineering, Aditya Engineering College, Surampalem 533437, Andhra Pradesh, India

[2] Department of Applied Science & Humanities, Rajkiya Engineering College, Azamgarh, U. P., India

[3] Department of Electronics & Communication Engineering, Institute of Engineering and Technology, Lucknow, U.P., India

[4] Department of Physics, Islamic University of Gaza, PO Box 108, Gaza, Palestine †

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A designed setup of low-priced in-house goniometer/tensiometer

Zeeshan Ahmed [a], Ajinkya Sarode [b], Abhishek Kumar Tripathi [c], Satyajeet Parida [c], V.K. Singh [d]

[a] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh 53343, India
[b] Department of Mechanical Engineering, Indian Institute of Technology Gandhinagar, Gujarat 382355, India
[c] Department of Mining Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh 53343, India
[d] Thermal Engineering Division, Space Applications Centre, Ahmedabad, Gujarat 380015, India

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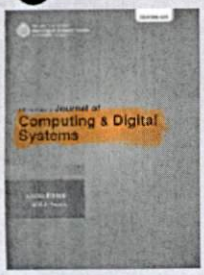
Abstract

In many educational institutes and industries, the contact angle and surface tension analysis are done to measure the quality of a solid surface and of a liquid. In order to determine these, the sessile and pendant droplet method are the most widely used methods, which are conventionally obtained using commercial goniometer/tensiometer. In view of the growing concern regardingcompact and inexpensive but accurate experimental devices, we have developed a low-priced in-house goniometer/tensiometer. This device has the benefit of easiness, compactness, and movability over the conventional measurement instruments. In this study, we have used the commercial Drop image advanced as well as the Drop analysis plugin in ImageJ with high quality sharp edges images to compute static contact angle and



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A Qualitative Report on Diffusion b ased I mage Inpainting Models

Sridevi Gamini[1] and S. Srinivas Kumar[2]

[1]*Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India*
[2]*Department of Electronics and Communication Engineering, Jawaharlal Nehru Technological University, Kakinada, India*

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Abstract: Diffusion equations have been successfully applied in the field of digital image processing for the past twenty years, describing the random motion of the particles in physics. Image inpainting is a significant research problem in the image processing. Its main intent is to complete the unknown parts of the image from the knowledge of known parts of the image. This research problem can be used to restore damaged photograph, random loss of wavelet coefficients during transmission, superimposed text, noise, and/or blur. According to available models on digital image inpainting, this paper attempts to make an outline of state-of-the-art diffusion based image inpainting models with corresponding mathematical representation. We also compared the state-of-the-art diffusion based inpainting techniques in terms of its main idea, type of distortion, strengths, and weaknesses.

Keywords: Inpainting, Diffusion, Variational methods, Partial Differential Equations, Fractional Calculus

1. Introduction

Digital image inpainting is a progressive and fascinating research topic in past few years where retouching and restoration of damaged regions is done in an indistinguishable form for anyone having no knowledge of the reference image. Inpainting is executed by professional artists in the fine art museums. They propagated the colors from the boundary into the damaged parts and filled in the gap [1], [2].

The professional artists are carried out this retouching work, which is exhaustive and subjective also consume more time. To replace the manual work, the computer graphics community is inspired to deal the work using graphics algorithms to recover the small damages and cracks in the digital images of ancient paintings and old photos. The examples of damaged images are presented in Figure 1.

Image inpainting is regarded as a branch of image restoration where image inpainting and the traditional restoration problems are different [1], [2]. In traditional restoration problems, such as haze removal and motion deblurring target region is damaged but not totally unknown. On the other hand, in the inpainting issues, information can only be inferred from the outside of the target region.

Inpainting has been developed throughout the past two decades. There are diverse applications of image like covering the scratch removal in the restoration of historical images [1], occlusions removal such as text, logos, and subtitles [2], lost blocks recovery in the transmission of wireless images [3], objects removal in image editing [4]. Other applications comprise of eliminating illustrations like location and orientation from medical, aerial, and military images.

Image inpainting approaches depend upon the source regions in the image used to complete the missing or unknown regions. These can be classified into four groups. These are diffusion based (generally called image inpainting) [1], [2], [3], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [26], [27], [28], [29], [30], [31], [32], [33], [34], [35], [36], [37] texture-based (generally called texture synthesis) [38], [39], hybrid- based [40], [41], [42], [43], and learning based image inpainting models [44], [45], [46], [47] (generally called image completion).

There is wide distinction between image inpainting, texture synthesis, and image completion, however all these are allied techniques. Many researchers handled these terms with the similar interpretation and for all the cases the inpainting term is used in general way. The main variations between these allied methods are the size of the missing part or unknown part to be recovered and the type of information to be filled in the missing part. The typical prerequisite of all the allied methods is the missing regions are to be known in advance.

E-mail address: sridevi_gamini@yahoo.com

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Paper

A reconfigurable integrated level shifted carrier based PWM method for modular multilevel converters

Aswini Kumar Muthavarapu, Anjana K. G., Jayanta Biswas, Mukti Barai

0.1002/tee.23606

Aswini Kumar Muthavarapu
Non-member

aswinikumarmuthavarapu@gmail.com

Electrical and Electronics Engineering, Aditya Engineering College (A), Surampalem, Andhra Pradesh, 533437 India

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egrated level shifted carrier-based pulse width
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Paper

A reconfigurable integrated level shifted carrier based PWM method for modular multilevel converters

Aswini Kumar Muthavarapu ✉, Anjana K. G., Jayanta Biswas, Mukti Barai ✉

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https://doi.org/10.1002/tee.23606

Abstract

This article presents a reconfigurable integrated level shifted carrier-based pulse width modulation (ILSC-PWM) method for modular multilevel converters (MMCs). The principles of basic level shifted carrier-based PWM (LSC-PWM) methods such as phase disposition PWM (PD-PWM), phase opposition disposition PWM (POD-PWM) and alternate phase opposition disposition PWM (APOD-PWM) methods are combined to develop the concept of reconfigurable ILSC-PWM method. The main objectives of the proposed reconfigurable ILSC-PWM method is to develop the pulse width modulated output voltage with both half-wave and quarter-wave symmetries and to reduce the total harmonic distortion (THD). A simplified mathematical approach is developed to formulate reconfigurable single ILSC wave for MMC with N number of submodules (SMs) per arm. The functionality and performance of the reconfigurable ILSC-PWM method are carried out on three-phase five-level MMC in MATLAB/Simulink. A hardware prototype of single-phase five-level MMC is designed for experimental validation. The proposed ILSC-PWM method is implemented on an Altera/Cyclone I series (EP1C12Q240C8N) field programmable gate array (FPGA). Computer Simulations and laboratory experimental results are presented.

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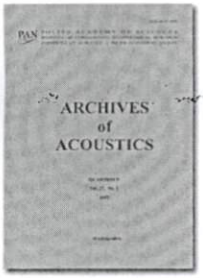

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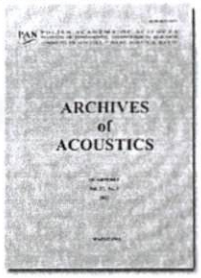
Acoustic Response of an Isotropic Beam Under Axially Variable Loads Using Ritz and Rayleigh Integral Methods

Somi Naidu BALIREDDY
National Institute of Technology Karnataka Surathkal, Mangalore India

Jeyaraj PITCHAIMANI
National Institute of Technology Karnataka Surathkal, Mangalore 575 025 India

Lenin Babu MAILAN CHINNAPANDI
Vellore Institute of Technology Chennai, Tamilnadu 600 127 India

V.S.N. Reddi CHINTAPALLI
Aditya Engineering College, Surampalem, Andhra Pradesh India



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Vibro-acoustic response of an isotropic beam under the action of variable axial loads (VALs), is presented in the study. Effects of six different types of VALs and three types of end conditions on buckling, free vibration and sound radiation characteristics are investigated. Static buckling and free vibration behaviours using shear and normal deformable theorem and Ritz method. However, the forced vibration response is evaluated using modal superposition method and the acoustic radiation characteristics are obtained using Rayleigh integral. The nature of variation of VALs and end conditions are influencing buckling and free vibration characteristics remarkably. Results indicate that the acoustic response is highly sensitive to the nature of VAL and intensity of the VAL. In general, sound power at resonance decreases when the magnitude of VAL is increased.

Keywords: Ritz method; variable axial load; buckling; vibration; sound radiation.

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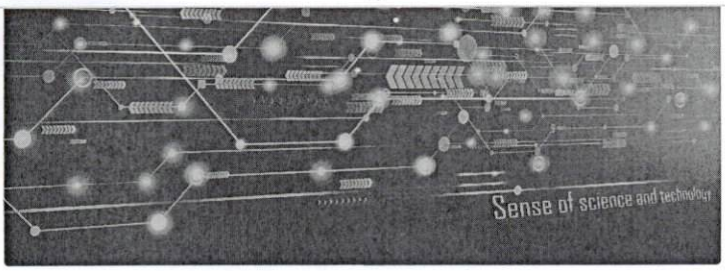

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Original Article

An Efficient Android Malware Detection Framework with Stacking Ensemble Model

A. Lakshmanarao[1,2], M. Shashi[2]

[1]*Department of IT, Aditya Engineering College, Surampalem, India.*
[2]*Department of CS&SE, AU College of Engineering, Andhra University, Visakhapatnam, A.P, India.*

laxman1216@gmail.com

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Abstract *- Due to the increased frequency of cyber-attacks with various targeted objectives, cyber security has become a major concern for society. Android phones being the most widely used devices, they are targeted in most of the attacks with malware. So, it is vital to explore innovative ways of identifying Android Malware attacks. Machine learning and deep learning have been employed to develop classifiers to determine if an app is malware or benign. Android apps are represented by a set of attributes that can describe their behaviour. This paper proposes a stacking ensemble model for detecting Android malware. The proposed framework is designed with two variants of stacking ensemble: blending and stacking. The dex files of android apps are extracted and translated into images. Later, a stacking ensemble is applied to the image dataset. Convolutional Neural Networks are used as base learners, and a Support Vector Machine is used as a meta learner. The experimental results of modelling with blending and stacking showed 99% and 98.3% accuracy, which advocates support of the proposed framework for Android malware detection.*

Keywords - *Android malware detection, CNN, Stacking Ensemble, SVM.*

1. Introduction

The number of attacks on mobile devices appears to increase unprecedentedly. More than 14.4 million attacks on mobile phones were recorded worldwide in the second quarter of 2021 only from a single antivirus (Kaspersky reports) firm [1]. Android has a dominant position in the smartphone market. However, this success has a downside as more per cent of mobile malware targets Android phones for stealing money or personal information. Attackers could use various Android development platforms to create malicious mobile apps. Infecting users' mobile devices with malicious software might have severe implications. Despite Google Play's numerous measures to keep dangerous apps out, attackers continue to find their way onto the mobile devices and penalize unsuspecting victims. Therefore, Android malware is becoming a growing threat to businesses and individuals. Machine Learning is a field of computer science that deals with developing intelligent systems by integrating prior examples and making forecasts of future occurrences. Because of these properties are widely used in cybersecurity, such as intrusion detection and malware detection. Anti-malware solutions have focused on signature-based recognition, which requires prior knowledge of the malware in the form of a signature. Early identification of Android

Malware is essential to limit the negative effects. Malware analysis techniques are classified into static Analysis and dynamic Analysis. Static Analysis is the most frequently used and preferred method by many researchers due to its low computation complexity and ease of implementation. This method analyses the application's source code without running it on an emulator or a real device. The APK archive is first unpacked to collect methods, manifests, meta-data, and media assets to perform this. The app's source code format at this point is dex bytecode, which is difficult to work with. Therefore it can be decompiled to java code/Smali code to make it more readable and process-able. After the extraction of the mobile app, several static features can be extracted. Static features include android app permission features, opcode sequences in the apk, strings, Method API features, Component features, intent features, and system command features. The extracted app does not contain all these features directly. Various tools can be used to extract all these features. In dynamic Analysis, the app is run in an isolated environment where it is feasible to obtain as much data as possible on the app's activity. In this method, additional features are extracted from the app's network traffic, sequence of events happening in the app execution, log behaviours, API monitoring etc. The authors proposed a stacking ensemble model with Convolutional Neural Networks and a Support Vector Machine for malware detection.

IEEE Transactions on Power Electronics

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Prof. Yaow-Ming Chen
Dept. of Electrical Engineering
National Taiwan University, Taiwan
ntuymchen@ieee.org

Meet the Editor

Prof. Yaow-Ming Chen
Dept. of Electrical Engineering
National Taiwan University, Taiwan
ntuymchen@ieee.org

Aims & Scope

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Subjects

An Efficient Sorting Algorithm for Capacitor Voltage Balance of Modular Multilevel Converter With Space Vector Pulsewidth Modulation

Publisher: IEEE

Aswini Kumar Muthavarapu ; Jayanta Biswas ; Mukti Barai All Authors

Abstract: Thisarticle presents an efficient analogue sorting algorithm for balancing the submodule (SM) capacitor voltages of modular multilevel converter (MMC). The proposed analo... **View more**

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Abstract:

Thisarticle presents an efficient analogue sorting algorithm for balancing the submodule (SM) capacitor voltages of modular multilevel converter (MMC). The proposed analogue sorting algorithm offers the advantage of fast convergence rate without any need of recursive loops for the implementation on embedded devices. It can be easily implemented with combinational logic operations on field programmable gate array (FPGA) and provides less hardware and computational overhead. The functionality and performance of the proposed analogue sorting algorithm is evaluated with the simulation model of three phase five-level MMC in MATLAB/Simulink environment. The real time implementation of the proposed sorting algorithm with the SM capacitor voltage balancing strategy is implemented on Altera/Cylone - I (EP1C12Q240C8N) FPGA. A five-level continuous space vector pulsewidth modulation (CSVPWM) is realized on a PIC microcontroller (PIC18F452). A down-scaled model of single-phase five-level MMC is designed and constructed to investigate the reliable and stable operation of MMC with the proposed analogue sorting algorithm and SVPWM method. Simulation and experimental results are presented for validation.

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Aswini Kumar Muthavarapu
Electrical and Electronics Engineering Department, Aditya Engineering College (A), Surampalem, India

Jayanta Biswas
Department of Computer Science, Christ University, Bengaluru, India

Mukti Barai
Department of Electrical Engineering, National Institute of Technology, Calicut, Kozhikode, India

Contents

The modular multilevel converter (MMC) [1], [2] has become the most prospective and emerging multilevel voltage converter topology for high power applications due to its modularity, scalability, and excellent output performance. One of the major advantage of MMCs is the elimination of individual dc voltage sources that are required in most of the cascaded configuration of multicell converters [3]. High voltage conversion is achieved in MMC by stacking a large number of submodules (SMs) made up of half-bridges, full-bridges, or other classical power units together [4]. Fig. 1(a) illustrates the three-phase of MMC with each arm consisting of N number of SMs connected in series. The SMs are two terminal devices. A half-bridge SM as shown in Fig. 1(b) is considered for the proposed work due to its low losses and simpler in construction compared to the other SMs.

Authors

Aswini Kumar Muthavarapu
Electrical and Electronics Engineering Department, Aditya Engineering College (A), Surampalem, India

Jayanta Biswas
Department of Computer Science, Christ University, Bengaluru, India

Mukti Barai
Department of Electrical Engineering, National Institute of Technology, Calicut, Kozhikode, India

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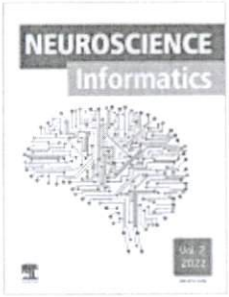

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Original Research Article

An investigation about the relationship between dysarthria level of speech and the neurological state of Parkinson's patients

Biswajit Karan [a, b], Sitanshu Sekhar Sahu [a], Juan Rafael Orozco-Arroyave [c, d]

[a] Department of Electronics and Communication Engineering, Birla Institute of Technology, Mesra, Ranchi, India
[b] Department of Electronics and Communication Engineering, Aditya Engineering Collegee(A) Surampalem, Andhra Pradesh, India
[c] Universidad de Antioquia, Medellín, Colombia
[d] Pattern Recognition Lab at the University of Erlangen, Erlangen, Germany

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https://doi.org/10.1016/j.bbe.2022.04.003

Abstract

Parkinson's disease (PD) is the most common neurological disorder that typically affects elderly people. In the earlier stage of disease, it has been seen that 90% of the patients develop voice disorders namely hypokinetic dysarthria. As time passes, the severity of PD increases, and patients have difficulty performing different speech tasks. During the progression of the disease, due to less control of articulatory organs such as the tongue, jaw, and lips, the quality of speech signals deteriorates. Periodic medical evaluations are very important for PD patients; however, having access to a medical appointment with a neurologist is a privilege in

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Volume 245, 15 April 2022, 123180

An optimal energy management among the electric vehicle charging stations and electricity distribution system using GPC-RERNN approach

B. Rajani [a], Bapayya Naidu Kommula [b]

[a] Department of Electrical and Electronics Engineering, Aditya College of Engineering & Technology, Surampalem, Andhra Pradesh, 533437, India

[b] Department of Electrical and Electronics Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, India

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Highlights

- The main role of this work is to produce maximum amount of energy with minimum cost.
- The proposed method minimizes the voltage and power losses on distribution systems.
- RERNN used to originate the quality-of-service constrained decision form for EVCSs.
- The GPC is utilized to rectify an optimization issues by equilibrium restrictions.

Overview

Aims and Scope

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Keywords

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Volume 219, Issue 12
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Research Article

Analysis of Band Alignment Engineering and Interface Defects on a GaAs/GaSb Heterostructure Solar Cell

Girija Shankar Sahoo, Guru Prasad Mishra

Girija Shankar Sahoo
Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, 533437 India

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In photovoltaic sector, optimal utilization of the solar spectrum combined with improved power conversion efficiency is the call of the day. Such elasticity is provided by heterostructure solar cells. But it is found that with a high lattice mismatch and band discontinuities, the open-circuit voltage (V_{oc}) and the fill factor deteriorates handsomely. As a result, the second requirement is still unsatisfied. To address such issues, band alignment engineering is introduced in this paper. Silvaco ATLAS is used to virtually create and verify the proposed model. Herein, different recombination events and their effects on the cell's V_{oc} are investigated in depth. Furthermore, interface trap defect is introduced to investigate its effect on the lower efficiency and V_{oc}. However, it is found that, in GaAs/GaSb heterostructures, the reduced V_{oc} and efficiency issues can be avoided, because the proposed model is able to achieve a lower trap density of 10^5 cm^{-2}.

Conflict of Interest

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Android Malware Detection with Deep Learning using RNN from Opcode Sequences

A. Lakshmanarao
Aditya Engineering College,Surampalem

M. Shashi
Andhra University, Visakhapatnam

DOI: https://doi.org/10.3991/ijim.v16i01.26433

Keywords: Android, Malware, Opcodes, Recurrent Neural Networks

ABSTRACT

Android is the most widely used operating system in smartphones. Mobile users can download and access apps easily from the play store. Due to lack of security awareness and risk associated with mobile apps, malware apps would be downloaded by normal users in general. The consequences after installing a malware app are unpredictable. Malware apps can gather user personal data, browsing history, user profiles, user sensitive data like passwords. Hence, android malware detection is essential for providing security to mobile users. Android malware detection using machine learning is done either by extracting static features (opcodes, permissions, intents, system commands) or by extracting dynamic features (log behavior, system calls, dataflow). In this paper, opcode sequences are extracted from malware and benign apps, and Recurrent Neural Networks are proposed on extracted sequences. Benign apps are collected from the play store, apkpure.com and malware apps are collected from the virus share website. The proposed Recurrent Neural Network model could achieve 96% accuracy for android malware detection.

AUTHOR BIOGRAPHIES

A. Lakshmanarao, Aditya Engineering College,Surampalem
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Anti pathogenic studies of new mixed ligand metal chelates

Sanivarapu, AK ; Babu, BK ; Anil Kumar, B ; Mohana Rao, K ; Ravichandra, G ; Swarnalatha, B

Abstract

Drug discovery aimed at the methodical extermination of life-threatening bacterial infection, especially considering the emergence of multi-drug resistance of pathogenic bacteria has remained a challenge for medicinal inorganic chemistry. In this article, the mixed ligand complexes of Cu (II), Co (II), and Ni (II) containing heterocyclic ligands were synthesized and characterized by IR, LC-MS, UV, and TG-DTA. Complexes are screened for Anti-microbial activity against human pathogenic bacteria.

Keyword(s)

Heterocyclic ligands and anti-microbial activity; Life-threatening bacterial infection; Mixed ligand complexes; Multi-drug resistance; Pathogenic bacteria

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There are currently no refbacks.

Indian Journal of Biochemistry & Biophysics
Vol. 59, February 2022, pp. 189-196

Anti pathogenic studies of new mixed ligand metal chelates

AK Sanivarapu[1,2], BK Babu[2]*, B Anil Kumar[2], K Mohana Rao[2], G Ravichandra[2] & B Swarnalatha[3]

[1]Department of Engineering Chemistry, AU College of Engineering; & [3]Department of Physics, AU College of Science and Technology, Andhra University, Visakhapatnam-530 003, Andhra Pradesh, India

[2]Department of H&BS, Aditya Engineering College, Surampalem-533 437, Andhra Pradesh, India

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Drug discovery aimed at the methodical extermination of life-threatening bacterial infection, especially considering the emergence of multi-drug resistance of pathogenic bacteria has remained a challenge for medicinal inorganic chemistry. In this article, the mixed ligand complexes of Cu (II), Co (II), and Ni (II) containing heterocyclic ligands were synthesized and characterized by IR, LC-MS, UV, and TG-DTA. Complexes are screened for Anti-microbial activity against human pathogenic bacteria.

Keywords: Heterocyclic ligands and anti-microbial activity, Life-threatening bacterial infection, Mixed ligand complexes, Multi-drug resistance, Pathogenic bacteria

In recent years, the world's mortality rate has increased due to multi -resistance to antibiotics in treating infectious diseases that are directly related to bacteria[1-3]. Therefore, there is a necessity to develop new Antibacterial drugs with excellent mechanisms and structural activity[4-6]. Numerous challenges encountered in antibiotic chemistry can overcome in bioinorganic chemistry[7]. Coordination chemistry of transition metals with biologically active ligands is important in metallo-enzymes and other biological activities[8]. In most cases, complexation of metal with ligands shows higher bioactivities than the free ligands[9] and drug resistance and some side effects are reduced[10]. Chelating ligands containing donor atoms like O, S, and N have high biocidal actions of the metal complexes[11-13]. When a metal ion chelates with ligands the polarity of the metal ion gets reduced appreciably, due to the overlap of ligand orbital and partial sharing of its positive charge with metal atoms. Hence the lipophilicity of the complexes increases due to delocalization of the π-electron on the chelating ring[14-15]. Consequently, the metal complexes easily penetrate into the cell membrane of microbes blocking the enzymes of organisms; in some cases, metal complexes also block the synthesis of proteins which restricts further growth of organisms. It has been found that mixed ligand complexes are more active biologically than the ligand itself hence they are used in fighting microbial infections[16-22]. This makes the researchers interested in the synthesis of mixed ligand complexes.

In this review various kinds of mixed ligand complexes are synthesized with metal atoms of Cu(II), Ni(II), Co(II) and ligands such as Riboflavin, Tyrosine, Arginine, Bipyridyl, Phenyl- acetic acid as primary ligands NCO, N_3 are selected as secondary ligands and focus is placed on antibacterial activities on six pathogens: *Shigella sonnei* NK4010 (Gram-negative), *Salmonella enterica serovar* C6953 (Gram-negative), *Aeromonas hydrophilla* DH1585 (Gram negative), *Vibrio cholera* 010 *gawa* CO855 (Gram negative), *Klebsiella pneumonia* MTCC109 (Gram negative), *Micrococcus luteus* MTCC106 (Gram positive).

Materials and Methods

Chemicals

All chemicals reagents and solvents are procured from renowned companies and were of analytical grade used as received without further purification.

Instruments

IR spectra are obtained with a Shimadzu IR Prestige 21 FT-IR spectrophotometer. Electronic spectra are recorded on LABINDIA UV3000+ UV/Vis spectrophotometer. LC-MS spectra are recorded on AGILANT QQQ (ESI-MS). Mass spectrometer. TG-DTA spectra are obtained using SDT Q600 V20.9 BUILD 20.

Synthesis of metal complexes

Riboflavin complexes

Coordination compounds of complexes 1 and 2 were prepared by the addition of 1 mM solutions of

*Correspondence:
E-mail: jacobkishore@gmail.com

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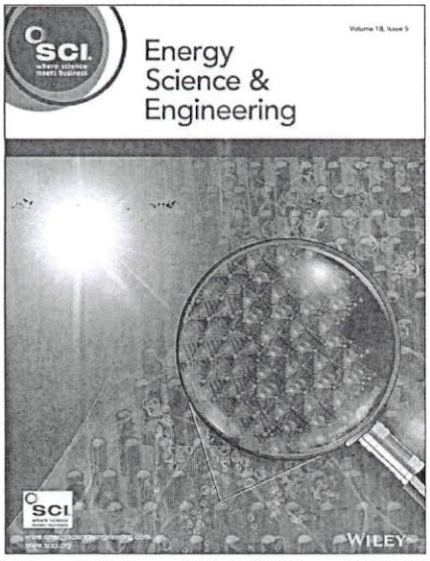

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ORIGINAL ARTICLE

Artificial neural networks model for predicting the behavior of different injection pressure characteristics powered by blend of biofuel-nano emulsion

P. V. Elumalai[1] | R. Krishna Moorthy[2] | M. Parthasarathy[3] | Olusegun David Samuel[4,5] | Hilary I. Owamah[6] | C Ahamed Saleel[7] | Christopher C. Enweremadu[5] | M. Sreenivasa Reddy[1] | Asif Afzal[8,9,10]

[1]Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

[2]Department of Mechanical Engineering, CK college of engineering and Technology, Kadalur, Tamil Nadu, India

[3]Department of Automobile Engineering, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Avadi, Tamil Nadu, India

[4]Department of Mechanical Engineering, Federal University of Petroleum Resources, Effurun, Delta State, Nigeria

[5]Department of Mechanical Engineering, University of South Africa, Florida, South Africa

[6]Department of Civil and Environmental Engineering, Delta State University, Abraka, Delta State, Nigeria

[7]Department of Mechanical Engineering, College of Engineering, King Khalid University, Abha, Saudi Arabia

[8]Department of Mechanical Engineering, P. A. College of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Mangaluru, Karnataka, India

[9]Department of Computer Science and Engineering, University Centre for Research & Development, Chandigarh University, Mohali, Punjab, India

[10]Department of Mechanical Engineering, School of Technology, Glocal University, Saharanpur, Uttar Pradesh, India

Correspondence
Olusegun David Samuel, Department of Mechanical Engineering, Federal University of Petroleum Resources, Effurun, Delta State P.M.B 1221, Nigeria.
Email: samuel.david@fupre.edu.ng

P. V. Elumalai, Department of Mechanical Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh 533437, India.
Email: elumalaimech89@gmail.com

Asif Afzal, Department of Mechanical Engineering, P. A. College of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Mangaluru, Karnataka 574153, India.
Email: asif.afzal86@gmail.com

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Abstract

This investigation deals with the usage of graphene oxide (GO) nanoparticles with orange peel biodiesel in a conventional CI engine. The different fuel blends used for this experiment are biodiesel 10% + diesel 80% + ethanol 5% + surfactant 5% + GO 50 ppm (B10), biodiesel 20% + diesel 70% + ethanol 5% + surfactant 5% + GO 50 ppm (B20), biodiesel 50% + diesel 40% + ethanol 5% + surfactant 5% + GO 50 ppm (B50) and B100. The addition of ethanol has dual benefits for improving the vaporization of fuel blends and reduction of oxides of nitrogen (NOx) emission. Span80 and Tween80 were chosen as surfactants based on hydrophilic-lipophilic balance numbers. It is useful for improving the homogeneity of immiscible fuel blends. From this study, the injection pressure (IP) was varied from 180, 200 to 220 bar for better atomization characteristics of nano additive biodiesel blend. The experimental results indicated that an increase in the percentages of biodiesel beyond 20% in the blend, NOx increases, and hydrocarbon (HC) and carbon dioxide (CO) emissions were found to be decreased. It is also observed that the highest brake thermal efficiency (BTE) was found for fuel 20 at

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Article

Assessment of CI Engine Performance and Exhaust Air Quality Outfitted with Real-Time Emulsion Fuel Injection System

Krishnamoorthy Ramalingam [1,*], Elumalai Perumal Venkatesan [2,3], Abdul Aabid [4] and Muneer Baig [4]

[1] Department of Mechanical Engineering, CK College of Engineering and Technology, Cuddalore 607003, India
[2] Department of Mechanical Engineering, Aditya Engineering College, Surampalem 533437, India; elumalaimech89@gmail.com
[3] Department of Mechanical Engineering, Jawaharlal Nehru Technological University Kakinada, East Godavari District, Kakinada 533003, India
[4] Department of Engineering Management, College of Engineering, Prince Sultan University, P.O. Box 66833, Riyadh 11586, Saudi Arabia; aabid@psu.edu.sa (A.A.); mbaig@psu.edu.sa (M.B.)
* Correspondence: kskrishnamech@gmail.com; Tel.: +91-9698922334

Abstract: The main target of the current research work is effectively eliminating fossil fuel dependency and improving the exhaust air quality of conventional Compression Ignition (CI) engines. This research paper demonstrates for the first time that a nanofluid (water without surfactant) stored in separate tanks can be quantified, collected, and immediately emulsified by a high shear mixer before transfer into the combustion chamber of a diesel engine. The experiment was carried out under different load states (25%, 50%, 75% and 100%) with a constant speed of 1500 rpm. Biofuel was extracted from citronella leaves using an energy-intensive process. The 5% water share was used for preparing the biofuel emulsion and nano-biofuel emulsion. A cobalt chromate nanoadditive was used to make the nanofluid. An experimental investigation was performed with prepared test fuels, namely, ultra-low sulphur diesel (ULSD), 100% Citronella (B100), surfactant-free Diesel emulsion (SDE), surfactant-free bioemulsion (SBE), and Surfactant free nano-bioemulsion (SNBE), in a test engine. The properties of the sample test fuels was ensured according to EN and ASTM standards. The observation performance results show that the SNBE blend exhibited lower BTE (by 0.5%) and higher SFC (by 3.4%) than ULSD at peak load. The emission results show that the SNBE blend exhibited lower HC, CO, NO_x, and smoke emissions by 23.86%, 31.81%, 2.94%, and 24.63%, respectively, compared to USD at peak load. The CP and HRR results for SNBE were closer to ULSD fuel. Overall, the novel concept of an RTEFI (Real-time emulsion fuel injection) system was proved to be workable and to maintain its benefits of better fuel economy and greener emissions.

Keywords: nanofuel; diesel engine; emission; real-time emulsion fuel

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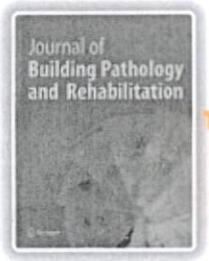
1. Introduction

Over the past twenty years, the rate of air pollution has grown rapidly and fossil fuels are becoming depleted due to the growth of industrialization and the drastic increase in the number of transport vehicles. The drain on global fossil energy sources is assessed as being likely to increase over the next ten years, and thought should be given to long-term utilization as well [1,2]. Among the many types of conversion equipment, the basic fuel engine has particular benefits, such as durability, reliability, power output, energy consumption, etc., Nevertheless, diesel fuel engines create high amounts of smoke emissions and nitrogen oxide [3,4]. At present, government emission regulations are very stringent in order to preserve human and environmental health. For these reasons, the scientific community seeks to discover renewable and emission-free alternate fuels for basic engines [5].

To satisfy energy demand, vegetable oil-based alternative fuels have received a great deal of consideration, as it is sustainable and non-toxic. Out of high viscous biofuel, today many researchers are attracted to the topic of low-viscosity biofuel because of its



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RESEARCH ARTICLE

Design optimization of non-overflow section of a concrete gravity dam

Batta Jaya Naga Satish[1] · Chava Venkatesh[2] · B. Anitha Reddy[3] · Komma Hemanth Kumar Reddy[4] · Ramamohana Reddy Bellum[5]

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Abstract
The ever-increasing demand for concrete used in the construction and infrastructure field leads to increasing global pollution over the decades. Hence, the construction field should look always for using its raw materials in sustainable ways without affecting the functionality of the structure. Design optimization is one such decision-making strategy in providing an engineered solution with maximum reliability, environmental sustainability and cost efficiency of constructed facilities. In the present study, the design optimization of a non-overflow section of a concrete gravity dam has been studied. The modelling and analysis of the non-overflow section of the concrete gravity dam have been carried out in the FEM package ANSYS along with appropriate algorithms. The parameters considered for the algorithmic optimization of the typical dam section are geometrical properties of the Dam as design variables (for fixed height and freeboard) to minimize the volume of concrete without compromising on loading and factor of safety requirements as per IS code provisions. The current work is focused on optimizing the non-overflow section of a concrete gravity dam by the reduction in its volume, to its weight which is always in direct proportion. Decreasing the dam's weight is must both from the sustainable design and economical point of view. All effective load combinations (as per IS: 6512-2003) where the dam is subjected to maximum loads under ideal operating conditions are considered for stress analysis and optimization. The results of the optimization are presented and discussed in this paper. This study observed that the reduction of 9.95% weight of non-overflow section for concrete gravity dam without actually compromising on the increased factor of safety, which is in association with its functioning under standard normal operating conditions subjects to IS code provisions. Also, green house gas CO_2 emission can be reduced, indicating the sustainable design solution for massive constructions like concrete gravity dam.

Keywords Concrete gravity dam · Design optimization · Non-overflow section · Sustainable design · CO_2 emission

1 Introduction

The ever-increasing demand for concrete used in the construction and infrastructure field leads to increasing global pollution over the decades. Hence, the construction field should look always for using its raw materials in sustainable ways without affecting the functionality of the structure. Design optimization is one such decision-making strategy in providing an engineered solution with maximum reliability, environmental sustainability and cost efficiency of constructed facilities. Since the construction of massive concrete structures such as Dams and Bridges consumes a large amount of concrete, Design optimization for minimization of construction costs and environmental impact has been attracted in recent years [1–4]. Concrete is most commonly used for civil infrastructures and buildings, is a composite

✉ Batta Jaya Naga Satish
satishbjnvignan@gmail.com

1 Megha Engineering and Infrastructures Limited, Hyderabad 500037, India

2 Department of Civil Engineering, CVR College of Engineering, Ibrahimpatnam, Hyderabad, Telangana 501510, India

3 Department of Applied Engineering, VFSTR University, Vadlamudi, Guntur, Andhra Pradesh, India

4 Department of Civil Engineering, K.S.R.M College of Engineering, Kadapa, Andhra Pradesh 516003, India

5 Department of Civil Engineering, Aditya Engineering College, Aditya Nagar, ADB Road, Surampalem, E.G District 533437, India

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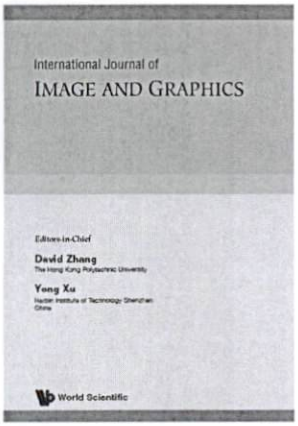

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Detection and Localization of Copy-Move Forgery in Digital Images: Review and Challenges

Gulivindala Suresh and Chanamallu Srinivasa Rao

Department of ECE, Aditya Engineering College, Surampalem, AP 533437, India

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Abstract

Copy move forgery in digital images became a common problem due to the wide accessibility of image processing algorithms and open-source editing software. The human visual system cannot identify the traces of forgery in the tampered image. The proliferation of such digital images through the internet and social media is possible with a finger touch. These tampered images have been used in news reports, judicial forensics, medical records, and financial statements. In this paper, a detailed review has been carried on various copy-move forgery detection (CMFD) and localization techniques. Further, challenges in the research are identified along with possible solutions.

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Development and Evaluation of Dust Cleaning System for a Solar PV Panel

Abhishek Kumar Tripathi*, Mangalpady Aruna**, Shashwati Ray***, N R N V Gowripathi Rao****, S. Vamshi Krishna***** and Durgesh Nandan******

*Department of Mining Engineering, Aditya Engineering College, Surampalem, A. P., India.
**Department of Mining Engineering, National Institute of Technology Karnataka, Surathkal, India
***Department of Electrical Engineering, Bhilai Institute of Technology, Durg, India
****Department of Agricultural Engineering, Aditya Engineering College, Surampalem, A.P, India
*****Department of Electronics and Communication Engineering, Ravindra College of Engineering for Women, Kurnool, A.P., India
******Account Manager, Accendere Knowledge Management Services Pvt Ltd., CL Educate Ltd., New Delhi, India
Corresponding Author: abhishekkumar@aec.edu.in

ABSTRACT

The most promising application of solar energy is the conversion of solar energy into electrical energy by using solar photovoltaic (PV) panel. The performance of solar based PV panel is definitely influenced by the amount of solar radiation, which are reaching on the panel surface. Since the solar PV panels are operating in open atmosphere dust particles get deposited on their surfaces and most of the times they have to work in this condition. These deposited dust particles create a layer of dust particles over the panel surface which prevents the 100% penetration of solar radiation into the panel surface. Therefore, proper cleaning of the panel surface becomes very necessary. In order to improve the performance of the PV panel an automatic microcontroller driven dust cleaning technique is developed which is capable of removing the accumulated dust particles from the PV panel surface. Moreover, an experimental study has been performed to analyse the efficiency of this developed technique. The developed cleaning system showed an improvement of 27.98% in the output power of PV panel when compared to the dusty panel.

Keywords: Solar energy; Photovoltaic panel; Dust; Automatic cleaning.

INTRODUCTION

Human sustainability and development of any nation highly depends upon three factors that are water, power and health. Excluding the other two factors the remaining third factor, i.e., power is most significant for every individual and it provide a major contribution in the development of any nations. The unavailability or shortage of power affect the industrial and economic growth of the country. But, due to the rapid growth in the population and fast depletion of fossil reserves an alarming signal can be observed in the power storage scheme. Thus, it is necessary to plan an alternative way so that the issue of power shortage can be minimised (García and Balenzategui, 2004; Hammond et al., 1997). In this regard, the application of renewable energy can be treated as the primary form of electrical power generation. The practice of encouraging renewable energy as the primary form of electrical power generation is not only sponsoring the green energy atmosphere but also sufficing the energy requirement of the world energy traders (Jager-Waldau, 2011). Also, the usage of renewable energy reduces the carbon emission which helps in mitigating the greenhouse effects and promoting the clean energy (Arango et al., 2018).

The available renewable energy sources are hydro, geothermal, biomass, wind and solar (sunlight based). Out of these sources, solar energy is getting increasingly more consideration in the last two decades in view of its enormous advantages, such as ease of accessibility of raw material (because sun rays are available in the infinite amount) of the sun rays, no discharge of any poisons gasses, can be utilised in remote territories, do not produce noise issue, simple installation and fillip by government. Also, the energy originating from the sun is very huge and is an infrangible energy

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Abstract

The expansion of urbanisation with improved living conditions are forecast to increase energy demand. One such massive consumption of fossil fuels is the transport sector. The new vehicles registered in India have an 843% growth rate over just 66 years (1951–2017). In addition to environmental concerns, and depletion of fossil fuels, bio-fuel based alternative fuels are intended to contribute to future energy requirements. Hence, this paper mainly concentrates on the

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P. S. Ranjit, V. Chintala, A. Saravanan,

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a Aditya Engineering College (A), Surampalem, India

Correspondence
psranjit1234@gmail.com
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Abstract

The expansion of urbanisation with improved living conditions are forecast to increase energy demand. One such massive consumption of fossil fuels is the transport sector. The new vehicles registered in India have an 843% growth rate over just 66 years (1951–2017). In addition to environmental concerns, and depletion of fossil fuels, bio-fuel based alternative fuels are intended to contribute to future energy requirements. Hence, this paper mainly concentrates on the biofuel to make use in a single-cylinder, 7.35 kW, in-direct injection, diesel engine

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Effective Cyber Security Using IoT to Prevent E-Threats and Hacking During Covid-19

Dr. Santosh Kumar[1], Dr. Rajeev Yadav[2], Dr. Priyanka Kaushik[3], S B G Tilak Babu[4], Dr. Rajesh Kumar Dubey[5] and Dr. Muthukumar Subramanian[6]

[1]*Asso. Prof., Lucknow Public College of Professional Studies, Lucknow, Uttar Pradesh, India, sanb2lpcps@gmail.com*
[2]*Professor in CSE, Arya Institute of Engineering and Technology, Jaipur, Rajasthan, India, yadavrajeev6@gmail.com*
[3]*Asso. Prof. in CSE, Poornima Institute of Engineering and Technology, Jaipur, Rajasthan India, Kaushik.priyanka17@gmail.com*
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[5]*Asso. Prof., Department of Electrical Engineering, Central University of Haryana Mahendergarh-123031 India, rajesh.dubey@cuh.ac.in*
[6]*Dept. of CSE, SRM Institute of Science & Technology, Trichy Campus, Tamilnadu, India - 621105, drsm.iiit@gmail.com*

***Correspondence:** -- S B G Tilak Babu; Email: thilaksayila@gmail.com

ABSTRACT- This research work is conducted to make the analysis of digital technology is one of the most admired and effective technologies that has been applied in the global context for faster data management. Starting from business management to connectivity, everywhere the application of IoT and digital technology is undeniable. Besides the advancement of the data management, cyber security is also important to prevent the data stealing or accessing from the unauthorized data. In this context the IoT security technology focusing on the safeguarding the IoT devices connected with internet. Different technologies are taken under the consideration for developing the IoT based cyber security such as Device authentication, Secure on boarding, data encryption and creation of the bootstrap server. All of these technologies are effective to its ground for protecting the digital data. In order to prevent cyber threats and hacking activities like SQL injection, Phishing, and DoS, this research paper has proposed a newer technique of the encryption process by using the python codes and also shown the difference between typical conventional system and proposed system for understanding both the system in a better way.

General Terms: Cryptography, Cryptanalysis, Pattern recognition, Data Security, Hacking.

Keywords: Interdisciplinary, Cyber security, Theory of computation, Internet of Things (IoT), E-threat.

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1. INTRODUCTION

1.1 Background

Advanced technology has widely changed today's world. By utilizing, IoT based digital technology, various complex tasks can be done faster without any error. Moreover, the digital-based technology also offers to operate the tasks like business operation, progress monitoring, and financial transaction through online processes. Moreover, data management also gets quite easier and more efficient as well after the rapid implementation of IoT technology. These kinds of wide diversified facilities effectively help the spread the usage of the IoT technology in the market faster [1].

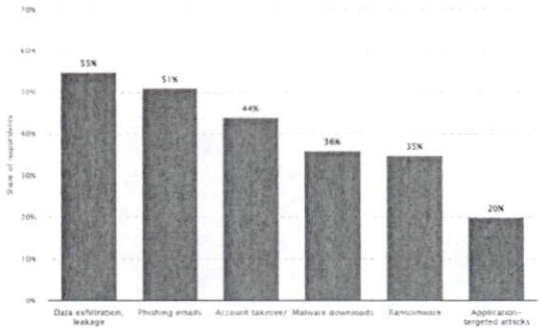

Figure 1: Cyberattacks during a pandemic

During pandemics, the incidents of cyber-attacks have been increased regardless of the location and industry. More specifically, most of the cyber-attacks that happened during this time are related to data exfiltration leakage and phishing the sensitive emails. This helps in analyzing the fact that the need of identifying the different IoT tools and methods used are needed to be analyzed.

1.2 Purpose

The main purpose of this research work is to demonstrate the ways the different cyber security methods and tools used in the time of pandemics to protect users from hackers or cyber

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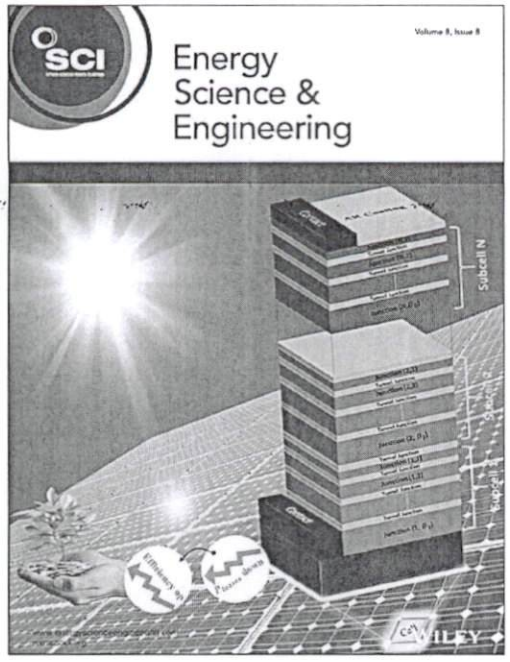

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Experimental based comparative exergy analysis of a spark-ignition Honda GX270 Genset engine fueled with LPG and syngas

Nataraj Ganesan, Bibhuti B. Sahoo, Porpatham Ekambaram, P.V Elumalai, Olusegun D. Samuel, Christopher C. Enweremadu, Asif Afzal, C. Ahamed Saleel

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Abstract

The present study investigates three different fuels such as gasoline, liquefied petroleum gas (LPG), and syngas in spark-ignition Honda GX270 Genset engine under wide-open throttle position on its performance, combustion characteristic as well as availability analysis. The results showed that when the engine operated with gasoline fuel, the brake thermal efficiency was higher than that of LPG and syngas by 6.2% and 7.4%, respectively, throughout the engine load condition. Brake-specific fuel consumption of the engine with syngas (660 g/kW h) and LPG fuel (812 g/kW h) was higher than that of the gasoline fuel (510 g/kW h) at the 4.5 kW of engine load. The engine emission results showed syngas operation caused a significant reduction in NOx by 58.4%, CO by 16.5%, HC by 23.2% compared to gasoline fuel at peak load conditions. On the other hand, exergy analysis concludes the exergy efficiency for all the test fuels increases with an increase in engine load due to a high rise in shaft output. At a 4.5 kW power output, the exergy efficiency of the engine was improved to 46.45% from 45.62% and 29.73% with syngas, gasoline, and LPG, respectively. The maximum exhaust gas availability has been observed as 24.51% of availability input for syngas at 100% load condition.

1 INTRODUCTION

The use of alternative fuels in internal combustion (IC) engines have received much interest nowadays due to the dramatic increase in fuel costs and strict emission regulations. Various alternative fuels for IC engines have already existed, almost from the invention of

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P.V Elumalai
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Abstract

The present study investigates three different fuels such as gasoline, liquefied petroleum gas (LPG), and syngas in spark-ignition Honda GX270 Genset engine under wide-open throttle position on its performance, combustion characteristic as well as availability analysis. The results showed that when the engine operated with gasoline fuel, the brake thermal efficiency was higher than that of LPG and syngas by 6.2% and 7.4%, respectively, throughout the engine load condition. Brake-specific fuel consumption of the engine with syngas (660 g/kW h) and LPG fuel (812 g/kW h) was higher than that of the gasoline fuel (510 g/kW h) at the 4.5 kW of engine load. The engine emission results [illegible] caused a significant reduction in NOx by 58.4%, CO by 16.5%,

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Experimental Investigations on Hydrogen Supplemented Pinus Sylvestris Oil-based Diesel Engine for Performance Enhancement and Reduction in Emissions

P.S. Ranjit
Aditya Engineering College, Surampalem, India

S. S. Bhurat
University of Petroleum & Energy Studies, Dehradun, India

A.K. Thakur
Lovely Professional University

G.S. Mahesh
Sri Venkateswara Engineering College, Tirupati, India

M. Sreenivasa Reddy
Aditya Engineering College, Surampalem, India

The paper mainly aims at improving the performance and reduction in exhaust emissions of an indirect injection diesel engine fuelled with alternative and modern biofuel Pinus Sylvestris oil, which is traditionally oxygenated and obtained from the resins of the Pinus Sylvestris tree. Its physical and chemical properties are similar to the regular petro-diesel fuel and can be used without transesterification directly in diesel engines. On the other hand, a lower cetane value hangs its direct use in diesel engines. Hence, the experiment followed a complementary approach to supplementing small dosages of gaseous Hydrogen (GH_2), which is highly flammable, colorless, odorless, and plenty available to overcome the de–merits nature of emissions. Gaseous Hydrogen was inducted through the inlet manifold and controlled by Timed Manifold Injection (TMI) in 5% to 7% of the total energy with the step of 1%. In addition to GH_2 supp–lementation, preheating the inlet air in the range of 40 ^{0}C to 60 ^{0}C with an increment of 10 ^{0}C was allowed to suck through the same inlet manifold. Supplementation of 6% GH_2 and 40 ^{0}C preheated air showed better results than conventional diesel operations without any engine modifications. All required NFPA Class I Division 2 Group B standards in this experiment were considered during the handling and use of gaseous Hydrogen.

Keywords: *Pinus Sylvestris oil, Pine oil, Hydrogen, In-direct Injection, NFPA standards, Performance, and Emissions*

1. INTRODUCTION

Unanimously reports coming from studies into alter–native and renewable fuels expect an enormous fossil fuel demand by 2030, and the sudden rise in oil prices has already influenced these effects. Further, its envi–ronmental impact is a significant concern [1, 2]. Researchers started working on sustainable, reliable, and environmentally friendly alternative fuels to over–come these demerits concerning economic and envi–ronmental issues with fossil fuels. Further, using these alternative fuels may be in the straightway of its use or in the trans-esterified way or blending of either straight vegetable oil or its bio-diesel with conventional diesel operation. Biodiesel is one such option to replace con–ventional diesel. Biodiesel is produced through the trans -esterified process in different catalysts at different tem–peratures [3-7]. Due to their higher free fatty acids, some biodiesel preparations have touched the two-stage trans-esterification process [8, 9].

The use of this biodiesel had reduced the emissions like Smoke, HC, CO, and CO_2, and an increase in NOx was observed [10-13]. However, another set of researchers executed their experimentation with micro-emulsion fuels. Drastic reduction in NOx was observed with a penalty on CO, HC, and thermal brake efficiency [14, 15]. Even alcohols, oxygenated and less Viscosity, and reduced emissions and combustion were enhanced from diesel engines [16]. On the other side, it is also reported that alcohols being less viscous, suffer from miscibility with diesel fuel [17]. Few researchers exten–ded their work with Pinus Sylvestris in diesel engines. Pinus Sylvestris is stable concerning its use as well as storage. Being unique in this direction, its feedstock can be made available from the forest and, having phy–sicochemical properties very close to diesel, can be blended directly with diesel fuel. It is evident from the literature; that more than 30,000 tons of Pinus Sylvestris are produced globally every year [18]. Hydrogen as a supplement with different alternative fuels also succeeded in using diesel engines with enhanced brake thermal efficiency and reduction in emissions [19-22].

However, using these alternative fuels to replace the conventional diesel operation had a penalty on engine performance due to its low heating value and higher Viscosity than Petro-diesel. The high-energy supplement hydrogen overcame such deficiency.

2. MATERIALS & METHODS

Pinus Sylvestris (PS) trees can rise to a height of between 40 and 80 meters and have a smooth crown and

Received: July 2021, Accepted: February 2022
Correspondence to: Prof. P.S. Ranjit, Dept. of Mechanical Engg., Aditya Engineering College, Aditya Nagar, Surampalem, E.G. Dist., Andhra Pradesh, India
E-mail: psranjit1234@gmail.com
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False-Positive-Free SVD Based Audio Watermarking with Integer Wavelet Transform

Gulivindala Suresh[1] · Venkata Lalitha Narla[2] · D. P. Gangwar[3] · Aditya Kumar Sahu[4]

Received: 17 July 2021 / Revised: 20 March 2022 / Accepted: 22 March 2022 /
Published online: 18 April 2022

Abstract

Singular Value Decomposition (SVD) became a promising approach for developing digital media watermarking techniques due to stability and higher energy packing nature of singular values. Nevertheless, SVD based watermarking techniques suffers from false positive problem (FPP) when singular vectors are shared for extraction. Eliminating FPP in the development of digital audio watermarking (DAW) is still a challenging task. In this work, SVD based schemes and their vulnerability to FPP are studied, analyzed, and elucidated in detail. Further, a false positive free SVD based DAW scheme has been devised in Integer Wavelet Transform (IWT) domain. Audio is partitioned into segments. Each audio segment is transformed using IWT and SVD is applied on Arnold transformed watermark. Principal Component (PC) is obtained with the product of singular vector matrix and singular values matrix. Transformed audio is modified based on PC of watermark image. The developed scheme has been tested on benchmark dataset and it maintains imperceptibility, robustness, and capacity as

✉ Gulivindala Suresh
suresh.gulivindala@gmail.com

Venkata Lalitha Narla
lalithanarla.ece@gmail.com

D. P. Gangwar
dpgangwar@yahoo.com

Aditya Kumar Sahu
adityasahu.cse@gmail.com

1 Department of Electronics & Communication Engineering, Aditya Engineering College, Surampalem, A.P, India

2 Department of Electronics & Communication Engineering, Aditya College of Engineering & Technology, Surampalem, A.P, India

3 Central Forensic Science Laboratory, Sector 36-A, Chandigarh, India

4 Department of Computer Science & Engineering, Vignan's Foundation for Science Technology and Research, Guntur, A.P, India

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RESEARCH ARTICLE

Health monitoring jeopardy prophylaxis model based on machine learning in fog computing

Ravi Kumar Suggala ✉, M. Vamsi Krishna, Sangram Keshari Swain

First published: 18 April 2022
https://doi.org/10.1002/ett.4497

Abstract

Cloud-based fog computing was developed in recent years to make it easier for patients to monitor distant health and discover mosquito-borne syndromes at an initial period, allowing to track the mosquito-borne illnesses. Many obstacles have been confronted by the technology, including high latency, mobility, overhead connectivity, and location consciousness. Due to the security issue and wrong prediction of the diseases, users are affected by getting wrong alert messages from fog which increase the disease spreading. Hence a novel Prevention Technique based on Fog Computing has been introduced to prevent the epidemic syndrome at an initial period and safeguard the people around the world. Initially, each user register their personal information in Pristine Database through IoT device. These information are encrypted with 16 round of key-dependent operation via new Blowfish Encryption Algorithm. Subsequently, the mosquito spawned disease is diagnosed by measuring the resemblance factor between the user and disease through the Hybrid Endemic Halsen Classifier and the Resemblance Coefficient are used to diagnose and categorize users as infected or unaffected. The mosquito-borne disease is detected using this method by assessing the similarity factor between the user and the disease with less computing time. As a result, if a new symptom is found rather than one from the given medical dataset, the information will be saved in the Pristine Database, and the classification process will be faster with less computing time in the future if the same symptom is identified. Finally, the novel Temporal Social Network Analysis was developed to assess the likelihood of a disease breakout also analyze the infected users and send the awareness message to take the precautionary measures in the cloud processing layer. Thus, the proposed work effectively predicts and prevents the

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RESEARCH ARTICLE

Health monitoring jeopardy prophylaxis model based on machine learning in fog computing

Ravi Kumar Suggala, M. Vamsi Krishna, Sangram Keshari Swain

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M. Vamsi Krishna
Department of Computer Science and Engineering, Aditya Engineering College (A), Surampalem, Andhra Pradesh, India

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Abstract

Cloud-based fog computing was developed in recent years to make it easier for patients to monitor distant health and discover mosquito-borne syndromes at an initial period, allowing to track the mosquito-borne illnesses. Many obstacles have been confronted by the technology, including high latency, mobility, overhead connectivity, and location consciousness. Due to the security issue and wrong prediction of the diseases, users are affected by getting wrong alert messages from fog which increase the disease spreading. Hence a novel Prevention Technique based on Fog Computing has been introduced to prevent the epidemic syndrome at an initial period and safeguard the people around the

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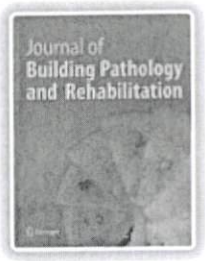

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RESEARCH ARTICLE

Mechanical properties of self-compacting concrete using steel slag and glass powder

K. P. P. Bharathi[1] · S. K. Adari[2] · Urmila Pallepamula[1]

Received: 29 January 2022 / Revised: 26 March 2022 / Accepted: 27 March 2022

Abstract
Concrete is the universally accepted building material for all types of construction and is the most commonly used material after water. The developments in concrete has led to the evolution of many types of concretes like geo-polymer concrete, self-compacting concrete, fibre reinforced concrete. Self-compacting concrete is a special type of concrete which flows by its own weight and is having variety of application. The uncontrolled and indiscriminate use of concrete depletes natural resources, as the main constituents such as fine and coarse aggregates which are extracted from the natural rocks. Besides, the use of cement contributes to the production of high volume of greenhouse gases resulting in the global warming. These issues posed a big challenge for the present day engineers to look after the possible alternatives to produce eco-friendly concrete. Apart from this, there were numerous industrial wastes like Steel slag, Glass powder, Fly ash, Ground granulated blast furnace slag etc., that are being deposited in the dump yards with no purpose. In the present study, it is aimed to study the fresh and hardened concrete properties by utilising the industrial wastes such as glass powder and steel slag in the self-compacting concrete. The experimentation is carried out on M20 grade concrete, by partially replacing the cement with 20% of glass powder and fine aggregate with varying quantities of steel slag as 25%, 50% and 75%. The obtained results witnessed that the optimum replacement of fine aggregate as 50% in combination with 20% of glass powder yielding in improved workability. The compressive strength, split tensile strength and flexure strength have shown an increase of 20.95%, 17.05% and 24.44% compared to conventional concrete.

Keywords Self compacting concrete · Glass powder · Steel slag · Fresh properties · Mechanical properties

1 Introduction

Concrete is the most widely used construction material in the world, with an annual consumption of 11 billion tons [1]. Cement is the primary component of concrete, which releases approximately 0.9 tons of CO_2 into the atmosphere for every ton produced [2, 3] and the use of coarse aggregate and fine aggregate which occupies around 70% of the concrete volume leads to depletion of natural resources [4, 5]. Though industrialization generates a lot of benefits to people, it accelerates the problem with waste management and environmental pollution. Taking this into consideration, industrial by-products such as slag, silica fume, glass powder, fly ash, etc. are used to fully or partially replace the constituents of concrete which results in a significant increase in strength and also the environmental performance [6, 7]. The development of concrete structures has been increased over the last few decades as a result of increased production and improved working environments [8]. Self-compacting concrete (SCC) has the property of compacting under its own weight when placed in the formwork [9]. As the total time of construction and the cost reduces by the use of SCC and it also eliminates vibration and can be very useful when there is congested reinforcement [10]. Because of their superior engineering and performance properties, fly ash (FA), ground granulated blast furnace slag (GGBFS), and silica fume (SF) are the most commonly used materials in the production of high strength and high-performance concrete [11]. Steel slag is a by-product of the steel industry produced during the manufacturing process, with iron accounting for 15–20% of the crude material used [12–15].

✉ Urmila Pallepamula
pallepamula.urmila@gmail.com

[1] Department of Civil Engineering, Aditya Engineering College, Surampalem, A.P., India

[2] Civil and Infrastructure Engineering Department, IIT Jodhpur, Jodhpur, India

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Numerical analysis of offshore topside with FGM under impact loads

S. Pachaiappan & S. Chandrasekaran

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Abstract

Impact loads due to the fall of objects always challenge the integrity and strength of the structural components. The deck of an offshore platform's topside is prone to impact loads during its construction and operation stages. Fall of objects from a considerable height may damage the structural components and lead to excessive deformation of the deck, which affects the platform operations and results in losses of lives. Impact loads generally arise from the fall of crane hooks, machinery, drill pipes, equipment, and tools. Severe impact load on deck may damage stiffeners, secondary beams, the collapse of the deck, etc. The topside deck and supporting structural components should possess adequate energy absorption. Functionally graded materials (FGMs) possess improved resistance to second-order vibrations, buckling, bending, high pressure, and temperature. FGM as a structural element in offshore platform

topside of an offshore platform using FGM and X52 steel under special loads. Innovative Infrastructure Solut 5:1–14. https://doi.org/10.1007/s41062-020-00337-4

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Author information

Authors and Affiliations

Department of Civil Engineering, Aditya Engineering College (A), Surampalem, Andhra Pradesh, India

S. Pachaiappan

Department of of Ocean Engineering, Indian Institute of Technology Madras, Chennai,

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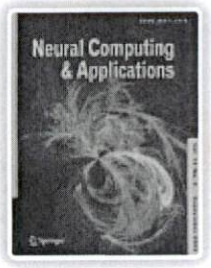
Performance comparison of empirical model and Particle Swarm Optimization & its boiling point prediction models for waste sunflower oil biodiesel

Olusegun D. Samuel [a, n], Mohammad Kaveh [b], Oluwayomi J. Oyejide [a], P.V. Elumalai [c, d], Tikendra Nath Verma [e], Kottakkaran Sooppy Nisar [f], C Ahamed Saleel [g], Asif Afzal [h, i, j], O.S.I. Fayomi [k, l], H.I. Owamah [m], Selçuk Sarıkoç [o], Christopher C. Enweremadu [n]

[a] Department of Mechanical Engineering, Federal University of Petroleum Resources, P.M.B 1221, Effurun, Delta State, Nigeria
[b] Department of Petroleum Engineering, College of Engineering, Knowledge University, 44001, Erbil, Iraq
[c] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India
[d] Department of Mechanical Engineering, Jawaharlal Nehru Technology University Kakinada, Kakinada, East Godavari District, Andhra Pradesh, India
[e] Department of Mechanical Engineering, Maulana Azad National Institute of Technology, Bhopal, MP, 462003, India
[f] Department of Mathematics, College of Arts and Sciences, Wadi Aldawaser, 11991, Prince Sattam bin Abdulaziz University, Saudi Arabia
[g] Department of Mechanical Engineering, College of Engineering, King Khalid University, PO Box 394, Abha, 61421, Saudi Arabia
[h] Department of Mechanical Engineering, P. A. College of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Mangalore, 574153, India
[i] University Centre for Research & Development, Department of Computer Science and Engineering, Chandigarh University, Gharuan, Mohali, Punjab, India
[j] Department of Mechanical Engineering, School of Technology, Glocal University, Delhi-Yamunotri Marg, SH-57, Mirzapur Pole, Saharanpur District, Uttar Pradesh, 247121, India
[k] Department of Chemical, Metallurgical and Materials Engineering, Tshwane University of Technology, P.M.B. X680, Pretoria, South Africa
[l] Department of Mechanical and Biomedical Engineering, Bells University of Technology, Ota, Nigeria
[m] Department of Civil and Environmental Engineering, Delta State University, Oleh Campus, Abraka, Delta State, Nigeria
[n] Department of Mechanical Engineering, University of South Africa, Science Campus, Private Bag X6, Florida, 1709, South Africa



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ORIGINAL ARTICLE

Performance estimation of tubular solar still with a wicked rotating drum using DT, LR, and KNN techniques of machine learning

A. Saravanan[1] · Satyajeet Parida[2] · M. Murugan[3] · M. Sreenivasa Reddy[1] · Purabi Bora[4] · S. Rama Sree[5]

Received: 2 November 2021 / Accepted: 11 April 2022

Abstract

The decision tree (DT), linear regression (LR), and K-nearest neighbours (KNN) models were employed in this work to estimate the thermal performance of tubular solar still with a wicked rotating drum. These three models were developed using real-world experimental data and calculated values. This study used a dataset containing 95 experimental iterations in total. Five input parameters, including solar intensity, basin water temperature, wind speed, ambient temperature, and glass temperature, were used as the independent variables of the DT, LR, and KNN models, and two dependent variables, thermal efficiency and productivity, were predicted. The DT model was the most significant model due to its lowest error and most incredible R^2 value compared to the LR and KNN model performances. The MAE, RMSE, and R^2 values for the DT model were 0.566828, 0.85135, and 0.9602, respectively, with the model efficiency of 0.961, which is the most significant value compared to other models. These results suggest that the DT model is a good fit for forecasting the thermal performance of tubular solar stills.

Keywords Machine learning · Tubular solar still · k-nearest neighbours · Decision tree · Linear regression

Abbreviations

ANN	Artificial neural network
DT	Decision tree
FFNN	Feedforward neural network
HHO	Harris Hawks optimizer
KNN	K-nearest neighbours
LM	Levenberg–Marquardt
LR	Linear regression
LSTM	Long short-term memory
MAE	Mean absolute error
ML	Machine learning
NN	Neural network
R^2	Coefficient of determination
RF	Random forest
RMSE	Root-mean-square error
SS	Solar still
SVM	Support vector machine
TSS	Tubular solar still
VHC	Volumetric heat capacity
WNN	Wavelet neural network

Symbols

$I(t)$	Solar intensity, W/m^2
m_w	Freshwater productivity, kg
T_a	Ambient temperature, °C
T_b	Basin temperature, °C
T_g	Glass cover temperature, °C
T_w	Basin water temperature, °C

✉ A. Saravanan
saravanan.a@aec.edu.in

[1] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, East Godavari (D.T), Andhra Pradesh 533 437, India

[2] Department of Mining Engineering, Aditya Engineering College, Surampalem, East Godavari (D.T), Andhra Pradesh 533 437, India

[3] Department of Mechanical Engineering, Aditya College of Engineering and Technology, Surampalem, East Godavari (D.T), Andhra Pradesh 533 437, India

[4] Petroleum Engineering Department, Chandigarh University, Chandigarh 140413, India

[5] Department of Computer Science and Engineering, Aditya Engineering College, Surampalem, East Godavari (D.T), Andhra Pradesh 533 437, India

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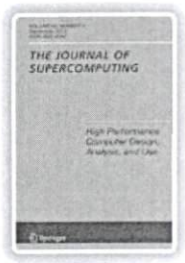

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Quasi oppositional Aquila optimizer-based task scheduling approach in an IoT enabled cloud environment

M. Kandan[1] · Anbazhagan Krishnamurthy[2] · S. Arun Mozhi Selvi[3] · Mohamed Yacin Sikkandar[4] · Mohamed Abdelkader Aboamer[4] · T. Tamilvizhi[5]

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Abstract

Large-scale applications of the Internet of Things (IoT) necessitate significant computing tasks and storage resources that are progressively installed in the cloud environment. Related to classical computing models, the features of the cloud, such as pay-as-you-go, indefinite expansions, and dynamic acquisition, signify various services to these applications utilizing the IoT structure. A major challenge is to fulfill the quality of service necessities but schedule tasks to resources. The resource allocation scheme is affected by different undefined reasons in real-time platforms. Several works have considered the factors in the design of effective task scheduling techniques. In this context, this research addresses the issue of resource allocation and management in an IoT-enabled CC environment by designing a novel quasi-oppositional Aquila optimizer-based task scheduling (QOAO-TS) technique. The QOAO technique involves the integration of quasi-oppositional-based learning with an Aquila optimizer (AO). The traditional AO is stimulated by Aquila's behavior while catching the prey, and the QOAO is derived to improve the performance of the AO. The QOAO-TS technique aims to fulfill the makespan by accomplishing the optimum task scheduling process. The proposed QOAO-TS technique considers the relationship among task scheduling and satisfies the client's needs by minimizing the makespan. A wide range of simulations take place, and the results are investigated in terms of the span, throughput, flow time, lateness, and utilization ratio.

Keywords Cloud computing · Internet of Things · Task scheduling · Objective function · Makespan · Bioinspired algorithm

✉ M. Kandan
kandan.win25@gmail.com

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Author information

Authors and Affiliations

Department of CSE, Aditya Engineering College, Surempalem, Andhra Pradesh, 533437, India

M. Kandan

Department of CSE, Velammal Institute of Technology, Chennai, Tamilnadu, 601204, India

Anbazhagan Krishnamurthy

Holycross Engineering College, Thoothukudi, Tamilnadu, 628851, India

S. Arun Mozhi Selvi

Department of Medical Equipment Technology, College of Applied Medical Sciences, Majmaah University, Al Majmaah, 11952, Saudi Arabia

Mohamed Yacin Sikkandar & Mohamed Abdelkader Aboamer

Department of Information Technology, Vel Tech Multi Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai, India

T. Tamilvizhi

Corresponding author

Correspondence to M. Kandan.

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RADICAL OF FILTERS OF TRANSITIVE BE-ALGEBRAS

V. Venkata Kumar, M. Sambasiva Rao and S. Kalesha Vali

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MSC 2010 Classifications: 03G25.

Keywords and phrases: Self-distributive BE-algebra, filter, radical of a filter, semi-maximal filter, ideal, skew-simple BE-algebra.

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Abstract The notion of skew-simple BE-algebras is introduced and derived an equivalent assertions for every skew-simple BE-algebra to become semi-simple. The concept of radical of filters is introduced in a BE-algebra and certain properties of these radicals are derived in terms of direct products and homomorphisms. The concept of semi-maximal filters is introduced in BE-algebras. Some equivalent assertions are derived for every semi-maximal filter to become a maximal filter. Properties of semi-maximal filters are derived in terms of homomorphisms and congruences.

1 Introduction

The notion of BE-algebras was introduced and extensively studied by H. S. Kim and Y. H. Kim in [8]. These classes of BE-algebras were introduced as a generalization of the class of BCK-algebras of K. Iseki and S. Tanaka [7]. Some properties of filters of BE-algebras were studied by S. S. Ahn and Y. H. Kim in [1] and by B. L. Meng in [9]. In [16], A. Walendziak discussed some properties of commutative BE-algebras. He also investigated the relationship between BE-algebras, implicative algebras and J-algebras. In 2012, A. Rezaei, and A. Borumand Saeid [11], stated and proved the first, second and third isomorphism theorems in self-distributive BE-algebras. Later, these authors [12] introduced the notion of commutative ideals in a BE-algebra. In 2013, A. Borumand Saeid, A. Rezaei and R. A. Borzooei [3] extensively studied the properties of some types of filters in BE-algebras. In [4], Chajda *et al.*, Characterized the complements and relative complements of the set of all deductive systems as the so-called annihilators of Hilbert algebras. Later, Halaš[6] introduced the concepts of an annihilator and a relative annihilator of a given subset of a BCK-algebra. In [5], Z. Ciloglu and Y. Ceven introduced the notion of bounded BE-algebras and investigated some properties of them. A. Paad [10] introduced the notion of the radical of ideals in BL-algebras and then characterized the notion of the radical of ideals by elements of a BL-algebra.

In this work, we derive some significant properties of maximal filters of a bounded BE-algebra. The notion of skew-simple BE-algebras is introduced and studied its properties. We prove that the condition of self-distributivity is sufficient to satisfy all the properties of a skew-simple BE-algebra. It is observed that every semi-simple BE-algebra is a skew-simple BE-algebra and the converse is not true. However, some equivalent assertions are derived for a skew-simple BE-algebra to become a semi-simple BE-algebra. The concept of a radicals of a filter is introduced in bounded BE-algebras. The elements of a radical of a filter are characterized in self-distributive BE-algebras. Certain properties of these radicals are then derived with respect to set-intersection, direct products, and homomorphic images.

The concept of semi-maximal filters is introduced, in bounded BE-algebras, in terms of radical of filters. Some equivalent assertions are derived for every semi-maximal filter of a BE-algebra to become a maximal filter. Finally, properties of semi-maximal filters are derived with respect to homomorphism, Cartesian products and congruences.

Clearly $F \subseteq rad(F)$. Again, let $x \in rad(F)$. Then $xN * x \in F$. Since $1 \in F$, we get $(xN * x, 1) \in \theta_F$. Hence

$$\begin{aligned} F_{xN*x} \in \{1\}/F &\Rightarrow (F_x)N * F_x \in \{1\}/F \\ &\Rightarrow F_x \in rad(\{1\}/F) \\ &\Rightarrow F_x \in \{1\}/F \end{aligned}$$

which gives $(x, 1) \in \theta_F$. Hence $x = 1 * x \in F$. Thus $rad(F) \subseteq F$. Therefore F is semi-maximal of X. □

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Author information

V. Venkata Kumar, Department of Mathematics, Aditya Engineering College, Surampalem-533437, Andhra Pradesh, India.
E-mail: vvenkat84@gmail.com

M. Sambasiva Rao, Department of Mathematics, MVGR College of Engineering, Vizianagaram-535005, Andhra Pradesh, India.
E-mail: mssraomaths35@rediffmail.com

S. Kalesha Vali, Department of Mathematics, JNTUK University College of Engineering, Vizianagaram-535003, Andhra Pradesh, India.
E-mail: valijntuv@gmail.com

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Seismic performance of a truss bridge with different substructure configurations

Batta Jaya Naga Satish, B. Anitha Reddy, Chava Venkatesh, Komma Hemanth Kumar Reddy & Ramamohana Reddy Bellum

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Abstract

In the present study, the seismic responses of typical railway truss bridges have been investigated using different types of substructure configurations such as single-column bent, multi-column bent and linked-type column configurations. A nonlinear static pushover analysis method is employed to assess the performance of all three substructure configurations using yield strength, yield displacement and ductility capacity as parameters under design basis earthquake and maximum credible earthquake levels. In addition, to provide more comprehensive insights, the collapse margin ratio has been calculated and compared for all three substructure configurations. The results indicated that the performance level is immediate occupancy. For single-column bent configuration, it is elastic for multi-column and linked column bent configurations in transverse and longitudinal directions. Ductility capacity has been calculated and reported higher in single-column bent configuration and lower in multi-column bent configuration for the seismic force in the longitudinal direction. In the transverse direction, ductility is higher in linked column configuration and lower in a single-column bent configuration. The collapse margin ratio observed to be higher for the linked column configuration than the other two configurations. The result shows that the performance of linked column bent configuration is seismically safe and can be used as an effective substructure configuration for the bridge located in high seismic prone regions.

Authors and Affiliations

Megha Engineering and Infrastructures Limited, Hyderabad, 500037, India

Batta Jaya Naga Satish

Department of Civil Engineering, CVR College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, 501510, India

Chava Venkatesh

Department of Applied Engineering, VFSTR University, Vadlamudi, Guntur, Andhra Pradesh, India

B. Anitha Reddy

Department of Civil Engineering, K.S.R.M College of Engineering, Kadapa, Andhra Pradesh, 516003, India

Komma Hemanth Kumar Reddy

Department of Civil Engineering, Aditya Engineering College, Aditya Nagar, ADB Road, Surampalem, E.G District, 533437, India

Ramamohana Reddy Bellum

Corresponding author

Correspondence to Batta Jaya Naga Satish.

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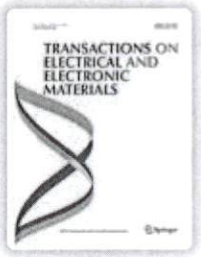

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Structural, Impedance and Modulus Studies of Effect of Magnesium (Mg) Substitution on Spinel $Li_4Ti_5O_{12}$ Anode Materials

B. Vikram Babu, M. Sushma Reddi, A. Rama Krishna, B. Sathish Mohan, G. Chandana, K. Anjani Devi, B. Sridhar & K. Samatha

Transactions on Electrical and Electronic Materials (2022)

Abstract

This research article aims at reporting the influence of magnesium by studying the structural, electrical impedance and modulus properties of the Mg substituted $Li_4Ti_5O_{12}$. These studies are useful for the electrochemical properties. The XRD reveals that the structure of all the Mg substituted materials belongs to the cubic spinel group having Fd-3m space symmetry. SEM images display the structural, morphological properties with the average size of grains falling in the vicinity of 1 μm. The electrical impedance of $Li_{4-x}Mg_xTi_5O_{12}$ materials was analyzed at frequencies between 20 Hz and 1 MHz and in the 30–120 °C range of temperature by employing the complex impedance spectroscopy (CIS) method. The modulus formalism is also a suitable tool to understand the

B. Vikram Babu
Department of Physics, Dr B. R. Ambedkar University, Srikakulam, 532410, India
M. Sushma Reddi
Department of ECE, Aditya College of Engineering and Technology, Surampalem, 533437, India
A. Rama Krishna
Bio Enviro Chemical Solutions, Visakhapatnam, 530003, India
B. Sathish Mohan
Department of Physics, Andhra University, Visakhapatnam, 530003, India
G. Chandana & K. Samatha
Department of Physics, Aditya Engineering College (A), Surampalem, 533437, India
K. Anjani Devi
Department of Physics, RGUKT, Srikakulam, A.P., 532410, India
B. Sridhar

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Correspondence to B. Vikram Babu or B. Sathish Mohan.

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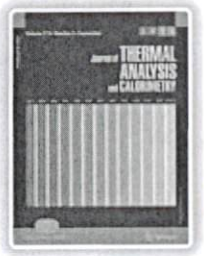

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The effect of thermal degradation and thermogravimetric analysis on pyrolysis oil production from waste milk packet for CI engine application

P. B. Senthilkumar, M. Parthasarathy, R. Nagarajan, N. Murgunachiappan, P. V. Elumalai & B. H. Varaprasad

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Abstract

Fossil fuels are non-renewable energy sources that are continuously depleting while also causing major environmental issues, which has led to the usage of alternative methods in conventional engines for better performance and emissions. Plastic is a non-degradable waste material, and recycling of waste plastic has gained much importance as the alternative source of energy, and it can be induced to the internal combustion engine to produce power generation and propulsion. The waste plastic oil (WPO) was extracted from the waste milk packet by

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SURAMPALEM - 533 437

Author information

Authors and Affiliations

Department of Automobile Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, India

P. B. Senthilkumar, M. Parthasarathy & N. Murgunachiappan

School of Mechanical Engineering, Vellore Institute of Technology, Vellore, India

R. Nagarajan

Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

P. V. Elumalai & B. H. Varaprasad

Corresponding author

Correspondence to P. B. Senthilkumar.

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The Ensemble of Unsupervised Incremental Learning Algorithm for Time Series Data

Document Type : Original Article

Authors

D. Beulah [1] ; P. Vamsi Krishna Raj [2]

[1] Aditya Engineering College, Surampalem, AP, India

[2] CIIS, Swarnandhra College of Engineering. & Tech. (Autonomous), Narsapur, AP, India

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Abstract

Data mining is one of the key concepts to discover hidden knowledge from available data. Along with the data mining, data analytics is a field to analyze and process data in a scientific and cognitive angle. It is more helpful to convert knowledge to actionable knowledge for accurate decision making. Data Stream Mining is another challenging area than normal Data Mining due to its dynamics. Dynamics of data in a stream includes changes in data frequency, volume and nature. This paper focuses on the behavior of data mining of machines in process/manufacturing industries. In general, such data is continuous numerical and time series data captured by various industrial sensors. By nature, equipment or machinery behaviour can change over time. It requires calibration/replacement before failure of machinery. By analyzing data, one can find the behavior or state change. To identify that, dynamic models are required to be built using data mining and data stream mining. Thus, we are following a semi-novel approach for building such models using "*Ensemble of Unsupervised Incremental Learning*" method. Results show how the existing methods are different from the proposed method. This method can be applied for any other domain like image/audio/video or text mining.

Keywords

Data mining ; Data Stream Mining ; Unsupervised Learning ; Incremental Learning

Main Subjects

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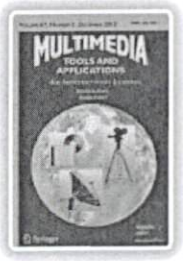

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Efficient detection of copy-move forgery using polar complex exponential transform and gradient direction pattern

S. B. G. Tilak Babu & Ch Srinivasa Rao

Multimedia Tools and Applications (2022)

Abstract

Evidence plays a vital role in image forensics. If evidence is an image, then its authenticity verification is the key to image forensics. One of the common forgeries in digital images is Copy-Move Forgery, which happens in a single image in which some portation of the image is copied and pasted in the same image. Copy Move Forgery Detection has demand in legal evidence, forensic examination and many more areas. The proposed method starts with the conversion of a grey image into overlapping blocks. Rotationally invariant stable Polar Complex Exponential Transform features are obtained from each overlapping block. The extracted feature dimensionality is further reduced using the Gradient Direction Pattern histogram. The similarity is identified among these histogram feature matrix rows. False matches are eliminated

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Author information

Authors and Affiliations

Department of ECE, Aditya Engineering College, Surampalem, India

S. B. G. Tilak Babu

Department of ECE, JNTUK UCEK, Kakinada, India

S. B. G. Tilak Babu

Department of ECE, JNTUK UCEV, Vizianagaram, India

Ch Srinivasa Rao

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Enhancement of Performance and Reduction in Emissions of Hydrogen Supplemented Aleurites Fordii Biodiesel Blend Operated Diesel Engine

P.S. Ranjit[a,b], Shaik Khader Basha[c], Swapnil Sureshchardra Bhurat[d], Amitkumar Thakur[e], A. Veeresh Babu[f], G.S. Mahesh[g] and M. Sreenivasa Reddy[a]

[a]*Dept. of Mech. Engg., Aditya Engg. College (A), Surampalem, Andhra Pradesh, India*
[b]*Corresponding Author, Email: psranjit1234@gmail.com*
[c]*Dept. of Mech. Engg., St. Annes College of Engg. and Tech., Chirala, Andhra Pradesh, India*
[d]*Dept. of Mech. Engg., University of Petroleum & Energy Studies, Dehradun, Uttarakhand, India*
[e]*School of Mech. Engg., Lovely Professional University, Phagwara, Punjab, India*
[f]*Dept. of Mech. Engg., National Institute of Tech., Warangal, Telangana, India.*
[g]*Dept. of Electrical and Electronics Engg., Sri Venkateswara Engg. College, Tirupati, Andhra Pradesh, India*

ABSTRACT:

The exponential growth in demand for energy and the non-availability of fossil energy and the immediate concern about environmental problems have intensified alternative fuels researchers' work. Aleurites Fordii (AF) biodiesel is a biomass-derived biofuel that can sequester carbon dioxide and release environmentally balancing O_2 and is thought to blend in 5-15% range with conventional petro-diesel fuel. Further, these blends were tested with 5% and 10% of total energy with GH_2 in a 4-stroke, 10 kW, water cooled, naturally aspirated, constant speed, in-direct injection compression ignition engine performance enhancement and reduction in emissions. All safety-related issues in handling and storage of GH_2 were considered as per National Fire Protection Association recommended standards. 5% AF biodiesel blend with 5% GH_2 (AFBD5H5) shown better performance with minimum emissions except NO_x was identified and compared with 90 ℃ pre-heated AF Straight Vegetable Oil (AFSVO), pure AF biodiesel (AFBD), 5% hydrogen supplemented AF Biodiesel (AFBD5H) and conventional petro-diesel operations.

KEYWORDS:

Aleurites Fordii; Tung oil; Straight vegetable oil; Biodiesel; Performance and emissions

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NOMENCLATURE:

AFSVO	Aleurites Fordii (AF) straight vegetable oil
AFBD	AF biodiesel
AFBD5H	AFBD with 5% gaseous Hydrogen
AFBD5	5% AFBD blended with conventional diesel
AFBD10	10% AFBD blended with conventional diesel
AFBD15	15% AFBD blended with conventional diesel
AFBD5H5	5% AFBD blended with conventional diesel along with 5% gaseous Hydrogen
AFBD5H10	5% AFBD blended with conventional diesel along with 10% gaseous Hydrogen

1. Introduction

Human life mainly depends on energy. Energy consumption continues to increase with fossil fuels being the primary source of supply. On the other hand, carbon reserves are not, as predicted. A source of oil demand and other significant worries about ecological problems and a significant fiscal consequence when consuming the same. Unconventional fuels, therefore, have a major part to play in addressing the scarcity of energy demand. However, considering economic issues, environmental problems and uninterrupted supply are critical when selecting renewable fuels. This alternate energy source might be renewable or biofuel. This paper utilizes both energies by utilizing Aleurites Fordii (AF) oil as bioenergy and supplementing it with GH_2 as clean energy. The major conclusion of the International Energy Agency (IEA) is that biofuel will occupy the sector by 27% by 2050, displacing traditional petro-diesel and related fuels [1]. In 2018, the Indian government renewed the National Biofuels Policy to boost the use of biofuels in transportation and agricultural pumps [2]. Furthermore, biofuel derived from biomass may trap carbon dioxide while emitting O_2, aiding in the stabilization of the climate AF is a member of the Euphorbiaceous family and is found in North Eastern India and adjacent Nations. After planting, the yield can be seen in 2 to 3 years, with an expected life of 11 years.

AF is largely composed of Alpha-Elaeostearic acid, which, in exchange for strong unsaturated fatty acids, makes it possible to produce biodiesel even at lower temperatures [3, 4]. Density and viscosity are both quite high. AF oil can be utilized in a variety of applications, including blending with other oils, pre-heating, transesterification and high-energy fuel replenishment. The other comprehensive technique for producing biodiesel from AF oil has previously been published in

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GENERALIZED LOWER SETS OF TRANSITIVE BE-ALGEBRAS

M. Bala Prabhakar, S. Kalesha Vali and M. Sambasiva Rao

Communicated by Ayman Badawi

MSC 2010 Classification: 06F35.

Keywords and phrases: Transitive BE-algebra, generalized lower set, ideal.

Abstract: The notion of generalized lower sets is introduced in transitive BE-algebras. Some properties of generalized lower sets are investigated in transitive BE-algebras. Furthermore, a sufficient condition is derived for every generalized lower set BE-algebra to become an ideal.

1 Introduction

The notion of BE-algebras was introduced and extensively studied by H.S. Kim and Y.H. Kim in [6]. These classes of BE-algebras were introduced as a generalization of the class of BCK-algebras of K. Iseki and S. Tanaka [5]. Some properties of filters of BE-algebras were studied by S.S. Ahn, Y.H. Kim and J.M. Ko in [2] and by B.L. Meng in [8]. In [11], A. Walendziak discussed some relationships between congruence relations and normal filters of a BE-algebra. In 2012, A. Rezaei and A. Borumand Saeid [9] stated and proved the first, second and third isomorphism theorems in self distributive BE-algebras. Later, these authors in [10] introduced the notion of commutative ideals in a BE-algebra. In 2013, A. Borumand Saeid, A. Rezaei and R.A. Borzooei [3] extensively studied the properties of some types of filters of BE-algebras. In [1], S.S. Ahn and K.S. So generalized the notion of upper sets in BE-algebras and discuss properties of the characterizations of generalized upper sets. In [7], H.S. Kim and K.J. Lee investigated several properties of upper and extended upper sets of BE-algebras.

In this paper, the concept of generalized lower sets is introduced in transitive BE-algebras as a dual of generalized upper sets. We discuss some significant properties of these generalized lower sets of transitive BE-algebras. It is observed that a generalized lower set of a transitive BE-algebra is not an ideal in general. However, a sufficient condition is derived for every generalized lower set to become an ideal. An equivalent condition is derived in terms of generalized lower sets for a subset of a transitive BE-algebra to become an ideal.

2 Preliminaries

In this section, we present certain definitions and results which are taken mostly from the papers [2], [4], [6] and [8] for the ready reference of the reader.

Definition 2.1. [6] An algebra $(X, *, 1)$ of type $(2, 0)$ is called a BE-algebra if it satisfies the following properties:

(1) $x * x = 1$,
(2) $x * 1 = 1$,
(3) $1 * x = x$,
(4) $x * (y * z) = y * (x * z)$ for all $x, y, z \in X$.

A BE-algebra X is called self-distributive if $x * (y * z) = (x * y) * (x * z)$ for all $x, y, z \in X$. A BE-algebra X is called transitive if $y * z \leq (x * y) * (x * z)$ for all $x, y, z \in X$. Every self-distributive BE-algebra is transitive. A BE-algebra X is called implicative if $(x * y) * x = x$ for all $x, y \in X$. A BE-algebra X is called commutative if $(x * y) * y = (y * x) * x$ for all $x, y \in X$.

The following two propositions are direct consequences of Lemma 3.15 and Theorem 3.12.

Proposition 3.16. *Let X be a transitive BE-algebra. Every non-empty subset I of X containing $[a^n; b]$ for all $a, b \in I$ and $n \in \mathbb{N}$ is a bounded subalgebra of X.*

Proposition 3.17. *Let X be a self-distributive BE-algebra. Every non-empty subset I of X containing $[a^n; b]$ for all $a, b \in I$ and $n \in \mathbb{N}$ is a bounded subalgebra of X.*

Theorem 3.18. *Let X be a transitive BE-algebra and I be an ideal of X. Then $I = \bigcup_{a,b \in I} [a^n; b]$ for every $n \in \mathbb{N}$.*

Proof. Assume that I is an ideal of X. Let $a, b \in I$ and $n \in \mathbb{N}$. Then by Theorem 3.12, $[a^n; b] \subseteq I$. Hence $\bigcup_{a,b \in I} [a^n; b] \subseteq I$. Again, let $x \in I$. Since $x \in [1^n; x]$, it follows that $I \subseteq \bigcup_{x \in I} [1^n; x] \subseteq \bigcup_{a,b \in I} [a^n; b]$. Hence $I = \bigcup_{a,b \in I} [a^n; b]$ for every $n \in \mathbb{N}$. □

Corollary 3.19. *Let X be a self-distributive BE-algebra and I be an ideal of X. Then $I = \bigcup_{a,b \in I} [a^n; b]$ for every $n \in \mathbb{N}$.*

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Author information

M. Bala Prabhakar, Department of Mathematics, Aditya Engineering College, Surampalem, Kakinada, Andhra Pradesh, 533 437, India.
E-mail: prabhakar_mb@yahoo.co.in

S. Kalesha Vali, Department of Mathematics, JNTUK University College of Engineering, Vizianagaram, Andhra Pradesh, 535 003, India.
E-mail: valijntuv@gmail.com

M. Sambasiva Rao, Department of Mathematics, MVGR College of Engineering, Vizianagaram, Andhra Pradesh, 535 005, India.
E-mail: mssraomaths35@rediffmail.com

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Performance-Based Code Calibration and Total Probability of Failure of the Nuclear Containment Structure Subjected to Missile Impact

Jaswanth Gangolu, Ph.D.; Ajay Kumar; and Hrishikesh Sharma, Ph.D.

Abstract

The multifarious calamities upon nuclear containment structures (NCS) and insufficient reliability-based factors inspired the current study for the investigation of hard missile impact. Available codes for design and construction of NCS suggest a load factor of 1.0 and basic information for the missile impact scenarios. However, the current study proposes novel reliability-based load and resistance factors for NCS subjected to a hard missile impact. The performance-based probabilistic energy capacity and demand models have been used for the

Authors

Jaswanth Gangolu, Ph.D.
Assistant Professor, Dept. of Civil Engineering, Aditya Engineering College, Surampalem, East Godavari District, Andhra Pradesh 533437, India.

Ajay Kumar
Research Scholar, Dept. of Civil Engineering, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand 247667, India. ORCID: https://orcid.org/0000-0003-4510-7146

Hrishikesh Sharma, Ph.D.
Associate Professor, Dept. of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati, Assam 781039, India (corresponding author). Email: shrishi@iitg.ac.in

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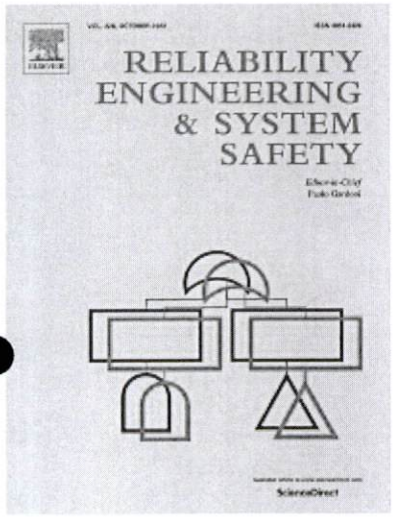

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Probabilistic demand models and performance-based fragility estimates for concrete protective structures subjected to missile impact

Jaswanth Gangolu [a], Ajay Kumar [b], Kasturi Bhuyan [b], Hrishikesh Sharma [b]

[a] Department of Civil Engineering, Aditya Engineering College, Aditya Nagar, ADB Road, Surampalem, Andhra Pradesh, India

[b] Department of Civil Engineering, Indian Institute of Technology Guwahati, Guwahati, Assam, India

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Highlights

- Developed probabilistic demand and damage models are accounted for all inherent uncertainties.
- Representative containment configurations are chosen for probabilistic analysis.
- Fragility estimation is carried out on experimental results and Tarapur nuclear containment structure.

Abstract

The manifold missile attacks upon structures and deficiency of codal provisions motivated the current study to develop probabilistic demand models for protective structures subjected to hard missile impact. These energy-based models are estimated using a defined performance-based design framework (PBD) with three performance levels associated with four damage states, i.e. from minor damage to total collapse. The evaluation of unknown model parameters is constructed using the Bayesian approach. The current

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Analysis of Regenerative Raw Signals Using Variational Mode Decomposition

Yogesh Shrivastava[1], Eram Neha[1], Bhagat Singh[2], Prashant Kumar Shrivastava[3], K.V.S.R. Murthy[4], Durgesh Nandan[5*]

[1] Department of Mechanical Engineering, Galgotias College of Engineering and Technology, Greater Noida 201306, U.P., India
[2] Department of Mechanical Engineering, Jaypee University of Engineering and Technology, Guna 473226, M.P., India
[3] Department of Mechanical Engineering, Dr. A. P. J. Abdul Kalam University, Indore 452016, M.P., India
[4] Department of Electrical & Electronics Engineering, Aditya Engineering College, Surampalem 533437, A.P., India
[5] Department of E & TC, Symbiosis Institute of Technology, Symbiosis International (Deemed University), (SIU), Pune, Maharashtra 412115, India

Corresponding Author Email: durgeshnandano51@gmail.com

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regenerative chatter, signal processing, variational mode decomposition, chatter index

ABSTRACT

Faults like regenerative tool chatter have been evaluated by several researchers in order to suppress its adverse effect. However, many facets of this domain are yet to be addressed. In the present work, a new methodology has been proposed to process the recorded regenerative chatter signals in order to extract the chatter features. In the proposed approach, experiments have been performed and signals pertaining to regenerative tool chatter have been recorded using microphone. Thereafter, the recorded signals have been evaluated and preprocessed using variational mode decomposition (VMD) in order to extract chatter features. The decomposed signals that result in variational mode functions have been further evaluated by calculating a response termed as chatter index. This response has been used to predict the chatter severity during machining at different combinations of input parameters, on verifying the obtained results it has been found that the proposed methodology is significant in identifying the chatter severity.

1. INTRODUCTION

Nowadays, fault diagnosis is very essential and trending. A lot of signal processing techniques have been adopted by researchers in order to identify faults in machinery. The faults can be of any type including fault in bearings, gears, moving part, surface finish or tool failure [1-7]. The adopted signal processing technique should have the capability to identify the exact fault. The selection of techniques is a very essential step in the due process. The researchers in the past have done the selection on the basis of the type of signal and feature to be extracted. The popular techniques used till date are peak to peak analysis [8], wavelet [9-11], short time-frequency transform (STFT) [12], Hilbert Huang transform (HHT) [5, 13, 14], Fourier transform (FT) [15, 16], empirical mode decomposition (EMD) [17, 18], and ensemble empirical mode decomposition (EEMD) [3, 19, 20]. The selection of appropriate signal processing technique depends on the type of feature we want to extraction, for time information peak to peak analysis is preferred. For frequency information, Fourier transform is adopted. However, for both time and frequency information short-time Fourier transform (STFT), wavelet transform (WT), Hilbert Huang transform (HHT), empirical mode decomposition (EMD) and ensemble empirical mode decomposition (EEMD). Recently, a researcher has discussed in his work that, from the above mentioned time-frequency techniques, wavelet, STFT are suitable for non-stationary and linear signal. HHT, EMD and EEMD are suitable for non-stationary and nonlinear signals. However, for different signals, the efficiency of the technique may vary. In the case of raw chatter signals, the signal is usually associated with unwanted noise and contaminations. In order to filter out, these contaminations an appropriate signal processing techniques need to be adopted. In 2019, Shrivastava et al. have used EMD in order to sieve out the contaminations from the recorded tool chatter signals. They have found that EMD is suitable for processing the raw chatter signals but sometimes due to the mode mixing phenomenon, the extraction of exact features is affected. Hence, they reported EEMD as a more effective alternative [21]. Later, in 2020 it has been reported that being EEMD more effective that EMD it also has certain issues like the involvement of noise contents in the filtered signals [19]. These noise contents are associated with the noise that is added to the signal intentionally during the decomposition using EEMD. However, no appropriate technology has been implemented to the raw chatter signals in order to rectify such a problem. Hence, in the present work, the variational mode decomposition (VMD) technique has been adopted and implemented to the raw chatter signals.

VMD technique mainly decomposes a signal into sets of sub-signals called as variational mode functions (VMFs) [22]. It efficiently separated the non-linear, non-stationary and noisy signals into sub-signals according to the frequency range. The VMD technique does not prefer any sifting mechanism for the decomposition procedure, because of which VMD never faces the problem of mode mixing. VMD comprises the benefits of Wiener filtering and Hilbert transform, hence it provides more accurate and precise decomposition results.

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Stabilization of soils with nanoclay subjected to freeze-thaw cycles

Mahmoud Al Khazaleh, Meeravali Karumanchi & Ramamohana Reddy Bellum

Nanotechnology for Environmental Engineering (2022)

Abstract

As the size of the soil particles varies from 4.75 mm to 1 nm, void spaces form at the nanolevel. Due to more void spaces impacting a higher plasticity index, more settlement, less stability, and soil structure affect soil properties, including shear strength, compaction, and consolidation. The establishment of nanotechnology, a novel stabilizing technique, was made due to the need to restore the structure to all qualities. Nanotechnology describes nanoparticles and weak natural soil, even in bad weather conditions, as a new means of filling gaps at the nanoscale, i.e., 1 to 100 nm, and enhancing all geotechnical features. The key benefit of this new technology is nanomaterials, which are filled with particles in void spaces ranging in size from 15 to 80 nm. This paper deals with stabilizing soft soils

Munib and Angela Masri Faculty of Engineering, Civil Engineering Department, Aqaba University of Technology, P.O. Box: 2417, Aqaba, 77110, Jordan

Mahmoud Al Khazaleh

Department of Civil Engineering, VFSTR (Deemed to Be University), Guntur, A.P., 522213, India

Meeravali Karumanchi

Department of Civil Engineering, Aditya Engineering College, Aditya Nagar, ADB Road, Surampalem, E.G. Dist, A.P., 533437, India

Ramamohana Reddy Bellum

Corresponding author

Correspondence to Ramamohana Reddy Bellum.

Ethics declarations

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The authors declared that there is no conflict of interest statement to publish this paper.

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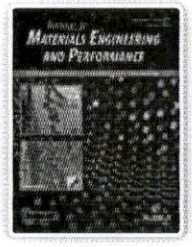

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Technical Article | Published: 28 September 2022

Characterization of AA7075 Surface Composites with Ex Situ Al_2O_3/SiC Reinforcements Tailored Using Friction Stir Processing

K. Suganeswaran, S. Ragu Nathan, R. Parameshwaran, N. Nithyavathy & N. R. Dhineshbabu

Journal of Materials Engineering and Performance (2022)

Abstract

Automotive monocoque is in need of AA7075 with enhanced strength and hardness properties. Fabrication of Surface Hybrid Composites (SHCs) by Friction Stir Processing is a prominent technique to satisfactorily enhance the aforementioned characteristics. SHCs are formed through different volume proportions of Al_2O_3/SiC reinforcements. Heat generation during the processing stage shows a linear trend along the longitudinal axis due to the thermal conductivity of AA7075. Microstructure of composites is observed with fine grain formation and homogeneous distribution of reinforcements. X-ray Diffraction pattern confirms the existence of both reinforcements in matrix alloy. Specimens with

Department of Mechatronics Engineering, Kongu Engineering College, Perundurai, 638060, Tamil Nadu, India

K. Suganeswaran, R. Parameshwaran & N. Nithyavathy

Micromachining Research Center (MMRC), Department of Mechanical Engineering, Sree Vidyanikethan Engineering College, Tirupati, 517102, Andhra Pradesh, India

S. Ragu Nathan

Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, 533437, Andhra Pradesh, India

N. R. Dhineshbabu

Corresponding author

Correspondence to S. Ragu Nathan.

Ethics declarations

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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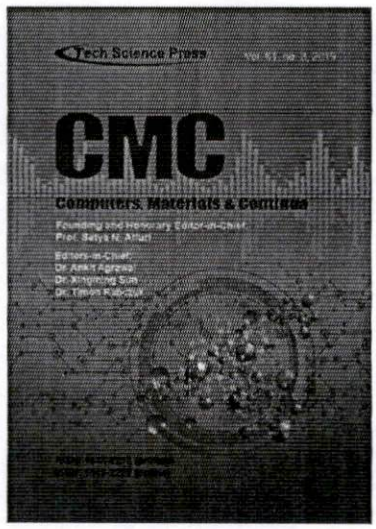

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Modified Differential Evolution Algorithm for Solving Dynamic Optimization with Existence of Infeasible Environments

CMC-Computers, Materials & Continua, Vol.74, No.1, pp. 1-17, 2023,
DOI:10.32604/cmc.2023.027448

Abstract Dynamic constrained optimization is a challenging research topic in which the objective function and/or constraints change over time. In such problems, it is commonly assumed that all problem instances are feasible. In reality some instances can be infeasible due to various practical issues, such as a sudden change in resource requirements or a big change in the

Computers, Materials & Continua
DOI: 10.32604/cmc.2023.032549
Article

Tech Science Press

Blockchain Driven Metaheuristic Route Planning in Secure Wireless Sensor Networks

M. V. Rajesh[1], T. Archana Acharya[2], Hafis Hajiyev[3], E. Laxmi Lydia[4], Haya Mesfer Alshahrani[5], Mohamed K Nour[6], Abdullah Mohamed[7] and Mesfer Al Duhayyim[8,*]

[1]Department of Computer Science and Engineering, Aditya Engineering College, Surampalem, 533437, India
[2]Department of Business Administration, Vignan's Institute of Information Technology, Visakhapatnam, 530049, India
[3]Department of Accounting and Audit, Azerbaijan State University of Economics (UNEC), Baku, Republic of Azerbaijan
[4]Department of Computer Science and Engineering, Vignan's Institute of Information Technology, Visakhapatnam, 530049, India
[5]Department of Information Systems, College of Computer and Information Sciences, Princess Nourah Bint Abdulrahman University, P.O.Box 84428, Riyadh, 11671, Saudi Arabia
[6]Department of Computer Sciences, College of Computing and Information System, Umm Al-Qura University, Saudi Arabia
[7]Research Centre, Future University in Egypt, New Cairo, 11845, Egypt
[8]Department of Computer Science, College of Sciences and Humanities-Aflaj, Prince Sattam bin Abdulaziz University, Saudi Arabia
*Corresponding Author: Mesfer Al Duhayyim. Email: m.alduhayyim@psau.edu.sa
Received: 22 May 2022; Accepted: 22 June 2022

Abstract: Recently, Internet of Things (IoT) has been developed into a field of research and it purposes at linking many sensors enabling devices mostly to data collection and track applications. Wireless sensor network (WSN) is a vital element of IoT paradigm since its inception and has developed into one of the chosen platforms for deploying many smart city application regions such as disaster management, intelligent transportation, home automation, smart buildings, and other such IoT-based application. The routing approaches were extremely-utilized energy efficient approaches with an initial drive that is, for balancing the energy amongst sensor nodes. The clustering and routing procedures assumed that Non-Polynomial (NP) hard problems but bio-simulated approaches are utilized to a recognized time for resolving such problems. With this motivation, this paper presents a new blockchain with Enhanced Hunger Games Search based Route Planning (BCEHGS-RP) scheme for IoT assisted WSN. The presented BCEHGS-RP model majorly employs BC technology for secure communication in the IoT supported WSN environment. In addition, an effective multihop route planning approach was designed by the use of EHGS technique. The proposed EHGS technique is derived from the concept of Hill Climbing strategy (HCS) and HGS algorithm. Moreover, a fitness function with two parameters namely residual energy (RE) and intercluster distance to elect optimal routes. The performance validation of the BCEHGS-RP model is experimented with under diverse number of nodes.

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Published: 12 July 2022

Design of a broadband dispersion compensated ultra-high nonlinear photonic crystal fiber

Sanat Kumar Pandey, Shivam Singh, J. B. Maurya, R. N. Verma & Yogendra Kumar Prajapati

Optical and Quantum Electronics **54**, Article number: 503 (2022)

Abstract

A photonic crystal fiber (PCF) with four circular rings of air holes expanded toward the cladding region is proposed. Four circular tiny air hole rings have been used between the air holes in a regular circular PCF to achieve low dispersion and confinement loss. Additionally, the core region is perforated with a rectangular-shaped hole filled with an extremely nonlinear material, gallium phosphide, to achieve the desired level of nonlinearity. We achieved extremely high nonlinearity and birefringence values of 4.6104 W^{-1} km^{-1} and 0.078 at the 1.55 μm telecommunication window by doing so. Further, we observed the structure with varying pitch (Λ) values and found a significant reduction in dispersion and

birefringence and high-nonlinearity photonic crystal fiber with As_2S_3 core. Opt. Commun. **410**, 396–402 (2018)

Zhao, T., Lian, Z., Benson, T., Wang, X., Zhang, W., Lou, S.: Highly-nonlinear polarization-maintaining As_2Se_3-based photonic quasi-crystal fiber for supercontinuum generation. Opt. Mater. **73**, 343–349 (2017)

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Author information

Authors and Affiliations

Department of Electronics Engineering, Government Polytechnic, Lucknow, UP, 226016, India

Sanat Kumar Pandey

Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, 533437, India

Shivam Singh

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Jingshu Wang, Xiaoning Tang

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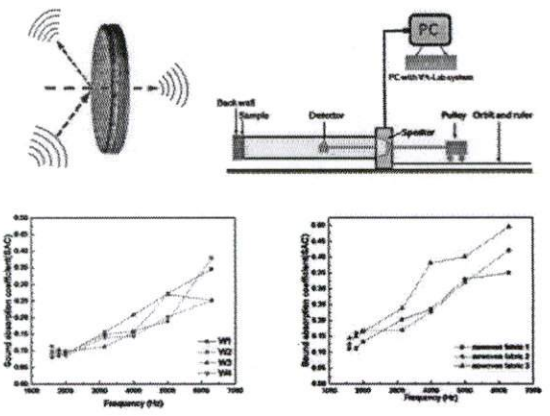

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Mechanical and thermal performances of styrene butadiene rubber nanocomposites with boron nitride nanosheets, carbon nanotubes, and the hybrid filler system

Lichao Gu, Hao Nan, Ruiguang Xing, Gaofei Pan, Yufei Wang, Xin Ge

Polymer Composites / Volume 43, Issue 9 / p. 6571-6577

RESEARCH ARTICLE

Preparation and characterization of opuntia-cladode fiber and citron peel biochar toughened epoxy biocomposite

Senthil Kannan N., N. Nagabhooshanam ✉, Anil Kumar, Pothamsetty Kasi V. Rao, Pravin P. Patil, B. V. V. L. Kala Bharathi

First published: 08 August 2022
https://doi.org/10.1002/pc.26970

Abstract

In this research, citron peel biochar and opuntia-cladode fibers (OCF) reinforced epoxy composites were fabricated and characterized for mechanical, wear, and electrical properties. The biochar was prepared from the waste peels of citron edible fruit whereas the opuntia fiber was from the cladode of the opuntia plant. The laminates were fabricated by hand layup process and evaluated in accordance with the ASTM standards. The results revealed that the mechanical properties such as tensile strength, flexural strength, impact toughness, hardness and adhesion strength were increased by 36.2%, 30.6%, 91.3%, 1.1%, and 5.3% for composite designation EC containing 30 vol% of OCF. Similarly, the addition of citron biochar of 2 vol% increased the load bearing and dielectric properties. However, the inclusion of 30 vol% of OCF on composite designation EC the sp. wear rate recorded 0.018 mm^3/Nm. Similarly, the lowest coefficient of friction and sp. wear rate is observed to be 0.42 and 0.008 mm^3/Nm for the composite with 2.0 vol% biochar. The ECO_4 composite designation represented a maximum dielectric constant and dielectric loss of about 7.4 and 1.1, respectively. The SEM fractography demonstrates that the silane-treatment strengthened the fiber-matrix interface and improved the interlocking mechanism. Such mechanically robust, wear-resistant improved and electrically conductive composites could be utilized in applications such as industrial sectors, spacecraft, automobile parts, packaging industries, and electrical appliances.

Polymer Composites / Volume 43, Issue 9 / p. 6571-6577

RESEARCH ARTICLE

Preparation and characterization of opuntia-cladode fiber and citron peel biochar toughened epoxy biocomposite

Senthil Kannan N., N. Nagabhooshanam, Anil Kumar, Pothamsetty Kasi V. Rao, Pravin P. Patil, B. V. V. L. Kala Bhar

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CORRESPONDING AUTHOR

N. Nagabhooshanam

nnbhooshanam@rediffmail.com

orcid.org/0000-0002-5889-5148

Department of Mechanical Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, India

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Abstract

In this resear fibers (OCF) reinforced epoxy composites w nical, wear, and electrical properties. Th els of citron edible fruit whereas the opuntia fi ant. The laminates were fabricated by dance with the ASTM standards. The results re as tensile strength, flexural strength, imp ngth were increased by 36.2%, 30.6%, 91.3% EC containing 30 vol% of OCF. Similarly, the ed the load bearing and dielectric properties. However, the inclusion of 30 vol% of OCF on composite designation EC the sp. wear rate recorded 0.018 mm^3/Nm. Similarly, the lowest coefficient of friction and sp. wear rate is observed to be 0.42 and 0.008 mm^3/Nm for the composite with 2.0 vol% biochar. The ECO_4 composite designation represented a maximum dielectric constant and dielectric loss of about 7.4 and 1.1, respectively. The SEM fractography demonstrates that the silane-treatment strengthened the fiber-matrix interface and improved the interlocking mechanism. Such mechanically robust, wear-resistant improved and electrically conductive composites could be utilized in applications such as industrial sectors, spacecraft, automobile parts, packaging industries, and electrical appliances.

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RESEARCH ARTICLE

EMI shielding of cobalt, red onion husk biochar and carbon short fiber-PVA composite on X and Ku band frequencies

G. Devi ✉, N. Nagabhooshanam, Mohan Chokkalingam, Santosh Kumar Sahu

First published: 16 July 2022
https://doi.org/10.1002/pc.26898
Citations: 1

Abstract

This present study discusses the effects of doped novel cobalt-onion peel-based water soluble Poly vinyl alcohol (PVA) composite for its electromagnetic interference shielding (EMI) effectiveness in high-frequency bands such as X and Ku region. The primary aim of this study was to prepare a flexible electromagnetic shielding material for protecting electronic gadgets from the EMI effect. The biochar particles were prepared from red onion peel and mixed with cobalt/chopped carbon fiber (CCF) to form a compound structure. According to the results, the biochar and CCF addition improved the relative permittivity up to 9.6. Similarly, the hysteresis analysis showed a broad "S" curve for 2 vol% cobalt-added PVA composite. Moreover the doped composites are better in mechanical properties and the highest tensile strength of 79 MPa with Shore-D hardness of 37 was noted for PV3 composite designation. Finally, the highest wave shielding of −44.37 dB and − 49.62 dB for X and Ku band were observed for composite designation PVA4. This EMI shielding effectiveness improved composites could be used as shielding material for modern industrial, defense, and medical applications.

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Authors hereby confirming that there is no conflict and competing interest between authors.

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RESEARCH ARTICLE

EMI shielding of cobalt, red onion husk biochar and carbon short fiber-PVA composite on X and Ku band frequencies

G. Devi, N. Nagabhooshanam, Mohan Chokkalingam, Santosh Kumar Sahu

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N. Nagabhooshanam
orcid.org/0000-0003-1962-2136

Department of Mechanical Engineering,
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Andhra Pradesh, India

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This pr novel cobalt-onion peel-based water soluble Poly vinyl alcohol (PVA) composite for its electromagnetic interference shielding (EMI) effectiveness in high-frequency bands such as X and Ku region. The primary aim of this study was to prepare a flexible electromagnetic shielding material for protecting electronic gadgets from the EMI effect. The biochar particles were prepared from red onion peel and mixed with cobalt/chopped carbon fiber (CCF) to form a compound structure. According to the results, the biochar and CCF addition improved the relative permittivity up to 9.6. Similarly, the hysteresis analysis showed a broad "S" curve for 2 vol% cobalt-added PVA composite. Moreover the doped composites are better in mechanical properties and the highest tensile strength of 79 MPa with Shore-D hardness of 37 was noted for PV3 composite designation. Finally, the highest wave shielding of −44.37 dB and − 49.62 dB for X and Ku band were observed for composite designation PVA4. This EMI shielding effectiveness improved composites could be used as shielding material for modern industrial, defense, and medical applications.

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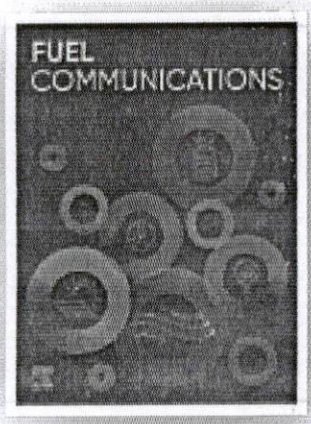

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Volume 324, Part B, 15 September 2022, 124603

Full Length Article

Combustion and emission behaviors of dual-fuel premixed charge compression ignition engine powered with n-pentanol and blend of diesel/waste tire oil included nanoparticles

P.V. Elumalai [a, b, 1], Santosh Kumar Dash [c], M. Parthasarathy [d, 1], N.R. Dhineshbabu [e], Dhinesh Balasubramanian [f, g, h], Dao Nam Cao [i, 1], Thanh Hai Truong [j], Anh Tuan Le [k], Anh Tuan Hoang [l, 1]

[a] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India
[b] Department of Mechanical Engineering, Jawaharlal Nehru Technological University Kakinada, Kakinada, East Godavari District, Andhra Pradesh, India
[c] Department of Mechanical Engineering, Ghani Khan Choudhury Institute of Engineering and Technology, Malda, West Bengal 732141, India
[d] School of Mechanical and Construction, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Chennai, India
[e] Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India
[f] Department of Mechanical Engineering, Mepco Schlenk Engineering College, Sivakasi, TamilNadu, India
[g] Mechanical Engineering, Faculty of Engineering, KhonKaen University, KhonKaen, Thailand
[h] Center for Alternative Energy Research and Development, KhonKaen University, KhonKaen, Thailand
[i] Institue of Mechanical Engineering, Ho Chi Minh City University of Transport, Ho Chi Minh City, Viet Nam
[j] PATET Research Group, Ho Chi Minh City University of Transport, Ho Chi Minh City, Viet Nam
[k] School of Mechanical Engineering, Hanoi University of Science and Technology, Hanoi, Viet Nam
[l] Institue of Engineering, HUTECH University, Ho Chi Minh City, Viet Nam

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Volume 323, 1 September 2022, 124415

Full Length Article

Experimental assessment on characteristics of premixed charge compression ignition engine fueled with multi-walled carbon nanotube-included *Tamanu* methyl ester

N. Murugu Nachippan [a], M. Parthasarathy [a], P.V. Elumalai [b, g], A. Backiyaraj [a], Dhinesh Balasubramanian [c, d, e], Anh Tuan Hoang [f]

[a] Department of Automobile Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, India
[b] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India
[c] Department of Mechanical Engineering, Mepco Schlenk Engineering College, Sivakasi, Virudhunagar, Tamil Nadu 626005, India
[d] Mechanical Engineering, Faculty of Engineering, Khon Kaen University, Khon Kaen, Thailand
[e] Center for Alternative Energy Research and Development, Khon Kaen University, Khon Kaen, Thailand
[f] Institute of Engineering, HUTECH University, Ho Chi Minh City, Viet Nam
[g] Department of Mechanical Engineering, Jawaharlal Nehru Technology University Kakinada, Kakinada, East Godavari District, Andhra Pradesh, India

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Research Article

Investigation of High-Temperature Wear Behaviour of AA 2618-Nano Si_3N_4 Composites Using Statistical Techniques

Santhi M. George,[1] Amel Gacem,[2] A. Kistan,[3] R. Mohammed Ashick,[4] L. Malleswara Rao,[5] Vinod Singh Rajput,[6] N. Nagabooshanam,[7] Moamen S. Refat,[8] Amnah Mohammed Alsuhaibani,[9] and David Christopher[10]

[1]*Department of Science and Humanities, RMK Engineering College, Thiruvallur, Tamil Nadu 601206, India*
[2]*Department of Physics, Faculty of Sciences, University 20 Août 1955, 26 El Hadaiek, Skikda 21000, Algeria*
[3]*Department of Chemistry, Panimalar Engineering College, Chennai, Tamil Nadu 600123, India*
[4]*Department of Civil Engineering, Sri Sairam Engineering College, Chennai, Tamil Nadu 600044, India*
[5]*Department of Physics, SRI Y N College, Narsapur, West Godavari, Andhra Pradesh 534275, India*
[6]*Department of Mechanical Engineering, Nowgong Engineering College, Nowgong, Chhatarpur, Madhya Pradesh 471201, India*
[7]*Department of Mechanical Engineering, Aditya Engineering College, ABD Road, Surampalem, 533437 Andhra Pradesh, India*
[8]*Department of Chemistry, College of Science, Taif University, P.O. Box 11099, Taif 21944, Saudi Arabia*
[9]*Department of Physical Sport Science, College of Education, Princess Nourah bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia*
[10]*Department of Mechanical Engineering, College of Engineering, WolaitaSodo University, Ethiopia*

Correspondence should be addressed to David Christopher; david.santosh@wsu.edu.et

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The wear behaviour of hot pressed AA 2618 aluminium alloy matrix composites reinforced through nano Si_3N_4 elements (1 percent and 2 percent) has been investigated in this paper. Temperatures of 50°C, 150°C, and 250°C were used to examine the tribological characteristics of the models under a range of loads and pressures. The best wear performance was found in AA 2618/2wt percent Si_3N_4. Under a load of 30 N and temperature of 250°C, it was discovered that Si3N4-enriched AA 2618 alloy was 35.7% more wear-resistant than unreinforced AA 2618 alloy. Metal flow and plain delamination were the most common wear mechanisms at higher temperatures. Delamination is the most common wear mechanism at temperatures between 50 and 250 degrees Celsius. In the analysis of variance, the wear rate was influenced by temperature, load, and the presence of Si_3N_4 by 47.2%. In order to predict the wear rate, regression equations (linear and nonlinear) were developed by Taguchi method. Using a high determination coefficient, the nonlinear regression was the preeminent success rate (92.8 percent).

1. Introduction

Lightweight, inexpensive, and energy-efficient alloys are becoming increasingly popular. It is broadly used in the automotive industries for its maximum specific strength, corrosion resistance, and excellent low-temperature properties [1]. Although Al alloys have some drawbacks, the most significant one is their less amount of wear and mechanical properties at higher temperatures [2, 3]. Al metal matrix composites have been developed to address these shortcomings (AMMCs). Al MMCs are commonly reinforced with a variety of materials, including SiC, Al_2O_3,B_4C, TiC, CNT, GNPs, GO, and Y_2O_3 [4]. Since Si_3N_4 has a high melting point and good thermal conductivity, it was a natural choice for Al MMC reinforcement. Research into MMCs' wear and friction patterns is essential [5–7]. In the event that two surfaces are in close proximity to each other, material loss can occur. Consequently, wear has become a major cause of

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Research Article

Nanotitanium Oxide Particles and Jute-Hemp Fiber Hybrid Composites: Evaluate the Mechanical, Water Absorptions, and Morphological Behaviors

C. R. Mahesha,[1] R. Suprabha,[1] Mahesh S. Harne,[2] Sachin G. Galme,[3] Sandeep G. Thorat,[4] N. Nagabhooshanam,[5] A. H. Seikh,[6] M. H. Siddique,[7] and Mebratu Markos[8]

[1]*Department of Industrial Engineering & Management, Dr. Ambedkar Institute of Technology, Bangalore, Karnataka 560056, India*
[2]*Department of Mechanical Engineering, Amrutvahini College of Engineering, Sangamner, Maharashtra 422608, India*
[3]*Department of Mechanical Engineering, Sandip Institute of Technology and Research Centre, Nashik, Maharashtra 422213, India*
[4]*Department of Mechanical Engineering, MIT ADT University's MIT School of Engineering, Rajbaug Loni Kalbhor, Pune, Maharashtra 412201, India*
[5]*Department of Mechanical Engineering, Aditya Engineering College Surampalem, Andhra Pradesh, India*
[6]*Mechanical Engineering Department, College of Engineering, King Saud University, P.O. Box 800, Al-Riyadh 11421, Saudi Arabia*
[7]*Intelligent Construction Automation Centre, Kyungpook National University, Daegu, Republic of Korea*
[8]*Department of Mechanical Engineering, College of Engineering, Wolaita Sodo University, Ethiopia*

Correspondence should be addressed to Mebratu Markos; mebratumarkos@wsu.edu.et

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Organic fiber-based biocomposites have gained prominence in a variety of sectors over the last four to five years due to their exceptional mechanical and physical properties. Natural fiber-based composites are increasingly being employed in autos, ships, airplanes, and infrastructure projects. The current study will look at the effect of nanotitanium oxide (TiO_2) fillers on the properties of hybridised jute-hemp-based composites. In this work, TiO_2-filled biocomposites were created using the hand layup method in hybrid jute-hemp composites containing jute fiber mats, woven hemp mats, and epoxy resin. After nanotitanium oxide fillers were injected in various weight proportions, the mechanical properties of fiber-reinforced polymers were investigated. The mechanical properties of laminated composites were tested using the ASTM standard. Compared to 2 and 4 wt.% of TiO_2, the 6 wt.% was provided the highest mechanical strength. Among the different types of specimen, the E-type specimen (30 wt.% of hemp, 7 wt.% of jute, 57 wt.% of epoxy, and 6 wt.% of TiO_2) gives their highest contribution, i.e., for tensile 24.21%, for flexural 25.03%, and for impact 24.56%. The scanning electron microscope was utilized to analyse the microstructures of nanocomposites.

1. Introduction

The utilization of composite materials has increased at an astounding rate, and these materials today have a remarkable and wide variety of uses. Minimal weight, strong fatigue tolerance, high corrosion resilience, insulation, and low coefficient of thermal expansion are key benefits of composites over several metallic materials. Polymer matrix composites (PMCs) offer outstanding physical and thermal qualities, like high specific toughness, as well as high toughness and rust resistance. The researchers emerged as viable alternatives to traditional metals in a wide range of applications, including aeroplanes, warships, housing, vehicles, microelectronics components, and maritime construction [1, 2]. The resources used throughout the airframe of a Boeing 777 contain 50% aluminium and 12% polymers by weightiness. However, in

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Research Article

Investigations of Nanoparticles (Al_2O_3-SiO_2) Addition on the Mechanical Properties of Blended Matrix Polymer Composite

K. Logesh,[1] V. M. Vel,[2] A. H. Seikh,[3] Ajit M. Hebbale,[4] Rajesh A S,[5] N. Nagabhooshanam,[6] Ram Subbiah,[7] M. H. Siddique,[8] and S. Praveen Kumar[9]

[1]*Department of Mechanical Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, Chennai, Tamil Nadu, India*
[2]*Department of Mechanical Engineering, KLN College of Engineering, Pottapalaiyam, 630612 Tamil Nadu, India*
[3]*Mechanical Engineering Department, College of Engineering, King Saud University, P.O. Box 800, Al-Riyadh 11421, Saudi Arabia*
[4]*Department of Mechanical Engineering, N.M.A.M Institute of Technology (Affiliated to Nitte Deemed to be University) Nitte, Karnataka 574110, India*
[5]*Department of Mechanical Engineering, JSS Science & Technology University, Mysuru, Karnataka 570006, India*
[6]*Department of Mechanical Engineering, Aditya Engineering College, ADB Road, Aditya Nagar, Surampalem 533437, Andhra Pradesh, India*
[7]*Department of Mechanical Engineering, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, Telangana 500090, India*
[8]*Department of Mechanical Engineering, Kyungpook University, Republic of Korea*
[9]*Department of Mechanical Engineering, Arba Minch Institute of Technology (AMIT), Arba Minch University, Ethiopia*

Correspondence should be addressed to S. Praveen Kumar; praveen.kumar@amu.edu.et

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The manufacture and investigation of the characteristics of nanocomposites with nanoparticles are made by the sol-gel technique. It comprises two substances (aluminium oxide-silicon oxide), as well as the influence of such particles on the mechanical characteristics of a polymeric matrix is described in this study. Tensile, bending, and hardness tests were utilized to assess the mechanical characteristics of the hybrid material. The evaluation results of composite nanoparticles revealed a clear dispersion of chemical components among aluminium oxide and calcium oxide, softness in particulate matter during crystallization at high and low temperatures, the initiation of various nanostructures forms, and distinct stages of an alumina particle. When compared to a polymeric mix without nanoparticle inclusion, mechanical behaviour tests demonstrated a considerable improvement in the mechanical capabilities of the nanocomposites, notably at 2%. Mechanical parameters such as tensile strength are 61.36 MPa, flexural strength is 74.25 MPa, and hardness is 83.27 D at 2.5 wt% at 600°C heat treatment conditions. Under 900°C heat treatment conditions, tensile properties of 54.12 MPa at 1 wt. percent, flexural properties of 79.21 MPa at 2 wt. percent, and shore hardness of 81.21 D at 2.5 wt. percent of nanoparticles were measured.

1. Introduction

Nanotechnology is a large and comprehensive scientific discipline that has exploded in popularity in current decades, and nanoparticles are the foundation of nanotechnologies. Nanostructures are advanced inorganic materials that are gaining professional curiosity due to their remarkable qualities when compared to other types of substances [1]. Nanocomposite particles are made up of two separate materials consolidated into a single hybridized particle, resulting in a multifaceted substance that may be employed in a variety of sectors, such as pharmaceuticals, electronics, and manufacturing, or to improve existing features [2]. As a result, interest in this type of material has grown, as have the tactics employed to make it [3]. Natural fibre may be utilized to make nanostructures, while tapioca plant films could

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Research Article

A Comprehensive Study of Ceramic Matrix Composites for Space Applications

S. Dhanasekar,[1] Arul Thayammal Ganesan,[2] Taneti Lilly Rani,[3] Venkata Kamesh Vinjamuri,[4] Medikondu Nageswara Rao,[5] E. Shankar,[6] Dharamvir,[7] P. Suresh Kumar,[8] and Wondalem Misganaw Golie[9]

[1]*Department of Electronics and Communication Engineering, Sri Eshwar College of Engineering, Coimbatore 641202, India*
[2]*Department of Mechanical Engineering, St Mary's Engineering College (SMEC), Hyderabad, Telangana 501505, India*
[3]*Department of Civil Engineering, University College of Engineering Kakinada JNTUK, Kakinada, Andhra Pradesh 533003, India*
[4]*Department of Mechanical Engineering, Aditya Engineering College (A), Surampalem, Andhra Pradesh 533437, India*
[5]*Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Guntur, Andhra Pradesh, India*
[6]*Department of Mechanical Engineering, Rajalakshmi Engineering College, Chennai, Tamil Nadu 602105, India*
[7]*Department of MCA, The Oxford College of Engineering, Bommanhalli, Bengaluru, Karnataka 560068, India*
[8]*School of Engineering, Department of Mechanical Engineering, University of Petroleum and Energy Studies Dehradun, Dehradun, Uttarakhand 248007, India*
[9]*Department of Chemical Engineering, College of Engineering, Ethiopian Defence University, Bishoftu, Ethiopia*

Correspondence should be addressed to Wondalem Misganaw Golie; wondalem.misganaw@dec.edu.et

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Ceramic matrix composites (CMCs) have grown in popularity as a material for a range of high as well as protection components, increasing the need to better understand the impacts of multiple machining methods. It is primarily composed of ceramic fibers embedded in the matrix. Ceramic materials, especially carbon fibers and carbon were used to create the matrix and fibers. These ceramics include a huge variety of non-metallic inorganic materials that are regularly utilized under high temperatures. The aircraft industry became revolutionized by this unique combination of materials, which made parts better resistant under extreme conditions as well as lighter than the earlier technology. The development, properties, and production of ceramic matrix composites, as well as space applications, are discussed in this article. Ceramic materials have an interesting set of properties, including great strength and stiffness under extremely high temperatures, chemical inertness, low density, etc. In CMC, ceramics are used in the matrix as well as reinforcement. The matrix material keeps things running smoothly while the reinforcement delivers unique special properties. Ceramic matrix composites are developed for applications that required high thermal and mechanical characteristics, which include nuclear power plants, aircraft, chemical plants, space structures, and transportation services. Even though advanced aircraft relies on high-performance propulsion systems, improving the total impulses over the total mass ratio for rocket engines becomes essential for improving their performance that demands reduced engine structural weight as well as higher component heat resistance. The evolution of new ultra-high-temperature composites having high-temperature resistance as well as low density that a substitute super alloy and refractory metal material has become so essential and laid the foundation for high-performance engine design. The benefits of continuous fiber- reinforced CMC with high-temperature engine designs have long been recognized as a better measure of a country's ability to design and produce spacecraft, modern aircraft, and weapons. Ceramic matrix composites materials are used in various aircraft type engines, aircraft brake disks, high-temperature gas turbines components, slide bearing components, hot gas duct, flame holders and components for burners are made by using oxide CMCs.

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Research Article

Design and Fabrication of Patient-Specific Implant for Maxillofacial Surgery Using Additive Manufacturing

Rakesh Koppunur[1], **Kiran Kumar Dama**[1], **Uzwalkiran Rokkala**[2], **Balaji Thirupathi**[3], **N. V. S. S. Sagar**[4] and **Bhiksha Gugulothu**[5]

[1]*Department of ME, Koneru Lakshmaiah Education Foundation, Guntur, India*
[2]*Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India*
[3]*iForge3D Rapid Prototyping Technologies, Hyderabad, India*
[4]*Design and Prototyping Center & Mechanical Division, Engineering Staff College of India, Hyderabad, India*
[5]*Department of Mechanical Engineering, Post Box No 144, Bule Hora University, Oromia, Ethiopia*

Correspondence should be addressed to Kiran Kumar Dama; kirandama@live.com

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Patient-specific implants are well known for fixing the fracture for bone repairs. However, the exact fixation of the fabricated implant to the patients is a challenging task. To overcome this problem, in the present study two kinds of designs are developed and fabricated. Based on the exact fitting to the patient's oral system, the best design is selected to fabricate. Computed tomography (CT) scan data of the patient oral anatomy is converted into a 3D model using the DICOM Software "Slicer 3D." The patient-specific maxillofacial implant is fabricated using fused filament fabrication (FFF) and direct metal laser sintering (DMLS) techniques. Before fabricating real time product, a prototype is fabricated at the initial stage using FFF. Later, stress distribution and displacement of the implant was investigated using a FEM simulation. The conclusion of the present work results are potential for FFF of patient-specific implants out of Ti-6Al-4V.

1. Introduction

Subperiosteally dental implant is a framework like custom made structure with abutments for support and fixation of dental restorations [1]. Subperiosteal dental implants are made from biocompatible materials like cobalt chromium (CoCr) and [2–4] Titanium alloys. Masticatory force is transferred to and distributed over a large area of the bone surface, rather than the bulk of the bone, as compared to root form implants [5, 6]. In general, for fixing the dental implants to the patient an acceptable bone is required to support the implant and also should contain healthy gums [7]. In some cases, bone grafting is created due to bone density is low. Nevertheless, in the case of severe bone resorption, extensive bone regeneration requirement represents clinical treatment challenges leading to hesitation from patients. Therefore, in recent times patient-specific implants are developing to avoid the above problems faced by various patients [8]. For the age group of 50–60 years, patient-specific implants are avoiding the regenerative surgeries and fixing the dental restoration [9].

Apart from dental restoration, maxillary and jawbone reconstructions find applications in treating bone defects caused by tumors, injuries, or infections [10]. However, such reconstruction represents major challenges from both the engineering and medical aspect. Subperiosteal implants are fabricated by the following three methods: (i) classic/traditional method, (ii) hybrid method, and (iii) digital method [11]. In the traditional method, the surgery needs to be performed twice, where during the first surgery the impression of the bone and the refractory model is made. The implant is designed based on the refractory model in Co Cr or Titanium alloy [12]. The second surgery is then done to install the implant on the patient. Though it takes two

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Research Article

An Artificial Intelligence Mechanism for the Prediction of Signal Strength in Drones to IoT Devices in Smart Cities

Mohamad Reda A. Refaai,[1] Vinjamuri S. N. C. H. Dattu,[2] H. S. Niranjana Murthy,[3] P. Pramod Kumar,[4] B. Kannadasan,[5] and Abdi Diriba[6]

[1]*Department of Mechanical Engineering, College of Engineering, Prince Sattam Bin Abdulaziz University, Alkharj 16273, Saudi Arabia*
[2]*Department of Mechanical Engineering, Aditya Engineering College, East Godavari, Surampalem, Andhra Pradesh, India*
[3]*Department of Electronics and Instrumentation Engineering, Ramaiah Institute of Technology, Bangalore, Karnataka 560054, India*
[4]*Department Computer Science and Artificial Intelligence, SR University, Warangal, Telangana, India*
[5]*Department of Civil Engineering, B. S. Abdur Rahman Crescent Institute of Science and Technology, Chennai, Tamil Nadu 600048, India*
[6]*Department of Mechanical Engineering, Mizan-Tepi University, Tepi, Ethiopia*

Correspondence should be addressed to Mohamad Reda A. Refaai; drengrefaai@gmail.com and Abdi Diriba; abdi@mtu.edu.et

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Drones, the Internet of Things (IoT), and Artificial Intelligence (AI) could be used to create extraordinary responses to today's difficulties in smart city challenges. A drone, which would be effectively a data-gathering device, could approach regions that become complicated, dangerous, or even impossible to achieve for individuals. In addition to interacting with one another, drones must maintain touch with some other ground-based entities, including IoT sensors, robotics, and people. Throughout this study, an intelligent approach for predicting the signal power from a drone to IoT applications in smart cities is presented in terms of maintaining internet connectivity, offering the necessary quality of service (QoS), and determining the drone's transmission range offered. Predicting signal power and fading channel circumstances enables the adaptable transmission of data, which improves QoS for endpoint users/devices while lowering transmitting data power usage. Depending on many relevant criteria, an artificial neural network (ANN)-centered precise and effective method is provided to forecast the signal strength from such drones. The signal strength estimations are also utilized to forecast the drone's flight patterns. The results demonstrate that the proposed ANN approach has an excellent correlation with the verification data collected through computations, with the determination of coefficient *R*2 values of 0.97 and 0.98, correspondingly, for changes in drone height and distances from a drone. Furthermore, the finding shows that signal distortions could be considerably decreased and strengthened.

1. Introduction

Drones are often referred to as unmanned aircraft systems. The drone is a flying robot, and it can be remotely controlled or flown automatically using software-controlled systems. It works in conjunction with sensitive devices and the global positioning system (GPS). Drones are now in demand for testing and multiple applications because of their versatility and capability to be used in a broad variety of applications, such as control, security, observation, and the rapid surveillance of inaccessible terrain. Furthermore, it is an alternative technology that enhances the ability of first responders to reach the areas of environmental disaster and carry out rescue operations. It can assist in emergency preparedness situations, such as medicine distribution, forest fire extinguishing, vital infrastructure preservation and testing, coastal surveillance, and police upgrades, and it can help meet the public safety standards of urban areas.

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Research Article

Investigation on Durability Behavior of Fiber Reinforced Concrete with Steel Slag/Bacteria beneath Diverse Exposure Conditions

Madhan Kumar M,[1,2] Vidhya Lakshmi Sivakumar,[1] Subathra Devi V,[3] N. Nagabhooshanam,[4] and Subash Thanappan[5]

[1]*Department of Civil Engineering, Saveetha School of Engineering, SIMATS, Chennai, Tamilnadu, India*
[2]*Department of Civil Engineering, Saveetha Engineering College, Chennai, Tamilnadu, India*
[3]*Director CIRA Technology Pvt. Ltd., Chennai 602105, Tamilnadu, India*
[4]*Department of Mechanical Engineering, Aditya Engineering College (A), Aditya Nagar, A D B Road, Surampalem, Andhra Pradesh, India*
[5]*Department of Civil Engineering, Ambo University, Ambo, Ethiopia*

Correspondence should be addressed to Subash Thanappan; subash.thanappan@ambou.edu.et

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One of society's most perplexing concerns is trash management. Among them is steel slag, which is obtained from steel mills and is used in the building industry as a partial substitution ingredient in concrete. To ensure that the concrete lasts the desired service life without deteriorating, bacteria (*Bacillus subtilis*) are introduced to ensure that the construction performs as planned. The research is focused on the M30 grade concrete mix specified in the Indian Standard Code. Concrete specimens containing fiber, steel slag, and bacteria are subjected to a variety of environmental conditions, including extreme, extremely severe, severe, moderate, and mild. The ultrasonic pulse velocity, sorptivity, water absorption, rapid chloride penetration, and acid resistance characteristics of the fiber-reinforced bacterial concrete are compared to those of regular concrete specimens.

1. Introduction

The 30 million tonnes of steel slag waste have been generated from the steel manufacturing industry every year in India. Utilizing this waste as a useful product in construction industry will reduce the over mining of natural resources. A single way of application can give the solutions for two problems such as waste management and depletion of natural resources. Steel slags are available in various sizes that can be used as substitute materials for fine and coarse aggregates in concrete. The properties of the steel slag such as size, shape, density, specific gravity, color, and appearance are compared to the conventional aggregates. Among all the properties, the water absorption of steel slag is slightly more than the normal coarse aggregates as, the micropores of the steel slag absorb greater portion of water from its surface [1]. The by-product of steel manufacturing plant is called steel slag and is used as a boosting material in clayey soil to improve the SBC of the soil [2]. Steel slag can be added as a basic ingredient material in concrete as well as a supplement material in cement for binding [3]. The depth of penetration of water in steel slag aggregate is higher in coarse form and lower in fine form while using in concrete. The same can be rectified by immersing the aggregate in water before using it into concrete [4]. The steel slag aggregate concrete having high resistivity to various imposed loads to avoid surface cracking in such a way that the particle binding in it [5]. Other than Blast Furnace Slag, the ferrous slag produced from the steel extraction producing major pollution element to the environment especially which leads leachate. Only

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Rectifier Acoustical Cardiac Activity Detection Analysis of ECG Signal

K.V.S Krishna[1], P. Manohar[2], N. Radha[3] and M.K. Singh[4]

[1,2,3,4]Department of ECE, Aditya Engineering College, Surampalem, India

*Correspondence: M. K. Singh.; mahesh.singh@aec.edu.in

ABSTRACT- Skilled cardiologists follow a series of steps to recognize the heartbeats of a patient. But it is a very difficult task to tune to particular frequencies for a doctor. So, in this manuscript, it is sorted into two series MIT-BIH data set steps for processing the heartbeat of a person without noise from a respiratory system to save a person from false detection of heart diseases. So, we expect our work is useful for researchers, educators, physicians. If the speed of the heart is faster or slower than it is said to be it is called an abnormality. Sudden cardiac death may also be attained due to false detection of a heartbeat. So, the early detection of this heartbeat is necessary to save the life of the patients. So, the algorithm proposed in this paper is useful in removing unnecessary sounds by surroundings and the overall mortality rate due to heart diseases can be reduced.

Keywords: Heartbeat, Phonocardiogram, Electrocardiogram, Heart rate variability, Noise.

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1. INTRODUCTION

Now a day's cardiac problems are very much common to even-aged, adults and even children due to increased levels of stress. The first stage to escape from this problem is a physical examination by doctors. Most doctors take several years for mastering in perfect detection of disorders of the heart [1-3]. It is even difficult for senior surgeons to estimate the disorder by a simple stethoscope. The period of a normal heartbeat is 30 ms. The characteristics of ECG signal indicating the cardiac disorder is a great deal quieter than others. ECG signal characteristics are shown in *Figure 1* taken from the MIT-BIH database [4-6]. Skilled cardiologists were also confused during this observation because of noise from surroundings. It is important to tune to frequencies of heart sounds to get a perfect diagnosis. Signal processing plays a major role in this medical diagnosis. For newborn babies, it is essential for recognizing holes in ventricles which may cause different heart sounds called murmur. Detection of a murmur by stethoscope is difficult due to human errors [7,8]. In this speech processing plays an important role i.e.., processing of recorded signals can estimate well than humans by computers. This is also called Phonocardiography. Phonocardiography requires more knowledge and time. Here introduced a Graphical User Interface (GUI) called MATLAB to measure the diameter of the hole in the heart. The heart has four chambers upper - atria, lower-ventricles [9-11].

ECG signal detection is related to cardiac activity. It is detected with two approaches first one traditional detection method which detected the ECG by stethoscope approach. The auditory stethoscope approaches are operated by the sound transmission from the heart of the patients [12-16]. It is air-filled tubes in hollow shapes to the ears of the listeners. If the diaphragm is positioned on the patient's body the sound vibrates the diaphragms, created the acoustic pressure wave that is traveling up to the tubing of the listener's ear. It is shown in *Figure 2*.

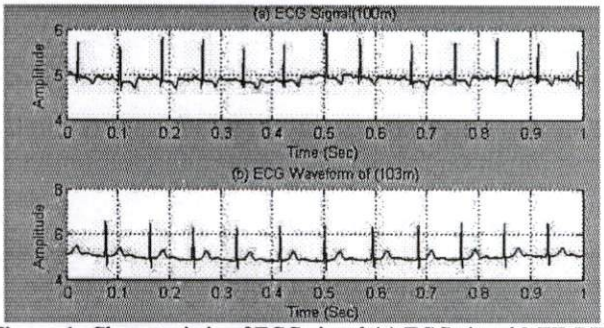

Figure 1: Characteristic of ECG signal (a) ECG signal MIT-BIH (100m database) (b) ECG signal MIT-BIH (103m database)

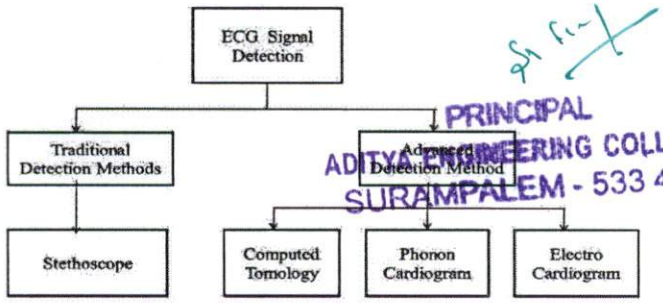

Figure 2: Overview of different Heart Beat measurement techniques

Heart muscles squeeze blood from different organs. The valve of the heart completely opens or completely closes when blood comes and goes out of the heart. But due to Stenosis valve does

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A Soft Computing Techniques Analysis for Planar Microstrip Antenna for Wireless Communications

K.D. Jyothi[1], P. Bala Srinivas[2] and S. Kumar[3]

[1,2,3]*Department of ECE, Aditya Engineering College, Surampalem, India*

***Correspondence:** S. Kumar.; sanjeev.kumar@aec.edu.in

ABSTRACT- The use of neural-network computational modules for radio frequency and microwave modelling and design has lately gained popularity as an uncommon but useful technique for this type of modelling and design. It is possible to train neural networks to study the behaviour of active and passive mechanisms and circuits. In this study, technologists will learn about what neural networks are and how they can be used to model microstrip patch antennas. An artificial neural network is used in this work to investigate in depth several designs and analysis methodologies for microstrip patch antennas. Various network structures are also discussed in this study for wireless communications. Microstrip antenna design has been presented and the use of ANN in microstrip antenna design are also shown in this article.

Keywords: IANN, Microstrip, Antenna, Wireless Communication.

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1. INTRODUCTION

Now a days, due to the increasing demand for faster communication, scientists and researchers have been attempting to improve existing devices and develop new ones. Recent advancements in communication and radar technology have accelerated antenna growth. An antenna allows data to be broadcast from one area to another. Newer technologies have modified the role, size, and design of antennas. Antennas have evolved rapidly over time, yet testing and implementation remain constant. The performance of a single antenna element may vary depending on the system and environment. An antenna is required to suit the needs of today's and tomorrow's wireless communication systems [1-3]. Researchers have a big challenge in developing small antennas for improved wireless and mobile communications. Smaller communication equipment requires smaller data transmission antennas [4-7].

Patch antennas can be analysed numerically or analytically. Methods based on mathematical or analytical notions of electrical or magnetic current distribution in the patch It is classified into four types: MOM, SDT, and FEM (FEM). Magnetic current distribution modelling includes transmission line, cavity, and multi-port network models (MNM). Numerical approaches can solve the problem, but they are tedious and time intensive, and the outcome can change if the geometry changes. The analytical models can also be used for a few patches' antenna forms. Artificial Neural Networks (ANN) are a novel type of soft computing based on learning (ANNs). Soft computing was coined by Zadeh in 1992. Soft computing differs from hard computing in that it does not require complex arithmetic. Soft computing includes ANNs, fuzzy logic, machine learning, and evolutionary computation (PSO-particle swarm optimization) [5-7]. Neural Networks are thought of as a model that mimics the human brain's functions. An example of a soft computing technique that takes its methodology from biological processes is the neural network. With the use of this comparison, artificial neural networks (ANNs) were able to learn and adapt like a human brain through training and testing. It was motivated by biological systems to handle non-linear challenges in scientific and antenna engineering sectors. Fault tolerance, high speed processing, parallel processing, non-linear mapping, and approximation are some of the capabilities of ANNs. Microstrip antenna properties, such as radiation pattern, bandwidth, and gain, can benefit from these soft computing advantages as well. An ANN model for a microstrip line is developed, and it is shown to be faster than the usual method. To determine the resonance frequency of thick circular microstrip antennas, an RBF network neural model was developed [8-10]. The network is trained using a variety of learning algorithms in accordance with the learning approach. Delta-bar-delta extended techniques were used by the neural model to get the best results from the MLP. employing radial basis function networks to improve laser diode line width. The clustering methods are learned using an extended delta-bar-delta algorithm. The concept of fractal geometries, which is employed in nature to model complex structures like coastlines and clouds, can be applied to the downsizing of antennas. An artificial neural network can be used to estimate the rectangular microstrip patch antenna's input impedance (ANN). A coaxially fed rectangular microstrip antenna based on ANNs was presented by the same author for use in calculating radiation resistance [11-18].

This paper provides a soft computing techniques-based analysis for microstrip antenna for wireless applications. This paper

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Effective Cyber Security Using IoT to Prevent E-Threats and Hacking During Covid-19

Dr. Santosh Kumar[1], Dr. Rajeev Yadav[2], Dr. Priyanka Kaushik[3], S B G Tilak Babu[4], Dr. Rajesh Kumar Dubey[5] and Dr. Muthukumar Subramanian[6]

[1]Asso. Prof., Lucknow Public College of Professional Studies, Lucknow, Uttar Pradesh, India, sanb2lpcps@gmail.com
[2]Professor in CSE, Arya Institute of Engineering and Technology, Jaipur, Rajasthan, India, yadavrajeev6@gmail.com
[3]Asso. Prof. in CSE, Poornima Institute of Engineering and Technology, Jaipur, Rajasthan India, Kaushik.priyanka17@gmail.com
[4]Dept. of ECE, Aditya Engineering College, Surampalem, thilaksayila@gmail.com
[5]Asso. Prof., Department of Electrical Engineering, Central University of Haryana Mahendergarh-123031 India, rajesh.dubey@cuh.ac.in
[6]Dept. of CSE, SRM Institute of Science & Technology, Trichy Campus, Tamilnadu, India - 621105, drsm.iiit@gmail.com

***Correspondence:** -- S B G Tilak Babu; Email: thilaksayila@gmail.com

ABSTRACT- This research work is conducted to make the analysis of digital technology is one of the most admired and effective technologies that has been applied in the global context for faster data management. Starting from business management to connectivity, everywhere the application of IoT and digital technology is undeniable. Besides the advancement of the data management, cyber security is also important to prevent the data stealing or accessing from the unauthorized data. In this context the IoT security technology focusing on the safeguarding the IoT devices connected with internet. Different technologies are taken under the consideration for developing the IoT based cyber security such as Device authentication, Secure on boarding, data encryption and creation of the bootstrap server. All of these technologies are effective to its ground for protecting the digital data. In order to prevent cyber threats and hacking activities like SQL injection, Phishing, and DoS, this research paper has proposed a newer technique of the encryption process by using the python codes and also shown the difference between typical conventional system and proposed system for understanding both the system in a better way.

General Terms: Cryptography, Cryptanalysis, Pattern recognition, Data Security, Hacking.

Keywords: Interdisciplinary, Cyber security, Theory of computation, Internet of Things (IoT), E-threat.

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1. INTRODUCTION

1.1 Background

Advanced technology has widely changed today's world. By utilizing, IoT based digital technology, various complex tasks can be done faster without any error. Moreover, the digital-based technology also offers to operate the tasks like business operation, progress monitoring, and financial transaction through online processes. Moreover, data management also gets quite easier and more efficient as well after the rapid implementation of IoT technology. These kinds of wide diversified facilities effectively help the spread the usage of the IoT technology in the market faster [1].

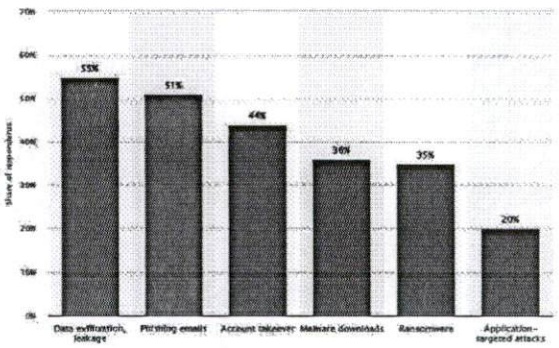
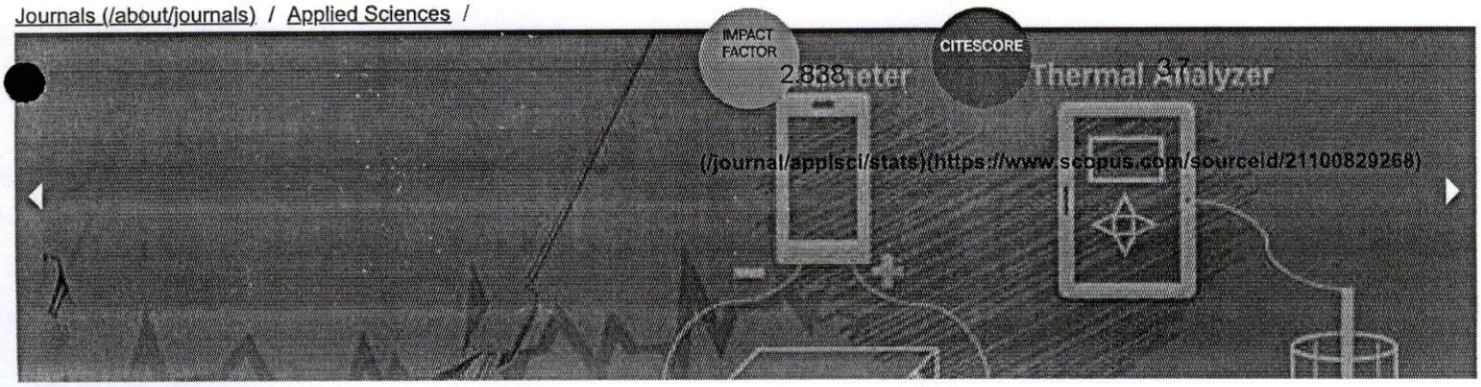


Figure 1: Cyberattacks during a pandemic

During pandemics, the incidents of cyber-attacks have been increased regardless of the location and industry. More specifically, most of the cyber-attacks that happened during this time are related to data exfiltration leakage and phishing the sensitive emails. This helps in analyzing the fact that the need of identifying the different IoT tools and methods used are needed to be analyzed.

1.2 Purpose

The main purpose of this research work is to demonstrate the ways the different cyber security methods and tools used in the time of pandemics to protect users from hackers or cyber



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Article

Digital Watermarking System for Copyright Protection and Authentication of Images Using Cryptographic Techniques

Prasanth Vaidya Sanivarapu [1], Kandala N. V. P. S. Rajesh [2], Khalid M. Hosny [3] and Mostafa M. Fouda [4,*]

1 Department of CSE, Aditya Engineering College, Surampalem 533437, India
2 School of Electronics Engineering, VIT-AP University, Vijayawada 522237, India
3 Faculty of Computers and Informatics, Zagazig University, Zagazig 44519, Egypt
4 Department of Electrical and Computer Engineering, Idaho State University, Pocatello, ID 83209, USA
* Correspondence: mfouda@ieee.org; Tel.: +1-(208)-282-7768

Abstract: Digital images are transferred with ease through the network. Many users are using the images without the knowledge of the owners. Therefore, a novel watermarking scheme is proposed to ensure copyright protection and authentication of images using cryptography techniques. Here, a quick response (QR) image is generated for a watermark image that contains public and private keys prepared using a cryptosystem. Later, this QR image is scrambled using a chaotic logistic map. The public and private keys are used to cipher and decipher the data. Next, the scrambled QR watermark is embedded into a color image using a single-level discrete wavelet transform followed by singular value decomposition using the key value. Finally, the inverse process is applied to extract the watermark. The proposed method is validated using various image processing attacks. The results are then compared with state-of-the-art watermarking schemes. The experimental results show that the scheme provides good results in terms of robustness and imperceptibility.

Keywords: digital watermarking; invisible watermark; QR code; RSA; singular value decomposition; discrete wavelet transform

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1. Introduction

Recently, with the development of long-range informal communication on the web, the capacity and dissemination of interactive media content have become extremely simple. On the other hand, this simplicity has led to the need for copyright protection, blocking information theft, and data genuineness [1,2].

To handle the above issues, digital watermarking has emerged as an appropriate solution. Digital watermarking is a way of embedding a watermark into a significant image/media. A watermark acts as copyright data, shielding advanced information from illicit replication and conveyance [3,4]. A watermark is a sort of marker clandestinely inserted in a signal (audio, video, or image information). A watermark embedded into media may or may not relate to it. Watermarks are utilized to check the realness or uprightness of the watermarked signal [5,6].

Watermarking is a strategy that is broadly utilized and ceaselessly created by utilizing different strategies and executions [7,8]. In the proposed method, discrete wavelet transform (DWT) and singular value decomposition (SVD) techniques are combined to accomplish the vigor and imperceptibility of the watermark. The scheme is generally achievable for clients and has an oddity edge over the other existing digital watermarking methods [9]. The idea of embedding the watermark information is to prevent intruders or other members from claiming to be the rightful owner of the data [10,11].

The literature review is provided in Section 2. The methods used in the proposed scheme are provided in Section 3. Section 4 provides the process of embedding and extraction of the propounded method. Section 5 presents the experimental results with various images, attacks, and metrics. Finally, the conclusion is provided in Section 6.

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Magnetohydrodynamic Radiative Simulations of Eyring–Powell Micropolar Fluid from an Isothermal Cone

Jyoti Atul Dhanke, K. Thanesh Kumar, Pudhari Srilatha, Kurapati Swarnalatha, P. Satish & S. Abdul Gaffar

International Journal of Applied and Computational Mathematics **8**, Article number: 232 (2022)

Abstract

The magnetohydrodynamics thermal convection viscoelastic micropolar fluid from an isothermal cone is presented in this article. Greater temperature invokes radiation impacts that are studied by approximating Rosseland diffusion flux. To explain the non-Newtonian dynamics of the fluid, the Eyring–Powell viscoelastic model is employed that gives a great analogy for magnetic polymers. In order to simulate the polymer's microstructural and shearing features, the Eringen's micropolar Eyring–Powell fluid models are coupled. The Keller-Box scheme is used to solve the dimensionless couple conservation equations. Validation using previously published Newtonian solutions is also included. The fluctuations of

Author information

Authors and Affiliations

Department Engineering Science (Mathematics), SPPU, Bharati Vidyapeeth's College of Engineering, Lavale, Pune, Maharashtra, 412115, India

Jyoti Atul Dhanke

Department of Mathematics, Hyderabad Institute of Technology and Management, Basuragadi, Hyderabad, Telangana, 501401, India

K. Thanesh Kumar

Department of Mathematics, Institute of Aeronautical Engineering College, Dundigal, Hyderabad, Telangana, 500043, India

Pudhari Srilatha

Department of Chemistry, CH.S.D.ST. THERESAS College for Women, Eluru, West Godavari, Andhra Pradesh, 534002, India

Kurapati Swarnalatha

Department of Mathematics, Aditya Engineering College (A), Surampalem, Andhra Pradesh, 533437, India

P. Satish

Department of Information Technology, Mathematics Section, University of Technology and Applied Sciences, Salalah, Oman

S. Abdul Gaffar

Corresponding author

. Abdul Gaffar.

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Eyring–Powell fluid **Micropolar fluid** **Vortex viscosity** **Magnetohydrodynamics** **Radiation** **Wall couple stress** **Angular velocity** **Heat transfer rate**

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WEDM Machining Performance of Al Based Metal Matrix Composites Reinforced with Rice Husk Ash

Ziyauddin Seikh[1,a], Sandip Kunar[2,b], Rafiqul Haque[1,c], Shamim Haidar[1,d] and Mukandar Sekh[1,e*]

[1]Department of Mechanical Engineering, Aliah University, Kolkata-700160, India

[2]Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

[a]mailziya28@gmail.com, [b]sandip.sandip.kunar@gmail.com, [c]rh.mech@aliah.ac.in, [d]shamimhaidar@yahoo.com, [e]mukandar@gmail.com

Keywords: Metal Matrix Composite, Aluminum, Rice Husk Ash, Density, WEDM, Cutting Speed

Abstract. With the enhancement in science and technology, necessity of complex shapes in manufacturing industries becomes essential for more versatile applications. These lead to demand for light weight and durable materials for applications in aerospace, defence, automotive, as well as sports and thermal management. Due to its high-tech structural, functional applications like defence, automobile, aerospace, thermal sensitive materials. Al-Matrix composites are considered as one of those classes of advanced engineering materials. In the present study, Al-RHA (Rice Husk Ash) composites are prepared by powder metallurgy route using 10% and 15% RHA by weight as reinforcement. Presence of abrasive particles leads to difficulty of conventional machining on Al-RHA composites hence non-conventional machining WEDM (Wire-Electric Discharge Machining) has been investigated. Suitable machining parameters for composites using wire EDM have been tried to get maximum material removal rate and speed. Optimizations of experimental parameters have been studied using Taguchi and Anova to standardize the process parameters for machining. Prime process parameters like servo-voltage, pulse-on time and pulse-off-time have been taken into consideration to study cutting quality of Al-RHA Metal matrix Composite using cutting speed as response parameters while effect of RHA weight fraction addition is also considered for evaluation to understand its influence on affecting the response.

Introduction

Metal matrix Composite (MMCs) are produced by joining two or more materials which are dissimilar in chemical and physical behaviour. This material is having well attention, by reason of less density, goodstiffness and strength. Nowadays, these types of materials requirement is increasing very fast in the area of automotive industries and aerospace engineering. The current research work in this composite has been stirred in the direction of aluminium based metal matrix composites, because of its varied applications such as bicycle frames, vehicle shafts, automotive pistons etc. Ceramic particles show larger mechanical properties to unreinforced Al as matrix. Utilization of waste material in Metal matrix composite is noted to be recent trend of research in present day for low-priced manufacturing. Among several reinforcements used are fly ash, fibres, rice husk ash etc. Rice husk ash is available in largeamount as solid waste by-product and it can be used as one of the low-density and most suitable reinforcement. In one studyAl alloy (AlSi10Mg) Composites developed by liquid processingwith RHA and fly ash and it is found that the hardness of the composite is linearly increasing with the rise of weight fraction of the RHA particles, around 10% RHA and fly ash (FA) showed maximum hardness. Adding RHA beyond 10 % decreased tensile strength and with the increase of FA percentage elongation also increases [1].MMC fabricated with Al alloy (A356) reinforced with 2%,4 % , and 6 % RHA particles and reported that a significant increase in terms of impact test, tensile test, compressive test and optimize results are noted to be at 6% RHA. Due to its weighty mechanical strength this Al Alloy-RHA Hybrid MMC found versatile applications in Industrial and Construction Material [2].

About this Journal

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Research Article

Improved Support Vector Machine and Image Processing Enabled Methodology for Detection and Classification of Grape Leaf Disease

Arshiya S. Ansari,[1] **Malik Jawarneh**,[2] **Mahyudin Ritonga**,[3] **Pragti Jamwal**,[4] **Mohammad Sajid Mohammadi**,[5] **Ravi Kishore Veluri**,[6] **Virendra Kumar**,[7] **and Mohd Asif Shah**[8]

[1]*Department of Information Technology, College of Computer and Information Sciences, Majmaah University, Al-Majmaah 11952, Saudi Arabia*
[2]*Faculty of Computing Sciences, Gulf College, Seeb, Oman*
[3]*Universitas Muhammadiyah Sumatera Barat, Padang, Indonesia*
[4]*Model Institute of Engineering and Technology, Jammu, J&K, India*
[5]*Department of Information Technology, College of Computer, Qassim University, Buraydah, Saudi Arabia*
[6]*Aditya Engineering College (A), Surampalem, JNTUK Kakinada, Kakinada, India*
[7]*Department of Plant Science, M. J. P. Rohilkhand University, Bareilly, India*
[8]*Bakhtar University, Kabul, Afghanistan*

Correspondence should be addressed to Mohd Asif Shah; ohaasif@bakhtar.edu.af

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In recent years, agricultural image processing research has been a key emphasis. Image processing techniques are used by computers to analyze images. New advancements in image capture and data processing have simplified the resolution of a wide range of agricultural concerns. Crop disease classification and identification are crucial for the agricultural industry's technical and commercial well-being. In agriculture, image processing begins with a digital color picture of a diseased leaf. Plant health and disease detection must be monitored on a regular basis in property agriculture. Plant diseases have had a tremendous impact on civilization and the Earth as a whole. Extensions of detection strategies and classification methods try to identify and categorize each ailment that affects the plant rather than focusing on a single disease among several illnesses and symptoms. This article describes a new support vector machine and image processing-enabled approach for detecting and classifying grape leaf disease. The given architecture includes steps for image capture, denoising, enhancement, segmentation, feature extraction, classification, and detection. Image denoising is conducted using the mean function, image enhancement is performed using the CLAHE method, pictures are segmented using the fuzzy C Means algorithm, features are retrieved using PCA, and images are eventually classed using the PSO SVM, BPNN, and random forest algorithms. The accuracy of PSO SVM is higher in performing classification and detection of grape leaf diseases.

1. Introduction

In recent years, there has been a significant increase in the amount of focus placed on agricultural image processing [1, 2]. The use of image processing has been shown to be beneficial in a wide variety of sectors, including agriculture. In agriculture, pictures are captured by cameras, aircraft, or satellites and then processed to expose information. This may be done in a variety of ways. Computers using various image processing techniques examine these pictures for

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Tribological enhancement of modified jatropha oil by activated carbon nanoparticle for metalworking fluid application

Norfazillah Talib [1*], Ainaa Mardhiah Sabri [1], Ariff Azizi Zolkefli [1], Kai Sheng Tan [1], Sandip Kunar [2]

[1] Fakulti Kejuruteraan Mekanikal Dan Pembuatan, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA.
[2] Department of Mechanical Engineering, Aditya Engineering College, Surampalem-533437, INDIA.
*Corresponding author: fazillah@uthm.edu.my

KEYWORDS

Modified jatropha oil
Activated carbon
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Tribology
Nanoparticle
Coefficient of friction
Mean wear scar diameter

ABSTRACT

The excessively use of petroleum-based oil as a metalworking fluid is hazardous to the worker and cause a pollution to the environment. As a result, environmentally friendly oil has gradually replaced petroleum-based oil in the machining process. The goal of this study is to investigate the tribological enhancement of modified jatropha oil (MJO) by activated carbon nanoparticle (AC) ranging from 0.01 to 0.05 wt.% through the four-ball test and turning process. The results reveal that MJO with 0.025wt% AC nanoparticle has exceptional tribological performance in terms of friction and wear, resulting in extended tool life in terms of machining length (7000mm) and machining time (49 minutes). The addition of 0.025wt.% AC nanoparticle created a protective layer that facilitates rolling action at the sliding surfaces. As a result, MJO with 0.025wt% AC has excellent tribological properties, making it a viable alternative as an environmentally friendly metalworking fluid.

1.0 INTRODUCTION

Tribological performance in lubrication is the study of controlling and managing lubricity, friction, and wear. The interfacial friction within the sliding system phenomena is a process that is continually accompanied by the change of energy form, where moving two objects together with the condition that both of them are in motion certainly dissipates the energy as it is the phenomenon of friction (Chan et al., 2018). Lubricants are primarily used to lubricate machines

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Research Article

Environmental and exergoeconomic assessments of a novel biomass gasification based solid oxide fuel cell and heat engine hybrid energy system

Abhishek Kumar Tripathi

a Department of Mining Engineering, Aditya Engineering College, Surampalem, Andhra Pradesh, India

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ABSTRACT

Recently, the exploitation of renewable energies and technologies in order to reduce the restrictions of fossil fuels is the attention of energy managers and engineers. Additionally, energy production cycles based on solid oxide fuel cells (SOFCs) are known for their versatility in fuel intake. In this regard, in the current

article the thermodynamic-conceptual assessment of a novel combined energy system (CES) based on biomass gasification is developed. The proposed CES is

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Research Article

Effect of particle loading and temperature on the rheological behavior of Al_2O_3 and TiO_2 nanofluids

Pritam Kumar Das

a Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India

Correspondence
pritamkumar.das0@gmail.com
View further author information

ar Dash, Ranjan Ganguly, nal Venkatesan, Ali A. Rajhi, Saboor Shaik &

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ABSTRACT

Nanofluids, which are stable suspension of nanoparticles in a carrier liquid, have gained traction in the past two decades for multiple scientific traits and a wide range of industrial features; one of them pivots around their improved physical properties and superior heat transfer capabilities over pure fluid. Viscosity plays a vital role in fluid flow and heat transfer characteristics of a nanofluid, as it is linked to the pumping power of fluid. The presence of the particles in the surfacted host liquids alters the viscosity of the medium and in nanofluid, and hence nanofluid

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Research papers

Thermal management system of lithium-ion battery packs for electric vehicles: An insight based on bibliometric study

M. Murugan [a] ✉, A. Saravanan [b], P.V. Elumalai [b], G. Murali [c], N.R. Dhineshbabu [d], Pramod Kumar [a], Asif Afzal [e, f, g]

[a] Department of Mechanical Engineering, Aditya College of Engineering and Technology, Surampalem, India
[b] Department of Mechanical Engineering, Aditya Engineering College, Surampalem, India
[c] Department of Mechanical Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur, 522 502, Andhra Pradesh, India
[d] Department of Electronics and Communication Engineering, Aditya Engineering College, Surampalem, India
[e] Department of Mechanical Engineering, P.A. College of Engineering (Affiliated to Visvesvaraya Technological University, Belagavi), Mangalore 574 153, India
[f] University Centre for Research & Development, Department of Mechanical Engineering, Chandigarh University, Gharuan, Mohali, Punjab
[g] Department of Mechanical Engineering, School of Technology, Glocal University, Delhi-Yamunotri Marg, SH-57, Mirzapur Pole, Saharanpur District, Uttar Pradesh 247121, India

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