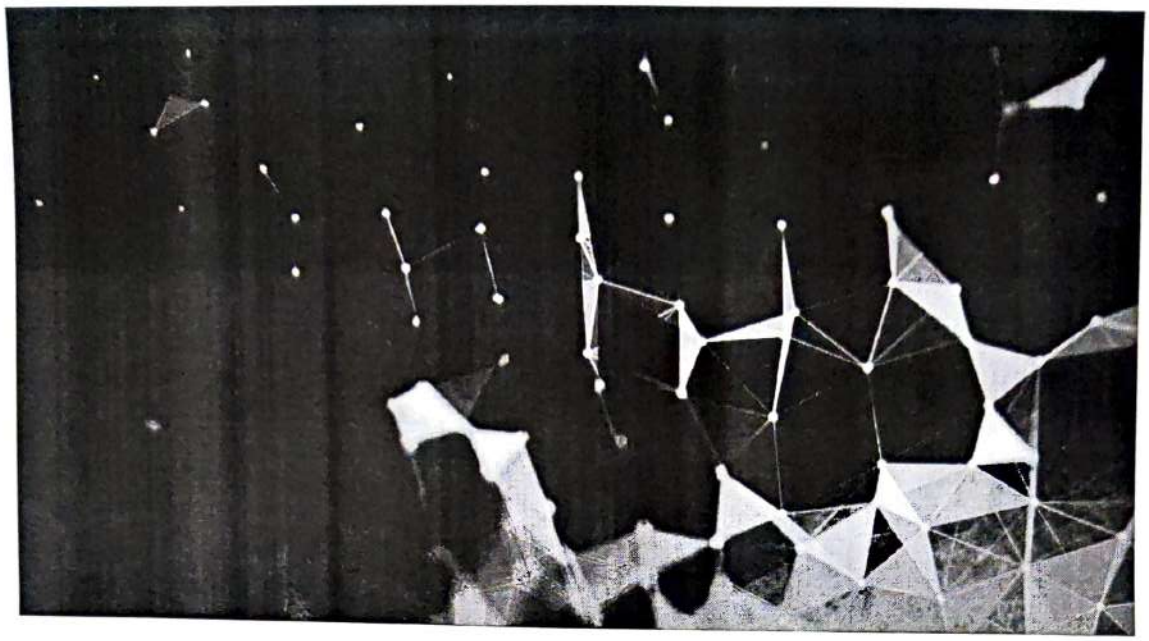

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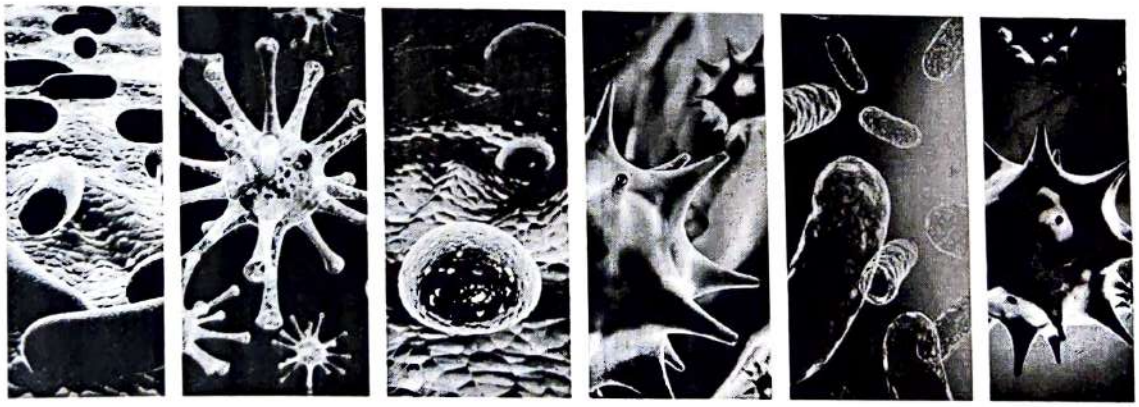
An Interdisciplinary Approach to the Life Sciences



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About the Editors

Jyoti Ranjan Rout, PhD, is Assistant Professor in the School of Biological Sciences, AIPH University, Bhubaneswar, Odisha, India. Before joining AIPH, he worked as Assistant Professor and Head of the Post Graduate Department of Biotechnology at the Academy of Management and Information Technology (AMIT), Bhubaneswar, India. Dr. Rout has more than 10 years of experience in both teaching and research in the field of biochemistry and molecular biology. He is the recipient of an NESA-Scientist of the Year Award and the Professor B.K. Nanda Memorial Award from the National Environmental Science Academy, India, and Orissa Botanical Society, India, respectively. Dr. Rout has published over 45 research articles in various national and international peer-reviewed journals and has contributed several book chapters to different edited book volumes with international publishers, including Springer and CRC Press. He is actively involved as an editorial board member and reviewer for many international journals. His area of research includes biochemical and molecular aspects of toxicology, protein and elemental profiling, gene expression of antioxidant enzymes, phytochemical screening and in vitro tissue and organ culture of medicinal plants. His recent area of interest is to understand the metal causing toxicity in cellular, biochemical, molecular level in plants which act as a potential bio-indicator of metal pollution to agriculture and public health. He earned his master's degree in Biotechnology from North Orissa University and his PhD (Biotechnology) from Utkal University in the area of stress biochemistry, molecular biology, and nutritional stress tolerance in plants.

Rout George Kerry, is a Research Scholar at Utkal University, Odisha, India. He has published about 27 articles in peer-reviewed international journals and edited books. He became acquainted with the importance of nanotechnology by one of his mentors, which triggered his interest to do scientific research in depth. Thereafter, Mr. Kerry was fully engaged in exploring the infinite potential that is possible from the crossover of biotechnology and nanotechnology. Basically, he emphasizes the formulation of nano-based therapeutics against infectious and noninfectious ailments, the

impact of probiotics in health management, and the role of nanotechnology in health as well as for the sustainable development of agriculture. Presently, he is working on an array of organic and inorganic nanoparticle-based drug delivery systems for reversal of type-II diabetes mellitus. Mr. Kerry graduated from Utkal University and went on to pursue his master's degree in Biotechnology from Berhampur University, India.

Abinash Dutta, recently joined the Institute of Life Sciences, Odisha, India, and carried out his postdoctoral research work on zebrafish development. His research work is mainly focused on the improvement of larval as well as cocoon traits (commercial traits) of the Tasar silkworm, Antheraea mylitta, an important component of the Asian nonmulberry silk industry, through foliar supplementation of exogenous antioxidants. Moreover, he is also interested in finding out the molecular mechanism and epigenetic regulation of redox homeostasis in silkworms in response to exogenous antioxidants. The outcome of his research work has been highly appreciated among insect biologists, and he was awarded a best paper and poster presentation award at a national and international level symposium. Recently, he has also awarded a BBA Young Investigator Award. Some of his research findings are published in reputed peer-reviewed international journals. Mr. Dutta received his master's degree in Biotechnology from North Orissa University, Odisha, India. He has submitted his PhD thesis in Biotechnology at P.G. Department of Biotechnology, Utkal University, Odisha, India.

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ABSTRACT ID : BBTN01

Studies on Biological Soil crusts and their role in soil Stabilization and control of rainfall-induced soil loss

Abin L Vinod1, Aswathy P Chandran1, Manya Madhu B1, Naveen Antony1, Biju Jacob*, Gayathri V*, K B Radhakrishnan*

Department of Biotechnology and Biochemical Engineering, Sree Chitra Thirunal College of Engineering, Trivandrum, Kerala, India – 695018.

Abstract

Biological soil crusts (BSC) form a living skin at the soil surface. These crusts play an important role in preventing soil erosion by wind and rain. Bacteria and Cyanobacteria are known as ecosystem engineers and they construct these BSCs. They bind soil microstructure through exopolysaccharides and create soil macro structure. These crusts improve soil stability, soil aggregation, porosity, fertility etc. In this study we use Biocrust forming microbes particularly bacteria Bacillus subtilis and cyanobacteria Aphanocapsa to form exopolysaccharides which connects the soil particles together and also to increase soil stability. After 10 days, inoculation of cyanobacteria and bacteria increased both TOC and SOM of soil, compared to the control conditions. The amount of carbon and organic matter falls during the first 10 days. It is due to the difficulty of microbes to cope with the new environment and the deficiency of nutrients. After 10 days, when provided with appropriate nutrients; the TOC and SOM increased significantly. The extracellular polymeric components of cyanobacteria serve as a significant source of organic carbon in this regard. The study's findings showed that a rapid increase in soil nitrogen and carbon content might be achieved by artificially expanding the population of soil microorganisms that fix nitrogen and carbon.

Figure 1 (a) shows time-dependent changes in TOC (b) shows the amount of soil eroded during control study.

Keywords: Rainfall-induced soil loss, biological soil crusts, soil aggregation, bacteria, cyanobacteria

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ABSTRACT: BBDN01

Studies on Production of Self-Healing Concrete using Immobilized Spores of Bacillus Cohnii through MICP Process

Anupama S S[1], V Reshmi[1], Anslet Mary[1], Abhinav Anil[1],
Biju Jacob[2,*], Vineetha Lekshmy P V[3]
Department of Biotechnology and Biochemical Engineering, Sree Chitra Thirunal College of Engineering, Trivandrum, Kerala
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Abstract

Bio-concrete is receiving perceptible heed in the construction sector for its long-lasting and expeditious crack healing potential with much significance to sustainability, which is inevitable. However, the self-healing construction materials are expensive and hence face the current limitation for the commercialization of bio concrete. In this study, we aim to demonstrate the potential of bio concrete to self-heal its cracks using a heterotrophic bacterium, Bacillus cohnii. The MICP study was conducted to determine the rate of calcite precipitated in different pH ranges. The concentration of calcium ion present in the sample is found by complexometric titration method and the result showed a linear relationship between the volume of EDTA with calcium ion concentration. The experimental values reveal that pH in the alkaline range (10-12) is favourable for the growth and calcite precipitation, which also ensures that the spore suspension used is capable of precipitating at this pH, resulting in the self healing process.

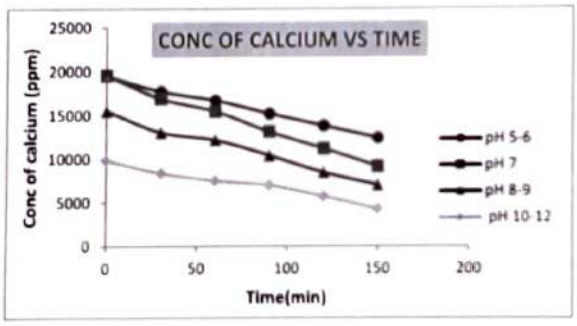

Figure 1: Conc of calcium vs time graph at different pH ranges

Keywords: Bio concrete, Self healing, Microbially Induced Calcite Precipitation, Bacillus cohnii

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YRA01: Design and synthesis of Mangiferin (MGF)/Chitosan (CS)nanoparticles (NPs) (MCN) as an oral delivery supplement and its efficacy against oxidative stress induced cancer

Rohini Samadarsi

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Oxidative stress is involved in diseases such as cardiovascular diseases, chronic obstructive pulmonary disease, chronic kidney disease, neurodegenerative diseases, and cancer. Antioxidant therapy could be used to prevent oxidative stress-induced damages in cell. A present study was done to evaluate the efficacy of Mangiferin (MGF)/Chitosan (CS) nanoparticles (NPs) (MCNs) against the oxidative stress-induced damages leading to cancer. MGF is an antioxidant polyphenol with numerous therapeutic properties. MCN was developed by ionic gelation method to improve the solubility and bioavailability of MGF. Free radical scavenging assays showed that the NPs had significant free radical scavenging activity in the cell-free system. To investigate the attenuative role of MGF-CSNPs against induced oxidative stress by chemicals, on normal kidney epithelial (NKE) cells nephropathic system was developed. Pre-treatment with the NPs prevented the induction of cytotoxicity induced by NaF and maintained the level of intracellular antioxidant enzyme level in the cells. NPs also inhibited lipid peroxidation and protein oxidation, thus retarding the formation of free radicals. MCNs also had pronounced cytotoxic effects against colorectal cancer (HT 29), cervical cancer (HeLa) and breast cancer (MCF 7) cell lines. The study could establish that the MCNs might be a promising candidate for oral delivery. MCNs can be used in food and pharmaceutical industries as a therapeutic agent to prevent oxidative stress-induced health disorders and cancer

Keywords: Oxidative stress; Antioxidants; MGF; CS; NPs; Cytotoxicity

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Abstract ID: WTHN01

Numerical Simulation of Hydrogen Storage In Porous Medium With Silicon Carbide And Magnesium Hydride Pair

Anamika P[1], Bhagya Lekshmi Jagadeesan[1], Catherin Ann Biji[1], Reshma M Pillai[1]
Susmitha Kumari S[2], Mohan G[3], K. B. Radhakrishnan[3]
Department of Biotechnology and Biochemical Engineering , Sree Chitra Thirunal College of Engineering ,Trivandrum, Kerala , India, 695018

Abstract

Metal hydrides (MH_x) are the most technologically relevant class of hydrogen storage materials. Magnesium hydride (MgH_2) is considered as an attractive candidate throughout the world for solid state hydrogen storage. However its application is limited due to high decomposition temperature and poor kinetics. It is found that small amount of silicon carbide (SiC) added can actually improve the hydrogen adsorption-desorption kinetics and there by storage capacity. This project outlines the effect of addition of SiC structure on hydrogen storage properties of MgH_2. A simulation study is carried out on two- dimensional geometry of MgH_2-SiC composite using COMSOL Multiphysics software. A highly porous 2-D foam of SiC is developed which is imported to the software. The heat transfer and mass transfer kinetics of H_2 adsorption-desorption in this developed system of MgH_2-SiC composite is studied for a range of temperature and porosity values.

Keyword: Magnesium hydride, Silicon carbide, Hydrogen storage, Simulation

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PYTHON PROGRAMMING

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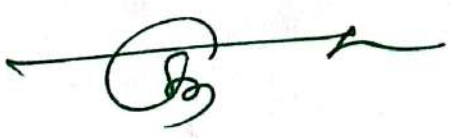

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Pytorch Deep learning Approach for Detection of Breast Cancer by Digital Holographic Method

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Abstract: The digital holographic method performs quantitative analysis of phase images. This interferometric method gives access to biophysical attributes of cells such as refractive index, dry mass, volume, and morphology. Pytorch deep learning library with transfer learning is employed thereby improving the classification accuracy of breast cancer tissues.

1. Introduction

The incidence of breast cancer is increasing in the developing world due to increased life expectancy, increased urbanization, and the adoption of western lifestyles. The death rate from breast cancer cases is high among Indian women primarily due to a lack of awareness and delayed detection[1].Digital holographic method is an interferometric method and provides a quantitative phase imaging of the histopathological breast tissue taking into account the optical path length changes. In digital holography, the holographic interference pattern is optically generated by the superposition of object and reference beams, that is digitally sampled by a charge-coupled device (CCD) camera and transferred to a personal computer as an array of numbers[2,3]. The propagation of optical fields is absolutely and correctly denoted by diffraction theory, which permits numerical reconstruction of the image as an array of complex numbers representing the amplitude and phase of the optical field.

2. Proposed work

The digital hologram is obtained with a Mach Zehnder interferometric set up as shown in Fig. 1(a). It consists of a He-Ne laser source of wavelength 632.8nm.The beam splitter splits the laser beam into two beams namely, object beam and the reference beam. The spatial filter is used to eliminate high-frequency fluctuations and to get a clear expanded laser beam.

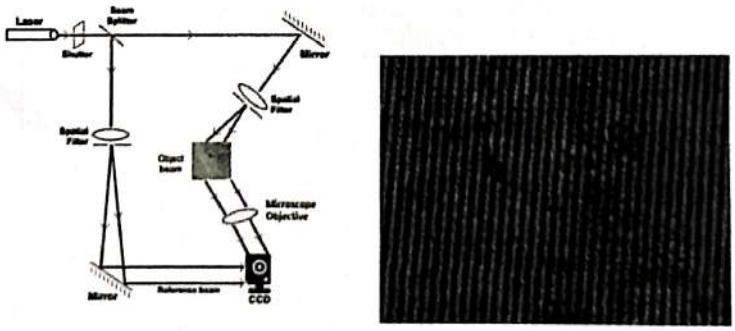

Fig. 1. a) Digital holographic set up b) Digital hologram

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ADMM Based Regularized Optimization for Reconstruction of Digital In-line Holography

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Abstract: Compressed sensing is effective in twin image removal of in-line holograms, but has slower convergence and higher computational time. Proposed method suppresses twin images by solving an inverse problem using ADMM and offers better convergence.

1. Introduction

In digital in-line holography (DIH), a hologram is formed from the interference of a reference field in alignment with an object field. The intensity of this hologram is given by,

$$I_H = |Ob+Re|^2 = |Ob|^2 + |Re|^2 + Ob^*Re + ObRe^* \quad (1)$$

$$= |Ob|^2 + |Re|^2 + V(x,y) + V^*(x,y) \quad (2)$$

where, V(x, y) = Ob*Re forms the twin image. Re(x, y) is the reference wave, Ob(x, y) is the object wave, and (x, y) is the spatial coordinates. Reference field $|Re|^2$ is assumed to be without loss and can be removed from the hologram. $|Ob|^2$ is regarded as the noise term. V(x, y) = Ob*Re represents an out-of-focus conjugate, which smears the reconstructed image. This blurring or poor resolution in the reconstruction of 3D shapes hinders accurate information retrieval. Numerical methods are widely used in twin image removal. Twin image can be eliminated by solving regularized optimization problem through compressed sensing approach [1] where Two-step Iterative Shrinkage Thresholding (TwIST) algorithm was used. The method was found to be more effective than previous phase retrieval method [2]. But it suffers from slower convergence and thus higher computational time. The proposed method offers better results and faster convergence using the Alternating Direction Method of Multipliers (ADMM) [3] algorithm.

2. Methodology

The 3D reconstruction can be formulated as an inverse optimization problem.

$$\hat{\beta} = \underset{\beta}{argmin} \frac{1}{2} \|b - A\beta\|_2^2 + \lambda \|\beta\|_{TV} \quad (3)$$

where $\hat{\beta}$ represents approximation of object field that minimizes the objective function in Eq (3). b is the recorded hologram. $A\hat{\beta}$ is obtained by forward propagation and is the real part of the complex field obtained from the mapping of object field to the scattered object wavefront. λ represents regularization parameter. Total Variation (TV) norm is the regularization term. TV norm is computed as

$$\|\beta\|_{TV}^{\cdot} = \|\nabla\beta\|_1 = \sum_{i=1}^{N_x}\sum_{j=1}^{N_y} |(\beta(i,j) - \beta(i-1,j)) + (\beta(i,j) - \beta(i,j-1))| \quad (4)$$

Reformulate Eq (3) in ADMM as

$$\underset{\beta}{argmin} \frac{1}{2} \|z\|_2^2 + \lambda \|y\|_1 \quad (5)$$

subject to: $z = A\beta - b$ and $y = \nabla\beta$
Writing Augmented Lagrangian in terms of scaled dual variables,

$$\mathfrak{L}(\beta, z, m, n) = \frac{1}{2}\|z\|_2^2 + \lambda\|y\|_1 + \frac{\eta}{2}\left\|z + b - A\beta + \frac{m}{\eta}\right\|_2^2 + \frac{\zeta}{2}\left\|y - \nabla\beta + \frac{n}{\zeta}\right\|_2^2 \quad (6)$$

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A Review on News-Content Based Fake News Detection Approaches, Swapna H; Soniya B

A Review on News-Content Based Fake News Detection Approaches

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1 440

Abstract

Abstract

Online Social Networks (OSN) have become very popular nowadays because of the numerous benefits they offer like helping users to get connected with friends, providing an ideal platform to share their opinions and thoughts, etc. But it is also seen that OSNs are a free channel for easy dissemination of fake news resulting in drastic and adverse effects in political, economic, and perhaps all aspects of society. Hence, automated detection of fake news becomes a dominant task. In this survey, we look at the work of the art techniques in fake news detection, especially those based on news content and style. Many models equipped for fake news detection are examined and their performances are compared. Human psychology tends to believe and hence trends to an article when it contains some appealing videos or audio along with the text. An upside-down pyramid style of writing exists when it contains such multimedia content. It uses images or videos rather than more text. Fake news creators often take this clue as a dominance which prompts them to design attractive fake news by compromising the transparency of the news. Thus, we conclude that for fake news detection, multimodal methods are very effective and it is necessary to explore unexplored and some sparsely explored graph-based tools for detection.

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A Virtual Assistant For The Visually Impaired

Alex Roy[1], Amal Saji[1], Gokul M S[1], and Subu Surendran[1]

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Abstract. The gift of sight is something that most humans take for granted, but not all of us are so fortunate. The visually challenged people face many problems in their day-to-day activities. In most cases, they would require constant support. The technology-driven world always strives to bridge the gap between the abled and differently-abled. A voice-enabled virtual assistant for the visually impaired helps in realizing this goal. A challenge that the visually impaired face most commonly is finding an object within a room. It is easy to imagine the time and effort it would take and the frustration a person would feel trying to find an object that he or she forgot or misplaced. For such situations, we propose a system in which the user can interact with a voice assistant to get the relative position of the object within the room. The system combines various technologies such as Object Detection, Natural language Processing and Cloud Computing integrated to solve this specific problem. The paper discusses the design and implementation of the system.

Keywords: Visually Impaired · Object Detection · Cloud Computing · Natural Language Processing (NLP) · Machine Learning (ML).

1 Introduction

Visual Impairment is a medical condition affecting many people around the world. According to Hindustan Times, "India currently has around 12 million blind people against 39 million globally". Dealing with blindness is a challenge already in itself, yet they strive to be self-sufficient. It is in human nature to be forgetful. Even when we have two eyes, we find it difficult to locate items that we have misplaced. So it is easy to imagine how much worse it would be for a visually impaired person. They will have to seek help from others constantly. This dependent nature makes them susceptible to feel like a burden to others, and lose confidence in themselves, even when they try hard to be self-sufficient.

Some of the major challenges include difficulty in finding an object without the assistance of someone. Some devices available in the market help them to overcome a few of these challenges. There is always a huge number of researches involved with the sole aim of building devices to help these visually challenged people.

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This is to certify that ***Dr. Sanukrishna S.S, Dept. of. Mechanical Engineering, Sree Chitra Thirunal College of Engineering, Thiruvananthapuram, Kerala, India*** has presented a paper **(Invited)** at the International Online conference on Nano Materials (ICN 2021) held at Mahatma Gandhi University Kottayam, Kerala, India during 09th -11th April 2021.

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PLMSS 2021

Certificate of Participation

Dr./ Shri./ Smt./ Kum. Anoop M S has participated in the PLMSS 2021 Conference held in online mode during 17th and 18th December 2021.

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ACEX145

CERTIFICATE

Issued for:

Dr. Kamal Krishna

We certify that **Dr. Kamal Krishna** successfully attended the 14th International (Hybrid) Conference on Advanced Computational Engineering and Experimenting, ACEX 2021, in Malta, from the 4 - 8 of July 2021.

During the conference, Dr. Kamal Krishna presented the work(s) entitled:

Experimental Investigation of Vibrational Characteristics of Composite tubes conveying fluids
R Kamal Krishna, J Kochupillai, M R Rajkumar, M Unnikrishnan

Prof. Prof. h.c. Dr.-Ing Andreas Oechsner D.Sc. (UoN)
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ACEX2021 4-8 JULY Malta

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quarter model is simulated. The numerical simulations suggest that the decreasing area profiles, referred to as the convergent foams, exhibit a double-shock mode and the foams with an increasing area-profile, referred to as the divergent foams, exhibit a single-shock mode. The theoretical predictions of both the double-shock and the single-shock cases are validated against the finite element simulations. An expression for the plastic energy dissipated by convergent foams has been derived, and we observe that the convergent foams dissipate less energy than the divergent foams. The plastic energy dissipated is not affected significantly by the gradient for the divergentfoams, whereas for the convergent foams, it increases with the area-gradient as shown in Fig. 2

Keywords: *Area-graded foams, stationary impact, double-shock, energy absorption*

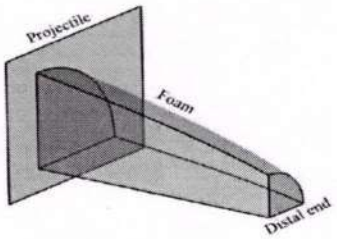

Fig. 1 Geometry of the convergent foam used for finite element simulations.

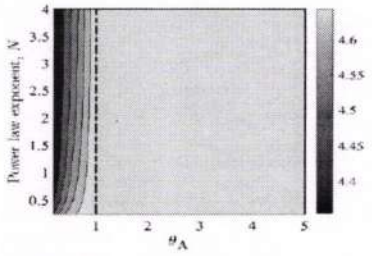

Fig. 2 Contour plots of the plastic energy dissipated at the end of crushing, as a function of area-gradient θ_A and exponent N, at a non-dimensional impact velocity $v_0 = 5$, corresponding to mass-ratio $\Gamma = 0.5$. For convergent foams $\theta_A < 1$, and for divergent foams, $\theta_A > 1$.

* * * * *

Comparison of Experimental and Operational Modal Analysis on a Flexible Silicone Tube Conveying Fluid

R Kamal Krishna[1], Jayaraj Kochupillai[2], M Unnikrishnan[3]

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Abstract: The flexible tubes are light in weight, corrosion-resistant and chemically inert to fluids. Also, as it offers low bending stiffness compared to the axial tensile stiffness, it

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Constructal Design of Weight Optimized Metal Hydride Storage Device Embedded with Ribbed Honeycomb

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Abstract

Hydrogen is considered as the potential energy carrier of future automobiles. However safety and low charging rates are some of the major challenges to be addressed. Compared to high pressure storage, solid state storage in metal/complex hydrides offers several advantages. Heat transfer is the major limiting factor affecting hydrogen sorption in metal hydride storage devices. Different heat transfer enhancement methods are reported in literature. However most such studies do not propose a weight optimized design for the given capacity and charging rate. The proposed constructal design of the storage device with multiple heat exchanger tubes integrated with ribbed honeycomb can effectively transport sorption heat to the coolant in the most effective manner analogous to bio transport systems. The numerical study on the parametric influence of the proposed device on sorption performance is conducted in COMSOL Multiphysics.

Keywords: Complex hydride, Heat and mass transfer, Constructal design, Simulation, Hydrogen storage

1. Introduction/Background

Sodium alanate is one of the promising materials for the storage of hydrogen which offers high gravimetric capacity. The sorption kinetics of alanates can be improved by mechanical grinding and chemical doping of alloys. Sodium alanate so modified are capable of reversible storage of hydrogen upto 3.0 wt. % at 80–140°C and about 4.5–5 wt. % when operated at temperatures around 150–180°C.

Even though, complex hydrides offer the benefit of high gravimetric storage capacity, their low effective thermal conductivity and high sorption heat are major shortcomings. Different methods to improve thermal conductivity of metal hydrides such as inserts, foams, wires and compacts [1] can be employed to complex hydrides with suitable modifications. However such studies are rarely reported. Hardy and Anton [2, 3] have proposed models to study the sorption performance of shell and tube type hydrogen storage device (with and without fins) containing $TiCl_3$ catalyzed $NaAlH_4$. The charging rate of finned storage device was found to be better than that without fins due to enhanced heat transfer. Raju and Kumar [4] studied the performance of hydrogen storage device with internal tubes and fins to meet the drive cycle demand of fuel cell for different operating conditions.

Maha Bhouri et al. [5] studied the heat and mass transfer of multi-tubular sodium alanate based finned reactor. They found that the charging of the system can be improved if cooling tubes with hexagonal cross-section were employed. The parametric study by the same authors [6] reported the superior hydrogenation performance of sodium alanate based multi-tubular storage device equipped with longitudinal fins.

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Proceedings of the 26thNational and 4th International ISHMT-ASTFE Heat and Mass Transfer Conference
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IHMTC2021–559

Pore scale Simulation of Hydrogen Absorption of Metal Hydride Storage Bed

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ABSTRACT

In solid sorption based storage systems, metal hydrides assumed a prominent role with advantages like compactness, safety and zero maintenance. However, their performance is affected by non-favourable material characteristics such as low thermal conductivity, powdering and densification during hydrogen sorption. Sorption performance of metal hydride based devices depends on heat transfer as the major rate controlling factor. During hydrogenation-dehydrogenation cycles, the morphology of the bed changes drastically due to powdering of the particles and its consequent settling and densification at the bottom of the container. Even though several studies were reported on the heat and mass transfer of metal hydride beds, the studies on the effects of bed morphology on its performance is less. In the present study, effect of this on the sorption performance of the bed is studied. Discrete element method is used to capture the particle mechanics of storage bed during charge discharge cycles. The consequent effect of this on the sorption performance of the bed is simulated using COMSOL Multiphysics®.

Keywords: Metal hydride, Simulation, Heat and mass transfer, $LaNi_5$, Discrete element method.

1. INTRODUCTION

Several metals, alloys and intermetallic compounds react reversibly with hydrogen at suitable temperatures and pressures to form metal hydrides. As hydrogen storage media, they offer high volumetric storage capacity, favourable sorption kinetics, good cyclic stability and safety. Metal hydride based hydrogen storage is a promising alternative to competing storage technologies in terms of energy and volume requirements. The optimized design of these storage devices is important for their possible deployment in mobile applications. Heat transfer is the major factor that controls hydrogen sorption in these devices. Other issues include lattice expansion of the alloy particles eventually leading to fragmentation into fines and subsequent settling at the bottom of the container. This can lead to stress concentration in those regions and eventual failure of the device upon charge-discharge cycles. The resultant structure and porosity of the bed can also affect hydrogenation performance of the device.

The hydrogenation performance of the storage device is affected by geometric parameters such as the bed thickness and operating parameters such as hydrogen supply pressure and coolant temperature. Heat transfer is the major rate controlling factor.

2. LITERATURE REVIEW AND OBJECTIVE

Gravimetric storage capacity and charging rates are important considerations in the thermal design of solid state hydrogen storage devices and effective solutions to these issues are required for the realization of hydrogen economy (Srinivasa Murthy [1]).Several studies were conducted on the numerical simulation of heat and mass transfer of metal hydride bed. Most such studies used effective properties for the modelling and simulation the alloy bed. However mechanical characteristics of the alloy bed and the associated porosity variations are not aptly represented in these models.

Okumura et al. [2] showed that the porosity of the metal hydride bed is reduced at the bottom due to the settling of pulverized metal hydride particles. Charlas et al. [3, 4] studied the real time measurements of change in volume of hydride bed in relation to swelling and shrinkage of hydride. The cyclic change of gradual settlement, porosity and global reduction in porosity was also studied. Lin and Chen [5] studied the decrease in particle size with progressive cycles of hydriding/dehydriding. Hu et al. [6] modeled a cyclic compression effect in clustering of hydride powders towards the reactor bottom. Saito et al. [7] studied the relation between volume expansion and hydriding/dehydriding reactions and associated agglomeration of fine particles at the bottom of the container.

New modeling and simulation methods needs to be developed to address the effects of pulverization, settling and agglomeration of the hydride bed on heat transfer and sorption performance of the storage device. The present study deals with the application of discrete element method to model the hydride bed on a pore scale. The heat and mass transfer performance of these pore scale models were studied using COMSOL Multiphysics® [8] commercial code. Effect of porosity variations in the alloy bed upon charge-discharge cycling on the hydrogenation performance of the device is studied.

3. MODEL AND METHODOLOGY

A schematic of vertically placed hydrogen storage container with filter tube at its center and outer cooling jacket is shown in Fig 1. The device is filled with alloy particles ($LaNi_5$) to the given height. Hydrogen inducted at the given supply pressure to the container is distributed through the centrally located filter tube. Filter tube is provided throughout the length of the container to avoid pressure variation in the bed. Sorption heat liberated during hydrogenation is transferred to the coolant circulated through the outer jacket. As heat transfer at the outer boundary of the storage bed is higher than the rest of the bed,

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Numerical Simulation of Hydrogen Transport in Metal Hydride Based Coupled Beds

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ABSTRACT

Metal hydride based sorption heat pump is witnessing an increased acceptance due to its environment friendliness and energy efficiency. These systems provide a wide operating temperature range and use low grade thermal energy to produce high quality thermal energy and cooling outputs. Further, these systems contain no moving parts, have a compact structure and offer noise free operation. Heat transfer effectiveness and kinetics are the major challenges to be addressed in these devices. Even though several studies were reported on the thermal performance of metal hydride based reaction beds, only a few deals with the hydrogen transport during their operation. In the present study, a transient heat and mass transfer model for the coupled beds with $LaNi_5$ - $LaNi_{4.7}Al_{0.3}$ alloy pair has been developed. The numerical simulations were carried out using COMSOL Multiphysics® commercial code. The influence of refrigeration and regeneration temperatures on the hydrogen transport between the two beds and its influence on the sorption performance has been studied.

Keywords: Metal Hydride, $LaNi_5$, $LaNi_{4.7}Al_{0.3}$, Hydrogen, Simulation

1. INTRODUCTION

With the world heavily impacted by the effects of climate change there is an urgent need to switch over to cleaner sources of energy to meet the growing energy demand. Hydrogen is a potential zero-emission secondary energy carrier. The use of which can reduce the usage of fossil fuels for transportation, heating and cooling applications. Therefore, the possibility of an increased use of hydrogen in the near future is high.

Storage of hydrogen in metal hydrides has several advantages over compressed and liquefied forms of hydrogen storage. The metal hydride systems also have a good potential for heating and cooling applications. Metal hydride-based sorption heat pump is witnessing an increased acceptance due to its environment friendliness and energy efficiency. These systems use low grade thermal energy to produce high quality thermal energy and cooling outputs.

The performance of the metal hydride-based heat pump mainly depends upon the selection of the alloy pairs for the required operating conditions. The metal hydride pair of $LaNi_5$ and $LaNi_{4.7}Al_{0.3}$ offers advantages such as easy activation at moderate temperatures and pressures, desorption of hydrogen at a temperature less than 100C and satisfactory absorption or desorption kinetics. Pressure difference is the major sorption rate controlling factor in these devices.

2. LITERATURE REVIEW AND OBJECTIVE

Nishizaki et al [1], proposed a model for the analysis of a metal hydride based chemical heat pump consisting $LaNi_5$ and $LaNi_{4.7}Al_{0.3}$. They introduced the concept of sensible heat exchange between the reactors containing the same metal hydride for improving the COP of the system. The working pairs reported favourable outputs. Performance analysis of a single stage metal hydride-based heat transformer, operating at temperatures of 423K, 383K and 303K, using the same alloy pair was carried out by Muthukumar et al [2]. They found that for the bed having thermal conductivity of 4W/mK, the cycle time can be decreased by 30% by reducing the bed thickness. Effect of operating temperature on the COP of system were also reported. Later, Muthukumar and Satheesh [3] studied the operating feasibility of a crossed van't Hoff single stage metal hydride heat pump working with two different hydride alloy pairs and presented the optimum operating temperatures. They reported that crossed van't Hoff systems yielded 60% higher COP than conventional single stage systems.

Sharma et al [4], conducted studies on La based intermetallic hydrides to determine their suitability in metal hydride based cooling systems. A major finding of the study was the effect of the metal hydride bed composition on the driving potential and hydrogen transfer rate during cooling and regeneration. Mohan et al [5] analysed the performance of a metal hydride based simultaneous cooling and heat transformation system. They also studied the variation in pressure during hydrogen transfer process between the metal hydride beds. Murthy et al [6] conducted a study on thermodynamic compatibility criteria for the selection of metal hydride pairs for the application in coupled metal hydride based thermal energy storage systems. The simulations were done using COMSOL 5.4, using alloy pair of Mg_2Ni and $LaNi_5$. They reported that the pressure variation in beds were consistent in the three cycles studied during charging and discharging processes at an energy storage efficiency of 89.4%.

Gopal and Murthy [7] conducted a study on the hydriding and dehydriding characteristics of $LaNi_{4.7}Al_{0.3}$ using a one dimensional mathematical model. The outcome of the study

Experimental study on ultrasonication, thermal conductivity and dynamic viscosity of Therminol 55-Al_2O_3(1.0wt%)/GNP(0.075wt%) hybrid nanofluid

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***Abstract*— Hybrid nanofluids, compared to mono-nanofluids, are a new class of heat transfer fluids that provide more control over the characteristics of the base fluid. In this study, an experimental investigation has been conducted on the effect of ultrasonication on the thermal conductivity and viscosity of the Therminol 55 (TH55) oil-based hybrid nanofluid containing alumina nanoparticles (Al_2O_3) and graphene nanoplatelets (GNP). The oleic acid stabilized TH55-Al_2O_3(1.0%)/GNP(0.075%) hybrid nanofluid has been prepared using the two-step method. The optimum bath ultrasonication duration has been determined by measuring thermal conductivity and viscosity as a function of ultrasonication time. The thermal conductivity of the hybrid nanofluid increases with temperature, reaching 15.52% at 65°C when compared to the base fluid, while pure TH55 oil exhibits a decreasing trend in contradiction. The increase in temperature resulted in the dynamic viscosity of the hybrid nanofluid decreasing by 84.5%, while the viscosity increased with the nanoparticle dispersion into the base fluid. Higher thermal conductivity with a promising particle dispersion stability has been obtained at three hours of ultrasonication duration with a 4000 Hz sonication frequency. Therminol 55 based hybrid nanofluids could be a potential candidate for medium temperature heat transfer applications based on the desirable properties over mono-nanofluids and conventional working fluids.**

Keywords— Nanofluid, heat transfer fluid, ultrasonication, thermal conductivity, viscosity Introduction (*Heading 1*)

I Introduction

The fast growth of nanotechnology has opened up a new way for typical heat transfer fluids (HTF) to develop nanofluids, which can significantly enhance the performance of thermal systems. As a result, there is a lot of research going on in this sector to improve the thermophysical properties of the HTFs. Among the various conventional HTFs used in medium temperature solar thermal collectors and process industries, Therminol 55 (TH55) is one of the most popular [1]. TH55 possesses a low freezing point and a high boiling point with a maximum operating temperature of 305°C and a low pouring point [2]. The main limitation of TH55 oil is its poor thermal conductivity. The addition of nanoparticles in TH55 oil can change its properties [2-4].

Nanoparticles play a vital role in this scenario. Dispersion of nanoparticles having a size less than 100nm in the conventional HTF imparts significant enhancement in the performance of heat exchangers [5]. Alumina (Al_2O_3) is a high potential nanomaterial among the many choices for nanofluids. They are relatively cheap and more chemically stable than some metal particles. Furthermore, Al_2O_3 is regarded as a promising nanoparticle for heat transfer applications due to its excellent thermophysical characteristics compared to other metal oxide nanoparticles. The thermal conductivity of Al_2O_3 at ambient temperature is about 36 W/m.K [6], which is more than 60 times that of water [7]. Heris et al. [8] carried out studies with Al_2O_3 and CuO nanofluids, confirming that the heat transfer improvement of the base fluid with the addition of Al_2O_3 is more than the addition of CuO nanoparticles.

Likewise, many investigators have experimentally evaluated carbon derivatives such as nanotubes [9,10], GO [11,12], and graphene platelets (GNP) [13,14]. GNPs have an outstanding thermal conductivity of around 5000 $Wm^{-1}K^{-1}$ [15,16], higher than the thermal conductivity of carbon nanotubes. Further, since GNP is a 2D material, the heat transfer properties are distinct from the 0-dimensional nanoparticles and 1-dimensional carbon nanotube. Various researchers' findings suggested that GNP could be a promising candidate for thermal energy conversion applications [17].

The thermophysical properties of a nanofluid are determined mainly by the key step, synthesis. Nanofluids can be synthesized either by the one-step or two-step process. The one-step technique uses wet chemistry procedures including plasma arc, spraying or sputtering, laser ablation, or electric ablation [5] and the fabrication and dispersion of the nanoparticles in the base fluid is carried out concurrently. The two-step approach requires two distinct procedures: fabrication followed by dispersion using various stabilizing methods. Even though the dispersion stability of nanoparticles in one-step synthesized nanofluid is superior, the process is complex and expensive [18]. Most researchers use two-step synthesis because of its more effortless production procedure and can better improve thermophysical properties than one-step synthesis [5,19,20]. Mohammadpoor

Optimization studies on aqueous two-phase extraction of hexavalent chromium from contaminated aqueous solutions

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Abstract. Chromium has wide applications in industry and its resources are limited. The total chromium discharge to the environment needs to be monitoredand regulated. The extraction of chromium to PEG offers its reuse in pure form. The present study focuses on the optimization of hexavalent chromium extraction to PEG 1500 using ammonium salt. The effect of independent parameters as to the initial salt solution pH and initial salt phase metal concentration on the extraction efficiency has been studied experimentally. Second-order polynomial models have been used to fit the dependent variables in the experimental range of parameters.Central composite rotatable design in Minitabstatistical software version 16is used as the optimization tool. The maximum efficiency that is achieved through the optimization studies is 29.8%at an initialsalt solution pH of 6.5 and initial metal concentration 24.4 ppm. The corresponding distribution coefficient at the optimum conditionshas been found to be 1.14. The results of the optimization studies have been validated by conducting experiments at the optimum conditions.

1. Introduction

Heavy metal contaminated solutions impose a severe threat to the environment due to their bioaccumulation capability. Extraction and recycling of these metals from contaminated aqueous solutions is a significant step in sustainable development. Various technologies such as adsorption, chemical precipitation, membrane separation, ion exchange, liquid-liquid extraction,and electrocoagulation are widely accepted methods for heavy metal removal from aqueous solutions. These techniques have inherent advantages and disadvantages. Aqueous two-phase extraction (ATPE)emerged as a green alternative to the liquid-liquid extraction method. Compared to liquid-liquid extraction ATPE is an environmentally benign method it contains only water-soluble biocompatible components [1].

Chromium is extensively used in industries and its usage in our day to day life is unavoidable. In nature, chromium exists in every oxidation state from 2 to 6. However, only three forms – zero-valent, trivalent, and hexavalent chromium is used in industries. Trivalent and hexavalent chromium are more stable compared to other forms. Hexavalent chromium is a well established anthropogenic carcinogen. Major consumers of chromium include the tanning industry, wood preservation, electroplating, and pigment industry [2]. The maximum concentration of wastewater discharge permitted by CPCB, India

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PHENANTHRENE DEGRADATION STUDIES USING WHITE ROT FUNGI: A BIBLIOMETRIC ANALYSIS USING BIBEXCEL AND VOS VIEWER

Amy Thomas, Jishna M, Meenakshi Mahesh, Rohit S Prasad,
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Abstract

The rapid industrialization and development has taken a toll on the environment due to the generation of enormous amount of toxic waste. This has amplified the need for innovative, cost effective and safe technology for its treatment. Over the years, treatment methods using microorganisms i.e. bioremediation, has become a widely studied area. White rot fungi belonging to the class of basidiomycetes is found to be promising in effectively degrading lignin, due to its complex ligninolytic enzyme system. A plethora of studies on the degradation of different compounds like Polychlorinated biphenyls (PCBs), Polycyclic aromatic hydrocarbons (PAHs), using various species of white rot fungi are available in literature. Among them, Phenanthrene is a PAH, with a three-benzene ring structure found in extremely high concentrations in PAH-contaminated soils or waste dumping sites. This paper is a bibliometric study that aims to give the current state of research and the impact of various literature dealing with bioremediation studies of Phenanthrene using the three strains of white rot fungi, *Phanerochaete chrysosporium*, *Pleurotus sajor-caju* and *Pleurotus ostreatus*. This is done by analysing the literature published on the Web of Science database from the period 1990-2020, using search strings shortlisted based on the field of study. The bibliometric analysis was conducted using the software BibExcel and VoS viewer. Some of the major parameters studied include h-index, growth of the literature in the period of study, time series analysis and collaborative coefficient.

Keywords: *Bibliometric analysis, Phenanthrene, degradation, Phanerochaete chrysosporium, Pleurotus sajor-caju, Pleurotus ostreatus, Web of Science, BibExcel , VoS viewer*

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Department of Chemical Engineering

Environmentally Benign Processes, Products and Materials for Sustainable Ecosystem (EBPPM 2021)

in Honor of Dr. N Anantharaman

Certificate of Presentation

This is to certify that Dr./Mr./Ms. ***Ani Lawrance, Research Scholar, Chemical Engineering, National insititute of Technology, Tiruchirappalli*** has presented a paper entitled ***"Comprehensive Mathematical Model for Prediction of Temperature of Bio-Drying of Municipal Solid Waste (MSW) Batch Process"*** co-authored with ***Ajit Haridas, S. Savithri, A. Arunagiri*** in the Online International Conference on **"Environmentally Benign Processes, Products and Materials for Sustainable Ecosystem (EBPPM 2021)"** in the Session on ***Process Modelling and Simulation*** held during November 19-20, 2021.

Dr. K Muthukumar	Dr. A Arunagiri	Dr. N Samsudeen	Dr. P Kalaichelvi
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(SREE-2021)

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This is to certify that *Ani Lawrance* has presented a paper entitled *Design of Temperature controller for bio-drying of Municipal solid waste* co-authored with R Gokul, K Muthukumar, T Murugesan, A Arunagiri in the National Conference on Sustainable Research in Energy and Environment (SREE-2021) organized jointly by Department of Biotechnology, Department of Chemical Engineering and Centre for Energy & Environment under the aegis of TEQIP-III, Ministry of Education, Govt. of India held during January 15-16, 2021.

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Department of Chemical Engineering

Environmentally Benign Processes, Products and Materials for Sustainable Ecosystem (EBPPM 2021)
in Honor of Dr. N Anantharaman

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This is to certify that Dr./Mr./Ms. ***Franklin Francis, M.Tech, Chemical Engineering, National Institute of Technology, Tiruchirappalli*** has presented a paper entitled ***"Exhaustive Mathematical Model for Endorsing Design of a Mechanical Biological Treatment Plant for Batch Bio-Drying of Municipal Solid Waste"*** co-authored with ***Ani Lawrance, A Arunagiri*** in the Online International Conference on **"Environmentally Benign Processes, Products and Materials for Sustainable Ecosystem (EBPPM 2021)"** in the Session on ***Process Modelling and Simulation*** held during November 19-20, 2021.

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during the Second International Virtual Conference on

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Proceedings in the International Conference on Recent Innovations in Chemical and Biological Engineering **(RICBE-2K21)** jointly organizing by the Departments of Chemical Engineering and Biosciences, RGUKT-Nuzvid in association with IIChE Amaravati Regional Centre - Guntur, 16th to 18th of September 2021.

Applications of Nanobiotechnology in the food sector and future innovations

Basim Mohammed Parapathil[1], Aneena Sharaf[1], Devika Pradeep[1], Merrin Sarah James[1], Devanarayan Nair[1], Rohini Samadarsi[1*]

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Nanotechnology includes the fabrication of nanoscale materials and/or engineering of the functional system at the molecular level. Research findings have shown the competence of nanotechnology in various sectors including food, pharma, and medicine. Nanobiotechnology in the food sector is considered to be far superior to conventional technologies, owing to their enhanced food quality, where nanostructures are used for pathogen detection by nanosensors and nano traces, nanoencapsulation, target, and control delivery, food processing, food preservation, nano fertilizers, nano additives, nutraceuticals production, and intelligent packaging. The solubility and bioavailability of many bioactive components such as mangiferin, curcumin, resveratrol were enhanced by nano-based delivery systems, with a plethora of applications in the food, pharmaceutical, and nutraceutical industries. Nanoemulsion of eugenol oil using gum Arabic and lecithin as a food-grade natural emulsifier showed excellent re-dispersibility in water and maintained their physicochemical properties after rehydration. Hence this is one of the pioneering developments in the food industry. The application of nanosensors in smart food packaging for monitoring the quality of the stored foods is also discussed. Safety assessment and regulation policies need to be followed before marketing nanoproducts to control health-related risks. Novel innovations of nanobiotechnology in the food sector can be achieved by further innovations in nanostructures and by developing methods to achieve controlled interactions at the molecular level. This review highlights the functionality and applicability of nanobiotechnology in the food industry and their safety assessment.

Keywords: Bioactive components, Food Nanotechnology, Nanoencapsulation nanosensors Nanostructures, nanoemulsions Safety issues

References

1. Acosta, E., 2009. Bioavailability of nanoparticles in nutrient and nutraceutical delivery. Current Opinion in Colloid & Interface Science 14 (1), 3-15
2. Neethirajan, S., Jayas, D.S., 2007. Nanotechnology for the food and bioprocessing industries. Food and Bioprocess Technology 4 (1), 39-47

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In-silico anti- cervical cancer potential of a quercetin

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SREE-238

Abstract: Cervical cancer is known as a serious malignancy that affects women can considerably threaten their health. A wide range of molecular mechanisms and genetic modifications have been involved in cervical cancer pathogenesis making it difficult to develop effective therapeutic platforms. Hence, the discovery and development of new therapeutic approaches are required. Nutraceuticals from medicinal plants could potentially be used alone or in combination with other medicines in the treatment of various cancers such as cervical cancer. Among various nutraceuticals, quercetin has shown great anticancer, antioxidant and anti-inflammatory properties. In-silico analysis has revealed that quercetin possesses a cytotoxic impact on cervical cancer cells. Diverse types of cervical cancer responsible proteins were analyzed under Autodock vina software tools such as PTEN, NKCR, BRCT7 and BRCT8, Chek1, BRCA, Rad51D, BRCA1, HSP27, and HSP70. Proteins study revealed the maximum anti-cancer effects on cervical cancers. Quercetin's roles in cervical cancer treatment were annotated employing systems biology with strong evidence. A detailed study and investigation of pathways associated with cervical cancer revealed several targets whose crystal structure can be used for molecular docking against Quercetin. Molecular docking via AutodocVina revealed that the binding energies of compounds associated with the p53 pathway showed great affinity towards Quercetin, the best candidate among them being DHODH protein, the inhibition of which helps in the activation of tumor suppressor protein in the p53 pathway. This study reveals the use of quercetin in pharmaceutical and nutraceutical industries to combat cervical cancer.

Keywords: Cervical cancer, Nutraceuticals, Quercetin, In-silico analysis.

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Nano-nutraceutical formulations for the delivery of antiviral drugs: a promising solution for the treatment of viral infections

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SREE-239

Abstract: Global pandemics are serious threats to human life. While well-established and characterized viruses such as The human immunodeficiency virus (HIV) and Hepatitis are still killing millions of people, the emerging viruses are also problematic and have caused several serious outbreaks in recent years, such as the Severe Acute Respiratory Syndrome-Coronavirus (SARS-CoV) in 2002–2003, Swine influenza A (H1N1) in 2009, and Ebola Haemorrhagic fever outbreak in 2014 which has caused thousands of deaths worldwide. The widespread problem of a 2019-novel coronavirus (SARS-CoV-2) strain outbreak has prompted a search for new drugs to protect against these viral infections in the future. It is necessary to immediately investigate this due to the mutation of the viral genome and there being no current protective vaccines or therapeutic drugs. Nano nutraceutical strategies can be considered a powerful tool to enhance the effectiveness of nutraceuticals as antiviral drugs, which are usually associated with solubility and bioavailability issues. Consequently, high doses and frequent administrations are required, resulting in adverse side effects. To overcome these limitations, various nanomedicine platforms have been designed. This review focuses on the protein-based nanoparticles for the delivery of approved nutraceuticals. A brief description of the main characteristics of nanocarriers is followed by an overview of the most promising research addressing the treatment of the most important viral infections. The activity of antiviral nutraceuticals can be enhanced by nanoformulations. Hence nanoparticles can affect the fate of the encapsulated nutraceuticals, sustained-release kinetics, enhanced bioavailability, modified pharmacokinetics, and negligable side effects. Besides, the physicochemical properties of nanocarriers can enable their capability to target specific sites and to interact with virus structures. In this regard, nanomedicines can be considered an opportunity to enhance the therapeutic index of antivirals. Efficacy, safety, and manufacturing issues need to be carefully assessed to bring this promising approach to the clinic.

Keywords: Antiviral drugs, nano-nutraceuticals, nanoparticles, targeted delivery.

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Precision Medicine(PM): The Recent Innovation in Health care

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Healthcare is transforming, and it is imperative to leverage new technologies to generate new data and support the advent of precision medicine (PM). Recent scientific breakthroughs and technological advancements have improved our understanding of disease pathogenesis and changed the way we diagnose and treat disease leading to more precise, predictable, and powerful health care that is customized for the individual patient. Genetic, genomics and epigenetic alterations appear to be contributing to different diseases. The rapid development in genome sequencing and pharmacogenomics has led to the conclusion that genes might influence drug response. With the wealth of information for different diseases and its link to intrinsic biology, the challenge is now to turn the multi-parametric taxonomic classification of disease into better clinical decision-making by more precisely defining a disease. As a result, the big data revolution has provided an opportunity to apply artificial intelligence (AI) and machine learning algorithms to this vast data set. AI, machine learning algorithms, computational biology, and digital biomarkers will offer an opportunity to translate new data into actionable information thus, allowing earlier diagnosis and precise treatment options. A better understanding and cohesiveness of the different components of the knowledge network is a must to fully exploit its potential.

Keywords: *Precision medicine (PM); Pharmacogenomics; artificial intelligence; computational biology; Biomarkers*

References

1. Burke HB. Predicting clinical outcomes using molecular biomarkers. Biomark Cancer. 2016;8:89–99.
2. Dai Y, Sui W, Lan H, Yan Q, Huang H, Huang Y. Comprehensive analysis of microRNA expression patterns in renal biopsies of lupus nephritis patients. Rheumatol Int. 2009;29:749–54
3. Nunez Lopez YO, Garufi G, Pasarica M, Seyhan AA. Elevated and correlated expressions of miR-24, miR-30d, miR-146a, and SFRP-4 in human abdominal adipose tissue play a role in adiposity and insulin resistance. Int J Endocrinol. 2018;2018:7351902.
4. Seyhan AA, Varadarajan U, Choe S, Liu W, Ryan TE. A genome-wide RNAi screen identifies novel targets of neratinib resistance leading to the identification of potential drug-resistant genetic markers. Mol BioSyst. 2012;8:1553–70.

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Zoonotic Risk Prediction and Prevention of Next pandemic Infections

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Most pandemics such as HIV/AIDS, severe acute respiratory syndrome, pandemic influenza—originate in animals, are caused by viruses, and are driven to emerge by ecological, behavioural, or socioeconomic changes. Despite their substantial effects on global public health and growing understanding of the process by which they emerge, no pandemic has been predicted before infecting human beings. Currently, the world is engulfed in combating a pandemic with its control dependent upon the acquisition of immunity by individuals and population groups against the causative virus. There still are millions of zoonotic diseases in the world on standby. In the present study current pandemics are analyzed and devised a pattern existing between the previous pandemics caused by existing or novel, bacterial or viral pathogens and to verify the existing estimate frequency with which occurrence of pandemics holds true. To acquire a quality level of preparedness against the next global pandemic the first step is to identify global level determinants, which gives an insight towards the likeliness of pandemic emergence through ecological processes. New mathematical modelling, diagnostic, communications, and informatics technologies can identify and report hitherto unknown microbes in other species, and thus new risk assessment approaches are needed to identify microbes most likely to cause human disease. In the current study a series of research and surveillance opportunities and goals are laid that could help to overcome the challenges of pandemics and move the global pandemic strategy from response to pre-emption.

Keywords: Pandemics; Zoonotic diseases; Determinants; Mathematical modelling; Microbes

References

1. Worst epidemic and pandemics in history By Owen Jarus, All About History March 21, 2020
2. Covid 19 short term prediction model-Hongwei Zhao, Naveed N. Merchant, Alyssa McNulty, et al. Published: April 14, 2021
3. Tharanga Thoradeniya & Saroj Jayasinghe Globalization and Health volume 17, Article number: 59 (2021)
4. prioritizing-diseases-for-research-and-development-in-emergency-contexts, WHO Bulletin
5. Chapter 17 Pandemics: Risks, Impacts, and Mitigation -Nita Madhav, Ben Oppenheim, Mark Gallivan, Prime Mulembakani, Edward Rubin, and Nathan Wolfe

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Significance of Feature Selection and Pruning Algorithms in Machine Learning Classification of E-Mails

| Chapter | First Online: 01 June 2021

| pp 29–50 | Cite this chapter

Artificial Intelligence for Cyber Security: Methods, Issues and Possible Horizons or Opportunities

V. Bindu & Ciza Thomas

Part of the book series: Studies in Computational Intelligence ((SCI,volume 972))

Abstract

Email classification using Machine Learning (ML) algorithm is an application of Artificial Intelligence (AI) where the system learns by itself to provide predictions between ham and

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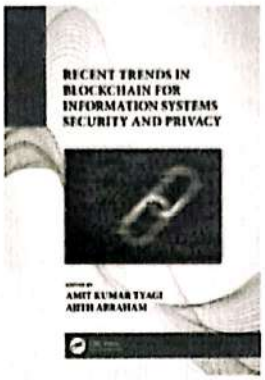
Chapter



Blockchain-Based Medical Insurance Storage Systems

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Design of an Optical Transfer Function Classifier based on Machine Learning and Deep Learning for Optical Scanning Holography

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***Abstract*— Optical Transfer Function in Optical Scanning Holographic (OSH) System describes the mathematical model of hologram generation frequency domain. Here a deep learning feature vector extractor is used for combining the features of the hologram to the classifiers. The classification learning is done with the regression-based machine learning models. This system works as the pupil function predictor for the generated hologram. The training is done with the given dataset for different types of pupil functions. The extracted features of the hologram determine the model prediction for pupils used and then classification of OTF is performed. The accuracy measure for different learning algorithms has been analyzed and the Ensemble Adaboost classification algorithm shows best accuracy results for the prediction of the pupils used in OSH. This classification algorithm gives an average prediction accuracy of 97.75%**

Keywords— *Ensemble Bag Classifier; Feature Vector; Point Spread Function; Optical Scanning Holography; Optical Transfer Function*

I. INTRODUCTION

Optical Scanning Holography manipulates the object information with the help of two pupil functions. This pupil functions determines pattern the refence beam should interfere with the object beam information. This pupil functions are responsible for the mathematical formulation of the OSH system transfer function (Optical Transfer Function/ Point Spread Function). This work presents an automated system for Optical Transfer Function (OTF) or Point Spread Function Classification (PSF) using Deep Learning and Machine Learning Techniques.

II. BLOCK DIAGRAM

The block represents the training phase and testing phase stages for the learning and pupil function prediction. A Very Deep Convolutional Neural Network (VGG16) extracts the features of the sine and cosine hologram. Regression based classifier learning techniques predicts the accuracy of the work.

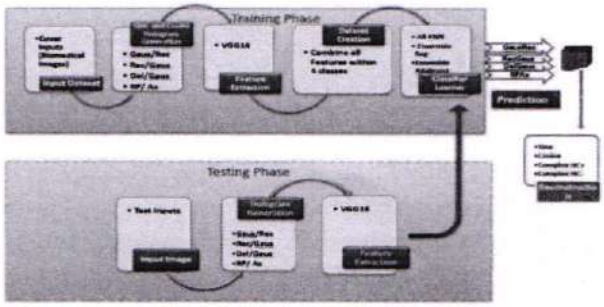

Fig. 1 Optical Transfer Function Classification

III. RESULTS

Table I Classification Results (Accuracy of OTF Prediction) with VGG16 Feature Extractor (Sine Hologram)

Classifier Model	Delta-Gaussian	Random Phase-Axicon	Gaussian-Rectangular	Rectangular-Gaussian	Average (%)
Coarse KNN	100	90	72	84	86.5
Ensemble Bag	100	97	84	94	93.75
Cubic KNN	100	97	88	94	94.75
Weighted KNN	100	97	88	94	94.75
Medium KNN	100	97	88	94	94.75
Fine KNN	100	97	91	94	95.5
Ensemble Adaboost	100	100	97	94	97.75

IV. REFERENCES

[1] W Wang, H Liu, "Automated clustering method for point spread function classification", Monthly Notices of the Royal Astronomical Society, Vol.478, pp.5671-5682, 2018.

[2] Yaping Zhang Et. Al, "Review on Feature Extraction for 3-D Incoherent Image Processing Using Optical Scanning Holography", IEEE Transactions on Industrial Informatics, Vol 19,11, pp. 6146-6154, 2019.

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Low Rate Multi-vector DDoS Attack Detection Using Information Gain Based Feature Selection

R. R. Rejimol Robinson and Ciza Thomas

Abstract The number of connected devices is exponentially growing in the world today and they need to work without having any interruption. This scenario is very challenging to cybersecurity and needs proper attention of network administrators, service providers, and users. Implementing security frameworks in this scenario is very difficult because attackers are using very sophisticated easy to operate weapons to launch huge attacks such as Distributed Denial of Service. Intelligently detecting and mitigating the attacks in the network requires the use of machine learning algorithms. This work proposes a strategic way involving feature selection based machine learning for the detection of stealthy attacks. The detection system works by performing information gain-based feature selection as a preprocessing step. This ensures case-based preprocessing of each attack vector present in the traffic and is proved to be effective empirically. The proposed method has been tested using two supervised machine learning classification algorithms, namely Random forest and J48. The evaluation results show that the Random forest algorithm gives a satisfactory True Positive rate of 99.6% in detecting stealthy layer 7 attacks. The overall accuracy obtained is 99.81%. This approach causes the algorithms to exhibit improved performance while doing classification.

Keywords Machine learning · Feature selection · Low rate attacks · Information gain · Stealthy attacks · Network security

1 Introduction

The digitally connected modern world demands uninterrupted connections, even the disruptions are unavoidable. Distributed Denial of Service (DDoS) attack is one such

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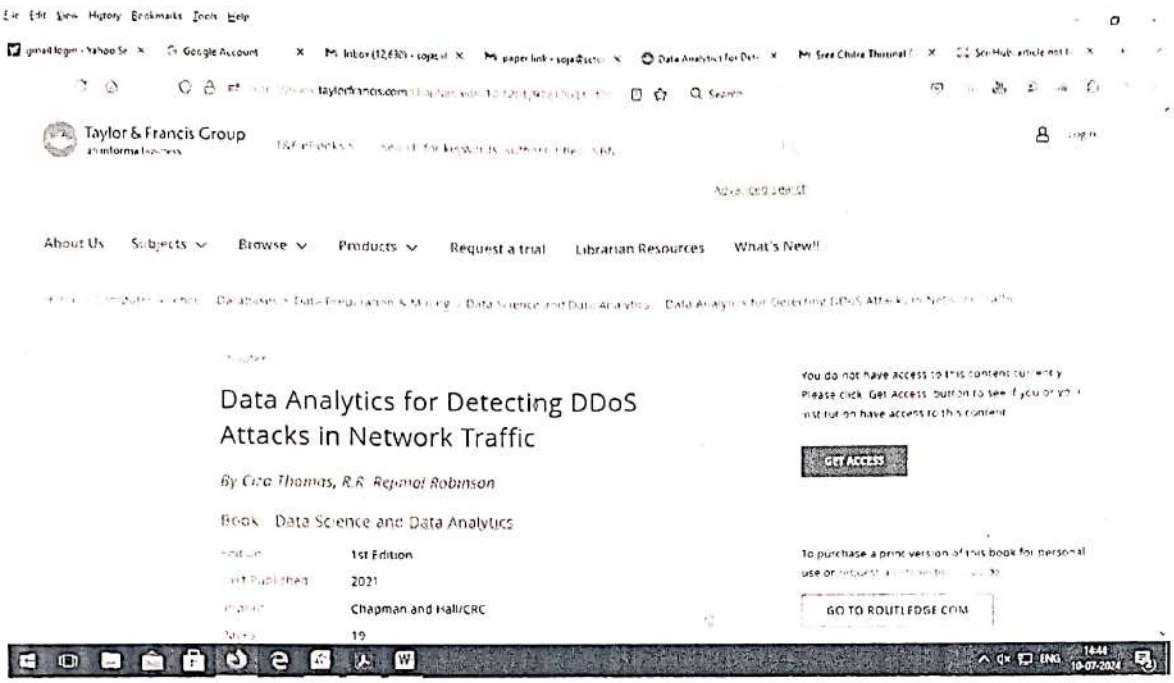

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Data Analytics for Detecting DDoS Attacks in Network Traffic

By Cini Thomas, R.R. Rejimol Robinson

Book: Data Science and Data Analytics

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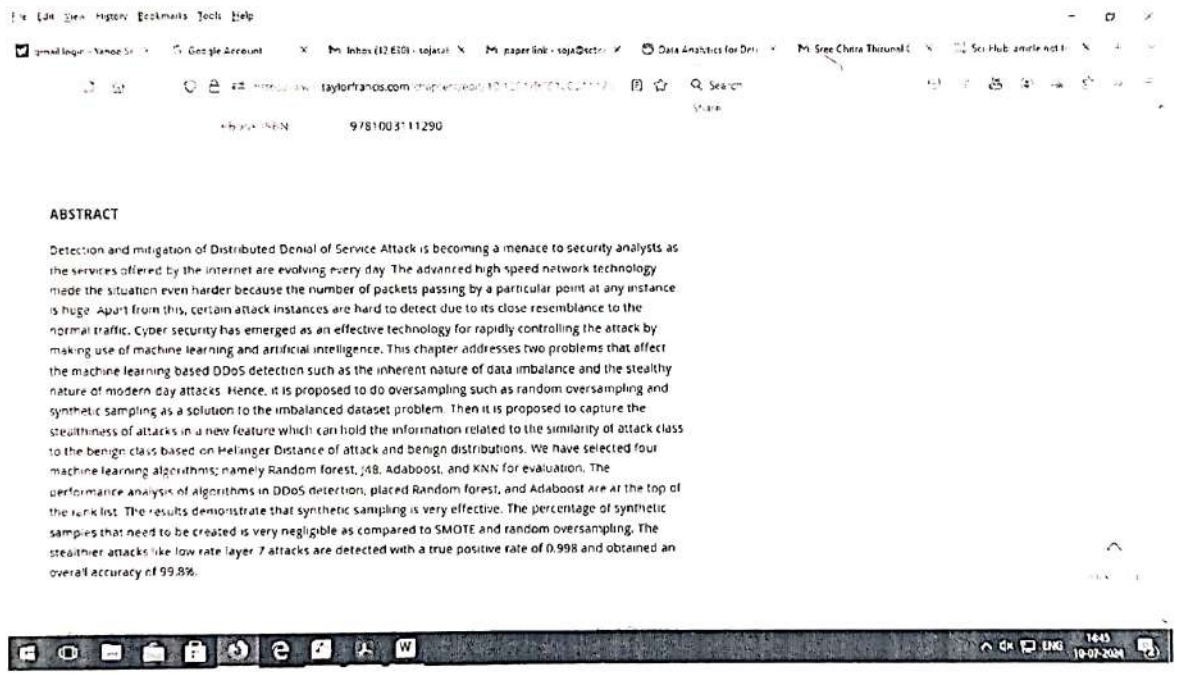

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ABSTRACT

Detection and mitigation of Distributed Denial of Service Attack is becoming a menace to security analysts as the services offered by the internet are evolving every day. The advanced high speed network technology made the situation even harder because the number of packets passing by a particular point at any instance is huge. Apart from this, certain attack instances are hard to detect due to its close resemblance to the normal traffic. Cyber security has emerged as an effective technology for rapidly controlling the attack by making use of machine learning and artificial intelligence. This chapter addresses two problems that affect the machine learning based DDoS detection such as the inherent nature of data imbalance and the stealthy nature of modern day attacks. Hence, it is proposed to do oversampling such as random oversampling and synthetic sampling as a solution to the imbalanced dataset problem. Then it is proposed to capture the stealthiness of attacks in a new feature which can hold the information related to the similarity of attack class to the benign class based on Hellinger Distance of attack and benign distributions. We have selected four machine learning algorithms; namely Random forest, J48, Adaboost, and KNN for evaluation. The performance analysis of algorithms in DDoS detection, placed Random forest, and Adaboost are at the top of the rank list. The results demonstrate that synthetic sampling is very effective. The percentage of synthetic samples that need to be created is very negligible as compared to SMOTE and random oversampling. The stealthier attacks like low rate layer 7 attacks are detected with a true positive rate of 0.998 and obtained an overall accuracy of 99.8%.

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A Multi-objective Optimal Trajectory Planning for Autonomous Vehicles Using Dragonfly Algorithm

R. Syama and C. Mala

Abstract Trajectory planning is considered as a major challenge in autonomous driving, which faces significant issues like safety and efficiency. This chapter proposes a novel swarm intelligence meta-heuristic optimization algorithm, called dragonfly algorithm, for the lane-change behaviour in the navigation of autonomous vehicles. A multi-objective lane-changing trajectory planning method has been proposed to optimize the trajectory and avoid collision, which mimics the dynamic and static swarm behaviours of the natural dragonflies. Whenever the autonomous vehicle senses an obstacle, automatically the lane-change manoeuvre should take place. The feasibility and the effectiveness of the algorithm are verified by simulation results using the lane-change data from the benchmark NGSIM dataset. Simulation results show that the proposed algorithm for trajectory planning gives an optimal path for lane-change scenario considering both static and dynamic obstacles.

Keywords Autonomous driving · Trajectory planning · Dragonfly algorithm · Lane-change manoeuvre

1 Introduction

Autonomous driving refers to self-driving vehicles that sense the environment and make decisions by their own without the involvement of a human driver. Autonomous driving has been one of the keen areas of research for the past few decades due to its ability to enhance the safety and efficiency of transportation system.

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CHAPTER 12

Stackelberg

Hidden Markov Model Approach for Behavior Prediction of Surrounding Vehicles for Autonomous Driving

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CONTENTS

12.1 INTRODUCTION

Autonomous driving refers to self-driving vehicles that sense the environment and move without human intervention. The need for safe, energy-efficient, sustainable, and comfortable transportation services is the top reason for the development of autonomous vehicles. A mixed scenario exists in which the autonomous vehicles share the roads with human-driven vehicles. For safe and effective operation on roads, autonomous vehicles must be able to correctly predict the intention or future movement of the surrounding vehicles.

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EARLY WARNING SYSTEM FOR DENGUE SURVEILLANCE IN THIRUVANANTHAPURAM

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INTRODUCTION

Over the last few years Kerala has witnessed many dengue epidemic cases with a maximum number of cases reported around 19,912 during 2017. The wide spread dengue infections cause a huge economic and health burden for the public health agencies. Dengue is a vector-borne disease caused by the dengue virus (DENV, 1–4 serotypes). *Aedes aegypti* and *Aedes albopictus* are the major vectors for dengue virus in India [1]. Srinivas Rao et al reported that, of all Indian states, dengue cases were more in Kerala due to the favourable breeding conditions, suitable temperature range (23.5-30^{0}C) and short incubation periods (9-14 days) during rainy season. The temperature is quite ideal for mosquito development and virus transmission [2]. In Kerala, though the cases of dengue antibodies were reported during 1979, the first outbreak in large numbers happened after south west monsoon in 2003 [3]. Several studies have reported an automatic early warning system to manage the dengue epidemics. For instance, Buczak Anna L. et al. correlated the dengue in Philippines with respect to various environmental factors and developed a machine learning model for successful prediction [4]. No studies have been carried out in the state using the environmental factors for early warning and controlling dengue incidence in Kerala. Given the region specific nature of dengue diseases, studies involving predictive modelling would be useful in the state of Kerala as the outbreak is tremendously increasing year after year. In this study, an early warning system for dengue surveillance model for Thiruvananthapuram district is attempted.

METHODOLOGY

In this paper, a dengue epidemic prediction model for Thiruvananthapuram district is built with a stacked XGBoost and Deep Neural Network Regressor having a ressemblance to that of a Multilayer Perceptron. The model is based on the hypothesis that the monsoon rain and water logging will increase *Aedes aegypti* mosquitoes breeding, thereby providing a fertile ground for vector development. The features used in the model includes temperature, dewpoint, humidity, rainfall and the monthly incidences of dengue for the period 2006-2018. As there was no dataset available for dengue prediction in Thiruvananthapuram district, an attempt was made to build a sample dataset. The number of dengue cases reported monthly in Kerala was collected from the Directorate of Health Services, Government of Kerala and the meteorological data was collected from the meteorological centre, Indian Meteorological Department Thiruvananthapuram. Data pre-processing was done to deal with the missing values followed by data normalization and standardisation with respect to the monthly dengue incidence. The training set was divided into 5 parts for K fold validation and the model trains on 90% of the data and is evaluated on the last 10%, using a loss metric of mean squared error. The model with the lowest error was used to evaluate the test set. The number of tress in the stacked XGBoost was varied from 50 to 1000 and set at 750 to come up with the final prediction. The learning rate was fixed at 0.03 with 4 hidden layer [10, 20, 20, and 10] in the DNN Regressor and Adam as optimizer.

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Optimization studies on aqueous two-phase extraction of hexavalent chromium from contaminated aqueous solutions

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Optimization studies on aqueous two-phase extraction of hexavalent chromium from contaminated aqueous solutions

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Abstract. Chromium has wide applications in industry and its resources are limited. The total chromium discharge to the environment needs to be monitoredand regulated. The extraction of chromium to PEG offers its reuse in pure form. The present study focuses on the optimization of hexavalent chromium extraction to PEG 1500 using ammonium salt. The effect of independent parameters as to the initial salt solution pH and initial salt phase metal concentration on the extraction efficiency has been studied experimentally. Second-order polynomial models have been used to fit the dependent variables in the experimental range of parameters.Central composite rotatable design in Minitabstatistical software version 16is used as the optimization tool. The maximum efficiency that is achieved through the optimization studies is 29.8%at an initialsalt solution pH of 6.5 and initial metal concentration 24.4 ppm. The corresponding distribution coefficient at the optimum conditionshas been found to be 1.14. The results of the optimization studies have been validated by conducting experiments at the optimum conditions.

1. Introduction

Heavy metal contaminated solutions impose a severe threat to the environment due to their bioaccumulation capability. Extraction and recycling of these metals from contaminated aqueous solutions is a significant step in sustainable development. Various technologies such as adsorption, chemical precipitation, membrane separation, ion exchange, liquid-liquid extraction,and electrocoagulation are widely accepted methods for heavy metal removal from aqueous solutions. These techniques have inherent advantages and disadvantages. Aqueous two-phase extraction (ATPE)emerged as a green alternative to the liquid-liquid extraction method. Compared to liquid-liquid extraction ATPE is an environmentally benign method it contains only water-soluble biocompatible components [1].

Chromium is extensively used in industries and its usage in our day to day life is unavoidable. In nature, chromium exists in every oxidation state from 2 to 6. However, only three forms – zero-valent, trivalent, and hexavalent chromium is used in industries. Trivalent and hexavalent chromium are more stable compared to other forms. Hexavalent chromium is a well established anthropogenic carcinogen. Major consumers of chromium include the tanning industry, wood preservation, electroplating, and pigment industry [2]. The maximum concentration of wastewater discharge permitted by CPCB, India

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Development of an Experimentation Setup for the Analysis of Flow Induced Vibrations in Flexible Tubes Conveying Fluid

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Abstract

Flexible tubes are used to transfer a wide range of fluids including gaseous fluids and liquids and hence find numerous applications in the industrial field, medical field, etc. Polyurethane (PU) tubes are one among the most widely used flexible tubes owing to their superior qualities and long life. Fluids conveyed through these tubes may not be always in steady condition, rather there are conditions of velocity or pressure varying flow. They can induce severe disturbances to the flexible tube than that induced during the steady condition. These can be extremely hazardous depending on the field of application. So it is needed to investigate the dynamic behavior of flexible tubes in velocity varying flow. Even though vast studies have been conducted in the steady flow through flexible tubes, more experimental studies are needed to be done concentrating velocity.

This paper attempts to introduce an advanced experimental setup for the study of flow-induced vibrations in flexible tubes. Flow is made velocity varying using a linear actuator coupled plunger rod mechanism which varies the flow from zero to maximum value through the plunger movement and this variation in flow velocity results in pressure pulsations in the fluid. The pressure variation is monitored by a pressure transducer and the dynamic responses of the fluid conveying tubes are acquired by means of a Laser Doppler Vibrometer. The experiments are found to be highly useful in the investigation of the dynamic behavior of the flexible tube under pulsatile flow and flow-induced vibration.

Keywords— Flexible tube, Polyurethane, Flow-induced vibration, Velocity, Pressure

Notations

Length of tube, m	= L
Interior Perimeter of tube, m	= S
Inside area of tube, m^2	= A
Linear density of pipe, kg/m	= m
Flexural Rigidity, $Mpa.m^4$	= EI
Coefficient of viscoelastic damping in the pipe, MPa	= E*
Coefficient of viscous damping, Ns/m	= c
Pressure, Pa	= P
Poison ratio,	= υ
Linear density of fluid, kg/m	= M
Axial fluid flow rate, m/s	= U
Longitudinal tension in tube, N	= T
Transverse shear force, N	= q
Bending Moment, kg.m	= M_b

I. INTRODUCTION

The dynamics of pipe conveying fluid has always been one of the concentrated areas of attention as it shows interesting as well as occasionally nonlinear behavior. Fluid-structure interaction resulting from the transfer of energy from and to the fluid can cause vibrations which can be severe in nature. These vibrations are sometimes hazardous and risky. So it is necessary to study the fluid-structure interaction and flow-induced vibration for practical engineering problems. Internal fluid flow is an important aspect to study the flow-induced instabilities and the dynamic characteristics of fluid conveying pipes. The analysis of natural frequencies of pipe conveying fluid helps to identify the safe operating frequencies of pipes and to design its supports. If the natural frequency of pipe matches with the frequency of structure or other attachment, resonance may occur and it can affect the pipe stability. They can result in leakage and failures.

Many devices which incorporate flexible fluid conveying tubes are now designed for engineering applications, hydraulic machinery application, utilization in hospital, etc. Polyurethane combines the best properties of both plastic and rubber. It offers tear resistance, high tensile and low compression set. It offers high elongation values like rubber and abrasion resistance superior to PVC. Polyurethane is naturally flexible and exhibits superior flexural abilities. As it possesses good chemical resistance with excellent weathering characteristics, polyurethane is superior to most other thermoplastics.

As Paidoussis and Li [1] found, experimental studies on the dynamics of fluid conveying flexible tubes are not numerous even though the theoretical, as well as numerical studies, are many. Naguleswaran and Williams [2] investigated the effect of pressurized flow on natural frequency in a clamped-clamped neoprene tube. Jendrzejczyk and Chen [3] conducted similar experiments on polyethylene and acrylic tubes under various support conditions. All these studies were limited to steady flow conditions and the effects of various parameters like pressure, flow velocity, initial stretch, etc on the critical flow velocity and natural frequency.

Unnikrishnan et. al.[4] discussed an experimental method for calculating dynamic characteristics of horizontal pre-stretched PU tube. Factors affecting modal parameter estimation are found out and optimum parameters are suggested. Zhang et al. [5] conducted an experimental study on pulsating and steady

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Microstructural and Hardness Study of A390/20wt.% SiC Functionally Graded Metal Matrix Composite

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ABSTRACT

Functionally graded materials are the upcoming new class of advanced materials, which exhibit gradual change in the microstructure and the composition in a definite direction, and hence variation in functional performance within a part. Functionally graded metal matrix composites (FGMMC) are FGM with metal and ceramic constituents. Aluminum-Silicon alloys are well-known for their unique combination of desirable characteristics, which includes excellent castability and less density combined with good mechanical properties. One such alloy that has been developed specifically for its wear resistance is the hypereutectic aluminum-silicon alloy A390. The research of wear behavior of this alloy at high temperatures has attracted attention in the past years. However, prospects of hypereutectic A390 alloy reinforced with SiC in a functionally graded manner are not discussed much in literature. The present study focuses on the development of A390/20wt.% SiC Functionally Graded Composite for high temperature tribological applications. The functionally graded A390/20% SiC is fabricated using centrifugal casting. The strengthening phases observed in the microstructural study are constituted by SiCp in the composite, which is formed in a graded manner confirming the FGMMC development. The hardness value showed a decreasing trend from outer to the inner region as expected from a functionally graded material. The hardness at the outer periphery of the developed FGMMC is also found to be higher than that of A390 alloy indicating higher wear resistance of the material.

Keywords: *A390/SiC, centrifugal casting, metal matrix composite, microstructure, hardness, SiC particles*

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INTRODUCTION

Functionally graded materials are an evolved class of engineering materials, which displays steady transitions in the microstructure and composition along a direction. This leads to the desired change in the functional enactment with advantages of the smooth transformation in the thermal stresses over the thickness and minimal stress concentration. These Functionally graded materials (FGMs) are finding applications in extreme conditions with high-temperature gradients. The advantages of FGMs are their improved and location-specific functional performance within a component [1–4].

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Development of Coconut Oil Based Bio-heat Transfer Fluid for Concentrated Solar Plant

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ABSTRACT

Vegetable oils are proven to be potential heat transfer fluids (HTF) in concentrated solar power plant (CSP) and their thermophysical and rheological properties are comparable to the contemporarily used synthetic HTF. The present study aims to investigate the use of coconut oil as potential HTF and to improve some of its properties for better performance. Natural additives are used to alleviate certain limitations of coconut oil in performing as an HTF. Primarily, the oxidative stability and cold flow property are improved by adding essential oils of garlic to coconut oil at different concentrations. The optimum mixture is chosen and the thermophysical properties which include density, specific heat capacity and thermal conductivity are looked into. These properties as well as the dynamic viscosity are correlated individually to temperature using polynomial equations. Further, the biodegradability of the mixture is checked to ensure the eco-friendliness of the mixture. Thus, an attempt is made to produce a bio-heat transfer fluid (BHTF) with improved thermophysical properties, dynamic viscosity, cold flow property and oxidative stability for performing as an effective substitute for synthetic HTF.

Keywords: *Heat transfer fluids, concentrated solar plant, coconut oil, natural additives*

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INTRODUCTION

Technologies for utilizing solar energy as an eco-friendly alternative to electricity have been implemented in areas which receive sunlight abundantly. Concentrated solar plant (CSP) is one such invention which helps to store thermal energy using heat transfer fluids (HTFs). The plant consists of several concentrators which help focus sunlight on the absorber tubes so that heat from the sunlight can be utilized by the HTF flowing inside the tubes. The HTF circulates in the solar receiver and the thermal energy is transferred to a heat exchanger which is attached in the thermal power block to generate electricity in a conventional steam generator [1, 2]. One of the pertinent reasons for the success of CSPs is the involvement of HTF which helps to utilize the thermal energy even when sunlight is not available. Rapid growth within the field of solar technology is impeded by technical barriers and those should be addressed to improve the efficiency of solar systems [3].

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PERFORMANCE EVALUATION OF SMALL SCALE PARABOLIC TROUGH SOLAR THERMAL COLLECTOR FOR SOLAR COOLING APPLICATIONS

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ABSTRACT: In this work, design, construction and experimental study of a simple parabolic trough solar collector have been conducted under the local climatic conditions for low-temperature applications. A small scale parabolic trough solar collector with 1.12m aperture, 2.5 m length and 90° rim angle has been developed with the locally available materials using the stainless steel sheet as the parabolic reflector and copper tube as the absorber/receiver. It has been outdoor tested at TKM College of Engineering, Kollam for the performance evaluation with and without glass cover. When glass cover is used over the absorber tube, the heat gained by the working fluid is observed to increase by 23.8% than that without a glass cover. The physical output indicates that by using an envelope glass to the absorber tube, high-temperature water can be produced for efficient hot water applications, in which working temperature of the system is lower than that of the hot water supply.

Keywords: Parabolic trough, Solar collector, Heat transfer fluid

INTRODUCTION

Concentrated solar power has great potential to utilize solar energy more efficiently than other solar systems. Parabolic Trough Collector found to have better efficiency with higher concentration ratios and effective conversion of solar energy. Parabolic trough solar collector is a line-focus solar thermal energy concentrator that reflects a larger area of beam solar radiation onto an absorber tube of smaller area with minimum loss. The collector surface focuses radiant energy from the sun on an absorber tube, and this is transmitted to working fluid. The metallic absorber tube is coaxial with the focal line of the parabolic reflector and has a glass covering to minimize the heat loss as shown in Fig.1. The performance of these parabolic collectors strongly dependent on the solar insolation available in the area where these collectors are installed. It is well recognized that insolation from the sun differs depending on the geographical position; therefore, it is necessary to consider the above in design, manufacture and functioning of solar thermal collectors.

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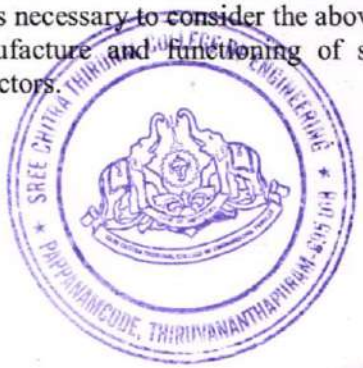

PP - 10

A BIBLIOMETRIC ANALYSIS ON PHENANTHRENE DEGRADATION STUDIES BY *PHANEROCHAETE CHRYSOSPORIUM*, *PLEUROTUS SAJOR-CAJU* AND *PLEUROTUS OSTREATUS*.

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ABSTRACT

The rapid industrialization and development of our era has taken a toll on the environment due to the generation of an enormous amount of toxic waste. This has amplified the need for innovative, cost effective and safe technology for treatment of these wastes. Over the years, treatment methods using microorganisms i.e. bioremediation has become a widely studied area. White rot fungi that belongs to the basidiomycetes class is found to be one of the promising class of organisms used for effective biodegradation of lignin due to its complex lignolytic enzyme system. A plethora of studies on degradation of different compounds like Polychlorinated biphenyls (PCBs), Polycyclic aromatic hydrocarbons (PAHs) using various species of white rot fungi are available in literature. Among them, Phenanthrene is a PAH with a three-benzene ring structure found in extremely high concentrations inPAH- contaminated soils or waste dumping sites. This paper gives a bibliometric study that aims to statistically analyse the various publications in literature on the bioremediation studies of Phenanthrene by three specific strains of white rot fungi, *Phanerochaete chrysosporium*, *Pleurotus sajor-caju* and *Pleurotus ostreatus*. The study has been conducted using the database obtained from Web of Science, an independent global citation database. The data collected has been analysed using the software BibExcel, which is a tool that helps researchers analyse bibliographic data. The results of the study include the extent of published research on the degradation of phenanthrene, year of maximum publications, most studied organism, most cited author, most cited paper, the country that contributed the most, and the relevant keywords used for the study for a period of 30 years from 1990 to 2020.

Key words : Phenanthrene, White rot fungi, Bibliometric study, Web of Science, BibExcel

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In silico Design of Ligand Molecules Opening Blocked Aquaporins for Efficient Water Transport in Cystic Fibrosis Victims

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Abstract

Aquaporins are transport proteins concerned with the transport of water in several parts of the body systems. They are found to be associated with and regulated by cystic fibrosis transmembrane conductance regulator (CFTR) proteins, which are chloride ion channels, in some regions of cells. Mutations in CFTR is found to be the primary cause of cystic fibrosis disease. One of the concerns with this disease is the absence of efficient water transport in tissue systems because of the non-regulation or block of water transport, by mutations in the CFTR gene and the formation of defective CFTR proteins. It can be found in the lungs, causing an absence of flushing of mucus and also in male sterility because of the lack of water in the male reproductive tract. In the present study the three-dimensional structures of aquaporin proteins were analyzed and ligands were developed by molecular modeling which could bind to blocked aquaporins to an open position for a short period of time.

Keywords: In silico, cystic fibrosis, aquaporin, lungs

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VLE Prediction using Activity Coefficients for Binary Systems

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Abstract

Distillation operations are inevitable in many chemical industries and all the petroleumindustries. The vapor liquid equilibrium data are very much essential in design of distillation columns. Generation of the VLE data using experimental methods are quite expensive and timeconsuming due to the enormous number of experimental runs needed. Theoretical means ofestimating the VLE for non ideal mixtures using activity coefficient models has been afascinating research area in the field of fluid phase equilibria. In the present work, a new two parameter activity coefficient model (TPACM) has been framed to obtain the VLE for three binary systems, namely Chloroform - Benzene, Carbontetrachloride - Cyclohexane, Carbontetrachloride - Ethanol. The VLE computed from TPACM for these systems (isothermaland isobaric) were validated using the experimental VLE from literature and Redlich –Kisterthermodynamic consistency test. The parameters for the systems are reported along with theerror analysis.

Keywords: VLE, Activity coefficient, Thermodynamic consistency, TPACM, JAVA

A Comparative study of performance of various types of constructed wetlands for automobile wash water treatment

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Abstract

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The current situations of enhanced water pollution and the upcoming thrive for waterusage has led to the need for more economical, scientific and effective strategies ofwater treatment. The notions of current researches indicate the effectiveness ofconstructed wetlands that precedes the natural and artificial water treatment methods.

Constructed wetlands classified under free water surface flow, sub-surface flow,horizontal sub-surface flow, vertical sub-surface flow etc. can be used efficiently for thetreatment of oil produced water and effluents of petroleum industry. Studies prove thatdifferent classes of constructed wetlands can be used effectively for the treatment ofautomobile wash water as well.

This study focuses on various constructed wetlands for the treatment of automobilewash water by comparing the results obtained from different studies reported in theliterature in terms of physiochemical parameters. The reduction in physiochemicalparameters from various literatures is juxtaposed and the conjectures are stated asgraphs and analytical tools providing a distinct representation of the efficiency ofconstructed wetland systems and other treatment frameworks.

Keywords: Constructed wetlands; Physiochemical parameters; Natural treatment methods; Artificial water treatment methods

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FPGA Implementation of PWM Based Sinusoidal Drive Generation for Stepper Motor

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***Abstract*— In control electronics the stepper motor is widely preferred for its ease in usage. Sinusoidal driving of motor using FPGA ensures the precise working and improved torque of the motor. FPGA based design is compatible with conversation to an ASIC (Application Specific Integrated Circuit). Using VHDL allows the control algorithm to be easily applied. This paper presents driving a stepper motor using sinusoidal input from PWM through FPGA. This driver can perform stable, precise control and improves the torque.**

Keywords: FPGA; VHDL; Stepper motor

I. INTRODUCTION

Motor drivers are widely used in different fields from aeronautics to biomedical industries and even in domestic usages. There are different types of motor drivers with different features. Stepper motor is a simple electromechanical device that can convert mechanical energy into electrical energy without a feedback mechanism. Changes in the output is done based on our requirements. Usually stepper motors are driven using step inputs. The different modes being; full stepping, half stepping and micro stepping. The output torque of these modes can be lowed than the design margin of various systems. So sinusoidal stepper motor drive is used to improve the output torque compared to that of the step input for the same current.

For this purpose FPGA is used to obtain PWM waveforms which are converted to sinusoidal waves and given as input to the stepper motor drive. FPGA is Field Programmable Gate Arrays (FPGAs) are semiconductor devices. FPGAs can be reprogrammed to desired application requirements. This feature distinguishes FPGAs from Application Specific Integrated Circuits. Although one time programmable FPGAs are available, SRAM based reprogrammable FPGAs are dominant in usage. In aerospace and defence FPGAs are used for image processing, waveform generation, and partial reconfiguration for SDRs. In this paper we explain the use of SRAM based reprogrammable FPGA for generating PWM waveforms. The FPGA used is ProASIC: A3PE1500.

To code into the FPGA, VHDL (Very High Speed Integrated Circuit Hardware Description Language) coding is used. The VHDL code is fused into the FPGA using a JTag Programmer. The waves can be seen through connecting a DSO.

II. RELATED WORKS

Stepper motors are widely used from our household works to a big rocket propulsion system. Stepper motors are usually driven using step inputs, whereas, here the driving is done using sinusoidal input. In [1], the authors explain a similar drive where DSP is used in place of VHDL as in our project. Their implementation is similar to ours. In [2], the authors say about the efficiency of the PWM power amplifier and the reason why we chose the same. In [3] and [4], we get the idea of FPGA implementation and in [5], the working of stepper motor is explained. Our paper considers all the aspects of the reference papers and modify accordingly to obtain a better working.

III. METHODOLOGY

The VHDL code is developed in Libero software by Microsemi. Before coding, the FPGA family being used must be specified and also the coding language, whether VHDL or Verilog. The FPGA used has a fixed frequency of 40Mhz. So we first give a frequency select division which divides this 40 MHz according to our need. The frequency division given is 50 or more, to obtain the waveform for an ample amount of time, otherwise capturing the waveform will be difficult. So the derived clock frequency will be 50x256x256. This is a ramp signal.

This derived clock is to the address generator block and the comparators. Two PWM waveforms with 90 degree phase shift from each other are required. So two address generations are to be done. So to the main code a sub code is to be incorporated which has the address of the sinusoidal waveform samples. Initially the derived counter is at zero. When the counter begins it generates an address of sine sample of one wave and also plus 90 degree phase shifted address for the second wave. So it counts 50x256x256 times and then generates the next address.

The inputs given through code are, Frequency select for derived clock and stepcount. The input bits given manually are, Countload, Clock (clk), Reset (reset_l), Direction. The outputs are, PWM 1 and PWM 2.

Once coding is done, the pre-synthesis simulation is done. This is just a beginning check simulation. Once this is successfully done, the next step is post synthesis simulation.

This is an important part because if post-synthesis simulation is successful, then the code is completely correct.

Then pins are assigned for the FPGA in the Libero itself. The datasheet of FPGA shows the various input output pins than can be assigned. Once pins are assigned, a fuse file is to be generated which is the last part. Finally, this fuse file is fused into the FPGA using a JTag programmer.

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Digital Holographic Technique Based Fingerprint Authentication for Criminal Investigation

S. Thansy and M. K. Sheeja

July 7, 2020

Principal
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Separable Convolution Neural Network for Abnormal Activity Detection in Surveillance Videos

S. S. Anju and K. V. Kavitha

Abstract Nowadays, the process of abnormal activity detection has gained a wide variety of applications in security and surveillance. Most of the public spaces are now installed with CCTV Cameras and the videos are continuously recorded. At present, the major part of surveillance cameras are tend to merely record the video for post-incident manual analysis. In this scenario, dependability on human monitors increase with a decrease in the reliability of the surveillance system. The security is at risk if the attention levels of the human monitors degenerate to unacceptable levels. The main aim is to enable surveillance cameras to understand activities in their environment instantly and report to the concerned users in case of events that need attention and to maximize the reliability of the surveillance system so that it could ensure maximum human benefit and security. The activities being recorded in a surveillance camera can be classified as normal and abnormal activities like accidents, theft, fire, crimes etc. This study proposes a separable convolution neural network which is trained and evaluated for finding better performance in the classification of activities based on surveillance videos. In particular, it examines the use of different optimizers namely Adam, RMSProp, and SGD in the proposed separable convolution neural network. The evaluation metrics used here are confusion matrix, accuracy, classification report with sensitivity, specificity, precision and f1-score. During evaluation the results showed that the proposed separable convolution neural network model trained with SGD optimizer has gained 94% accuracy with the test data.

Keywords Computer vision · Separable convolution neural network · Intelligent surveillance system · Activity detection · CCTV

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Live Acoustic Monitoring of Forests to Detect Illegal Logging and Animal Activity

J. C. Karthikeyan, S. Sreehari, Jithin Reji Koshy, and K. V. Kavitha

Abstract Illegal cutting of trees and poaching in the forest has become a serious issue regarding environmental conservation. Trespassing in the forest has an adverse effect on the habitat of animals. There is no effective solution for real-time detection and warning of such activity. Image-based monitoring solutions are too costly and cannot cover a wide range of areas. A novel approach of audio-based monitoring systems using deep neural learning can be proposed as a solution to this problem. A model has to be trained using various audio samples of cutting of trees, gunshots, etc., along with the outliers. There are numerous tree felling techniques and hunting techniques. In the case of methods that are known to the model, the model detects that event and hence warns the authorities. The audio samples in the dataset in the time domain are converted to the frequency domain using fast Fourier transform (FFT). This distributes the signal across corresponding frequencies. For better visualization of features, it is then converted into a Mel scale, and the spectrum of this spectrum is computed using cosine transformation to obtain the Mel-frequency cepstral coefficients. Relevant features are then extracted using these coefficients and classify them using the proposed deep neural learning method. There is a significant difference between the energy concentration distributions of the sound that has to be detected with that of the outliers. This enables to classify the audio samples with a greater signal-to-noise ratio. The resulting model is then used for live monitoring of forests against illegal activities. The current situation of the wildlife demands an accurate database of animal activity in a particular area. This helps both the wildlife tourism and various studies. For addressing this issue, the proposed model is also

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Exploiting the thermal and rheological potentials of graphene-PAG nanolubricant for the development of energy efficient refrigeration systems

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ABSTRACT

The addition of nanoparticles is one of state of the art methods to enhance the thermophysical and heat transfer characteristics of cooling and lubricating fluids. Exploring the energy-saving potentials of novel material graphene as a lubricant additive is the primary focus of this study. The thermal and rheological properties of Poly Alkylene glycol(PAG)-graphene nanolubricant at different volume fractions are investigated to pose as an energy-efficient alternative lubricant in refrigeration systems. Moreover, genetic algorithm based regression correlations are proposed to predict the thermal conductivity and viscosity of the graphene-PAG nanolubricant. The results show that the addition of graphene nanoplatelets to the oil has the potential to improve the thermophysical characteristics of the lubricant. The presence of platelet shaped nano graphene particles enhance the thermal and rheological characteristics of the colloidal suspension. The proposed regression models exhibit excellent agreement with the experimental data. Thermal and rheological studies revealed that the application of graphene-PAG nanolubricant is an option to improve the energy efficiency and overall performance of HVAC systems.

Selection and peer-review under responsibility of the scientific committee of the Third International Conference on Recent Advances in Materials and Manufacturing 2021

1. Introduction

The world energy utilization is expanding exponentially per year. The growth in numbers of refrigeration and air-conditioning systems both in commercial, industrial, and residential sectors are one of the major reasons for the expanding pattern of energy consumption across the globe. In view of energy security and environmental concern, the energy efficiency of such systems needs to be enhanced. The emergence of nanotechnology leads to the development of superior materials and heat transfer media having better thermal, mechanical, and morphological characteristics which will benefit in energy, communication, biomedical, and other diverse sectors[1,2]. Increasing demands in energy, miniaturization of systems, and precarious economic crisis mandate energy-efficient and high performing cooling media and lubricating fluids in diverse thermal applications and systems.

One of the fortunate approaches to increase the thermal transport phenomena in conventional heat transfer fluids is the use of nanoparticles as colloidal material [3]. Low thermal conductivity and heat transport capabilities are the primary hurdles to overcome for the development of sustainable and efficient systems in the arena of heat transfer. Thus it is imperative to increase the thermo physical and heat transport characteristics of these fluids from an energy-conserving perspective. Present and future HVAC systems would necessitate energy efficient primary and secondary working fluids such as refrigerants and lubricants. Consequently, investigations on energy saving through heat transfer enhancement and better tribological performance have gained great attention nowadays [4]. The addition of nanoparticles to the conventional heat transfer fluids as a heat transfer modifier have been gained consideration for the past few years [5]. Recently carbon and its novel allotropes such as graphene, fullerene, and nanotubes have emerged as an excellent additive to the coolant, lubricants, and heat transfer fluids including refrigerants, due to its remarkable, unique thermal, mechanical, electrical, and optical properties[67]. However, graphene, among them is not effectively

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Research Article

EVALUATION OF BIO-ADDITIVES AS EFFECTIVE ANTI-OXIDANTS FOR COCONUT OIL BASED LUBRICANTS

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KEY WORDS: Coconut oil; Bio-additive; Pour point; Oxidative stability; Viscosity; Bacterial growth

ABSTRACT

Despite having several properties of a potential lubricant, coconut oil is not used as an industrial lubricant due to lack of certain properties like low oxidative stability and high pour point. In the present study, methods are being undertaken to improve above mentioned properties of coconut oil by adding bio-additives, so that itcan be used as a potential lubricant. The intention of the study is also to create an eco-friendly lubricant which supports the aspect of green technology. The additives used in the study are essential oils of ginger, black pepper and garlic, which are added at 2%, 3%, 5% concentration separately to prepare nine different samples. Propylene glycol is also added to the sample to improve the pour point. The addition of essential oil brought about a significant increase in onset temperature for oxidative degradation and substantialdecrease in pour point. The pour point wasfurther brought downbythe addition of propylene glycol, which is a safe food additive. The bacterial growth on each sample istested toensurethat the sampleswere eco-friendly and their disposal wouldnot cause any harm to the environment. The dynamic viscosities of the samples are also compared with pure coconut oil to check the impact of addition of essential oil. The addition of essential oil at 3%concentration along withtraces of propylene glycol to coconut oil hasyielded optimumimprovement in oxidative stability with substantial reduction inpour point, without significant change in dynamic viscosity.

1. INTRODUCTION

Vegetable oils are perceived to be alternatives to mineral oils for lubricant base oils because of certain inherent properties and their ability for biodegradability[5][10]. Compared to mineral oil vegetable oils in general possess high flash point, high viscosity index, high lubricity and low evaporative loss[8]. Poor oxidative and hydrolytic stability, high temperature sensitivity of tribologicalbehaviour and poor cold flow properties are reckoned to belimitations of the vegetable oils for their use as base oil for industrial lubricants[6][7]. Technical solutions such as chemical modification and addition of certain substances have been suggested to overcome the poor oxidative stability[4][10] and high temperature sensitivity of tribologicalbehaviour of vegetable oils when used as base oil for lubricants. Widespread use of vegetable oils as lubricants was limited in colder countries due to their high pour point[6]. Mineral oils provide various fluids which have desirable properties as lubricating oils at a reasonable cost. For that reason, most of the lubricating oils are supplied from petroleum based materials[6].Recently the demand forenvironment friendly lubricants are increasing because of the high concern for

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Spent Medium Recycling and Characterization for the Cultivation of Chlorella sorokiniana Microalgae

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OP-03-019

Abstract

Microalgae has gained substantial attention as a potential feedstock for the productionof various green chemicals and fuels. The high water requirement for the production ofmicroalgae biomass increases the water footprint which is one of the major challengesin the production of microalgae and it might limit the microalgae production. Therefore, recycling of culture medium is necessary to reduce the water foot print of microalgaebiomass production. In this study, recycling of culture medium for the cultivation ofChlorellasorokiniana (microalgae) and the effect of medium recycling on its growthwas investigated. Microalgae were cultivated in recycled spent medium up to threerecycled stages. Specific growth rate of microalgae culture in BG-11 medium was found1.303 Day -1 and it was declined to 1.076 Day -1 after repeated recycling of spent medium. Total dissolved solids increased to 1647 mgL -1 after repeated recycling of spent mediumas compared to fresh BG-11 medium in which it was estimated to be 824 mgL -1 . Theconcentration of total dissolved solids in spent medium cultures increased to 49.9% ascompared to fresh BG-11 medium culture. The decline in growth rate in spent mediumwas majorly due to inorganic compounds accumulation in the medium.

Keywords: media recycle; microalgae; spent medium

Molecular modeling investigation for novel nutraceuticals against proteases of SARS-CoV-2, H1N1, and Ebola hemorrhagic fever

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OP-03-020

Abstract

Global pandemics are serious threats to human life. While well-established and characterized viruses such as The human immunodeficiency virus (HIV) and Hepatitis are still killingmillions of people, the emerging viruses are also problematic and have caused several serious outbreaks in recent years, such as the Severe Acute RespiratorySyndrome-Coronavirus(SARS-CoV) in 2002–2003, Swine influenza A (H1N1) in 2009, and Ebola Haemorrhagicfever outbreak in 2014 which has caused thousands of deaths worldwide. The widespreadproblem of a 2019-novel coronavirus (SARS-CoV-2) strain outbreak has prompted a searchfor new drugs to protect against these viral infections in the future. It is necessary toimmediately investigate this due to the mutation of the viral genome and there being nocurrent protective vaccines or therapeutic drugs. In silico screening, strategies were employedto determine the potential activities of seven HIV protease (HIV-PR) inhibitors, two fludrugs, and four natural nutraceuticals including, gingerols, curcumin, mangiferin, and piperincompounds. The computational approach was carried out to discover the structural modeswith a high binding affinity for these nutraceuticals on the homology structure of thecoronavirus protease (SARS-CoV-2 PR). From the theoretical calculations, all thenutraceuticals demonstrated various favorable binding affinities. An interesting finding wasthat nutraceuticals tested had a higher potential binding activity with the pocket sites ofSARS-CoV-2 PR compared to the conventional HIV-PR inhibitor drugs. This result supportsthe idea that all four nutraceuticals could be used individually or in combination to treat viralinfections. This study sought to provide fundamental knowledge as preliminary experimentaldata to propose an existing nutraceutical material against viral infection. Collectively, it issuggested that molecular modeling and molecular docking are suitable tools to search andscreen for new drugs and natural compounds that can be used as future treatments for viral diseases.

Keywords: Severe Acute RespiratorySyndrome-Coronavirus (SARS-CoV), Swine influenza A (H1N1), Ebola Haemorrhagic fever, 2019-novel coronavirus (SARS-CoV-2), nutraceuticals, molecular modeling, docking

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Resveratrol-Induced Augmentation of Telomerase Activity

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OP-01-005

Abstract

Cells age and lose their capacity to divide as their telomere length gets shortened each timethey divide. eventually leading to the stoppage of cell division. This is primarily the reasonfor aging of an organism. Telomeres are thousands of repeated sequences that protects thechromosome ends from DNA damage. Each time a cell divide, some part of the telomere islost due to the inability of DNA polymerase to replicate the end of the chromosome (the end replication problem) during lagging strand synthesis. As a result, most cells (includinghuman cells) can divide only up to a certain amount of division (50-70) before goingsenescent phase, a phenomenon known as Hayflick limit. Telomerase is an enzyme that canextend the telomere length and 'repair' the ends of chromosomes. It consists of twomolecules each of human telomerase reverse transcriptase (TERT), telomerase RNA (TR orTERC), and dyskerin (DKC1). TERT is a reverse transcriptase, which is a class of enzymethat creates single-stranded DNA using single-stranded RNA as a template. The enzymeworks by binding to a telomerase RNA molecule that contains a sequence complementary tothe telomeric repeat. It then extends the overhanging strand of the telomere DNA using thisRNA as a template. After that, DNA polymerase adds complementary strands to theoverhang producing double-stranded DNA. Various factors are known to affect the activityof telomerase enzyme. Thus, strategies for improving the activity of telomerase can increasethe telomere length and thereby increase the overall lifespan of the individual. The currentstudy intended to compare the different bioactive compounds that affect telomerase enzymevia docking and to optimise its usage. It has been found that the compound "resveratrol"showed the highest binding affinity towards telomerase.

Keywords: Telomeres; Hayflick limit; resveratrol

Compressibility Factor of Nanoconfined Alkane along Vapor-liquidCoexistence

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OP-01-006

Abstract

The fluid PVT properties have direct influence on the fluid compressibility factor (Z-factor). Thecommon sources of Z-factor values are experimental measurements, equation of states andempirical correlations. Moreover, these equations of states and correlations are applicable to thebulk fluid and not suitable for the fluids confined at nanoscale. In the current work,compressibility factor of saturated liquid (Z l) and saturated vapor (Z g) of nanoconfined alkanesare estimated using the simulation data obtained from the Monte Carlo simulations. Thisinvestigation indicates that with increase in temperature compressibility factor of saturated liquidincreases and the compressibility factor of saturated vapor decreases for all studied nanoporewidths. Critical compressibility factors (Z c) of nanoconfined alkanes are also estimated using thecritical point data obtained from simulations. The Z c of nanoconfined alkanes reveals non-monotonic trend with inverse pore width (1/H) and approaches to the bulk value at highernanopore width. Moreover, with decrease in nanopore width, Z c decreases and finally remainsindifferent in quasi-2D region of nanopore width. A typical variation of Z c with inverse ofnanopore width (1/H) for nanoconfined methane and n-butane are shown in the following figure.

Keywords: compressibility factor; nanoscale; nanoconfined alkanes; NPT-Monte Carlo simulation.

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Knowledge Base Representation of Emails Using Ontology for Spam Filtering

| Conference paper | First Online: 14 August 2020

| pp 723–735 | Cite this conference paper

Advances in Artificial Intelligence and Data Engineering

(AIDE 2019)

V. Bindu & Ciza Thomas

Part of the book series: Advances in Intelligent Systems and Computing ((AISC,volume 1133))

Included in the following conference series:
International Conference on Artificial Intelligence and Data Engineering

Abstract

With the development of the Internet, emails became the swiftest, cheapest as well as the

A Novel Framework for Spam Hunting by Tracking Concept Drift

Conference paper | First Online: 22 January 2020

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Second International Conference on Computer Networks and Communication Technologies

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Included in the following conference series: International Conference on Computer Networks and Inventive Communication Technologies

05-11

HOLOGRAPHIC RECORDING OF MICROSCOPIC IMAGES USING PHASE SHIFT INTERFEROMETRY

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Background: Phase-shifting interferometry (PSI) is a holographic interferometric technique where multiple holograms are generated by giving appropriate phase shift to one of the beams. The amplitude and phase information of the object can be analyzed from the complex hologram. The proposed work is based on transmission type microscopic tissue imaging based on phase shifting interferometry and its reconstruction by angular spectrum method. The proposed method is evaluated by computing the Peak Signal to Noise Ratio(PSNR).

Proposed Transmission type Microscopic Imaging PSI: The proposed work is meant to record the hologram of transmission type microscopic tissue imaging based on phase shifting interferometry. The post operative collected specimen after processing is embedded in paraffin block. The paraffin block is cut into thin microscopic sections using microtome and fixed on a glass slide.

The microscopic tissue is placed as sample and a microscopic objective (MO) is used to magnify the microscopic tissue. The beam splitter splits laser beam into two parts-the reference beam and the object beam. One mirror is mounted with a Piezo Electric Transducer (PZT) which provide appropriate phase shift to the reference beam. The reflected object beam is again reflected by mirror and made to fall on microscopic sample. The MO helps to yield a magnified version of the sample. On the second beam splitter both the object beam and phase shifted reference beam are superposed and the corresponding interference pattern is observed in CCD which can be transferred to a PC.

The complex amplitude of the object light is referred to as the complex hologram because the amplitude distribution of the object light in the object plane is retrieved from by performing digital back-propagation. The reconstruction can be performed by angular spectrum method.

Simulation Results: To monitor the quality of the resulting reconstructed image of the hologram, the Peak Signal to Noise ratio between images is measured, which is defined as

Mean Square error, where $I_0(m,n)$ and $I_i(m,n)$ represents reconstructed and input image, M,N is the size of the image and R is the maximum fluctuation in the input image data type. The PSNR value is used to measure the quality of image after reconstruction and is found to be 12.03.

Conclusion: The proposed work implemented the hologram generation and reconstruction of microscopic sample tissue images by phase shifting interferometry. Phase-shifting interferometry provides a convenient method for computer analysis of interference patterns. The PSI technique can eliminate the influence of zero-order light and twin image, thereby improves the quality of the reconstructed images at the output.

Keywords: Phase-shifting interferometry, holographic interferometry, multiple holograms, phase shift, reconstruction.

05-12

ENHANCED PEDESTRIAN DETECTOR USING FIRST ORDER AND SECOND ORDER AGGREGATED CHANNEL FEATURES

Blossom Treesa Bastian and Jiji C.V.

Computer Vision Lab, Dept. of Electronics and Communication, College of Engineering Trivandrum

Background: Pedestrian detection is an active research area in computer vision field due to its significant role in

Phase-Coded Multiplexing Technique for Holographic Data Storage System

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Abstract. Holographic data storage is a technology that allows holograms containing several millions of bits of information to be written or read in a single flash of light. Holographic storage systems use the volume of the recording material to store information which is based on the principle of interference. Numerous data pages can be simultaneously recorded on photopolymer medium using multiplexing techniques. The multiplexing techniques in use are shift, angle, wavelength, polytopic, aperture and peristrophic multiplexing. Holographic data pages can be stored in a photopolymer medium using suitable multiplexing method. The same reference beam which was used for recording is used to reproduce the stored data from the hologram. Phase-coded multiplexing is the best choice for volume holographic memories compared to other multiplexing techniques. In the present work, phase-coded multiplexing technique is analyzed in terms of Signal-to-Noise Ratio and Bit Error Rate. Phase-coded multiplexing method gives higher Signal-to-Noise Ratio and lower Bit Error Rate compared to other multiplexing techniques.

Keywords: Hologram, Interference, Multiplexing, Spatial Light Modulator, Signal-to-Noise Ratio.

1 Introduction

The individual bits of information are stored as distinct magnetic or optical changes on the surface of the recording medium in magnetic and optical data storage devices. This limitation is overwhelmed in holographic data storage by recording information throughout the volume of the medium. In holographic storage, the multiple images are recorded in the same area by making use of light at different phase angles. The data transfer rates are greater than those attained by traditional optical storage devices since holographic storage is capable of recording and reading millions of bits in parallel [1].

Holography is a technique by which patterns of light are recorded to produce a three-dimensional object. The recorded pattern of light is called hologram memory. The information is stored at high density inside photopolymers. Holographic data storage has the capability to become the next generation of storage media since the current storage techniques have reached the upper limit of possible data. The benefit of holographic storage is that the volume of the recording media is used for data storage instead of just the surface [2].

The interference pattern between the wave fields scattered from the object and a coherent reference wave is recorded. This is how holograms are constructed. In holography, the recording medium records the original complex amplitude, i.e., both the amplitude and phase of the object wave to generate variable intensity holograms. The creation of holograms is achieved through two coherent light beams split from one laser source. One of the beams is the signal beam and other is the reference beam. When these two beams interfere, a resulting interference pattern is formed which includes both the amplitude and phase information of the two beams. If a suitable photorefractive material is placed at the interference point, the interference patterns within the material are recorded. The angle of the beam is important, and it cannot vary by more than one fraction of a degree. The holographic storage thus achieves its high densities of data. By changing the angle or frequency of the reference beam, additional pages of data can be written in to the same crystal. The medium's dynamic range determines how many pages it can reliably hold. If the reference beam illuminates the material in the absence of the signal beam, the hologram diffracts the light in the same direction as the initial signal beam and reconstructs all the information on the original signal beam [3].

2 Holographic Data Storage System

Holographic Data Storage System is a system used to record data into a recording medium using two beams from the same laser source. The read and write operations in holographic data storage systems are performed using

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Quadrant-mapping-based computer generated hologram compression

Raj N. R., Nelwin, G., Kanjana, Cyriac, Meril, M. K., Sheeja

Nelwin Raj N. R., Kanjana G., Meril Cyriac, Sheeja M. K., "Quadrant-mapping-based computer generated hologram compression," Proc. SPIE 11331, Fourth International Conference on Photonics Solutions (ICPS2019), 1133105 (11 March 2020); doi: 10.1117/12.2552991

SPIE.

Event: Fourth International Conference on Photonic Solutions (ICPS 2019), 2019, Chiang Mai, Thailand

[8]. Thurman, R.B., Gerba, C.P., 1988. Molecular mechanisms of viral inactivation by water disinfectants. Adv. Appl. Microbiol. 33, 75–105.
[9]. Ouyang, W., Chen, T., Shi, Y., Tong, L., Chen, Y., Wang, W., Yang, J., Xue, J., 2019. Physico-chemical processes. Water Environ. Res. 91, 1350–1377.
[10]. Raeiszadeh, M., Adeli, B., 2020. A critical review on ultraviolet disinfection systems against COVID-19 outbreak: applicability, validation, and safety considerations. ACS Photonics 7, 2941–2951.
[11]. Sakudo, A., Shimizu, N., Imanishi, Y., Ikuta, K., 2013. N2 gas plasma inactivates influenza virus by inducing changes in viral surface morphology, protein, and genomic RNA. Biomed. Res. Int. 2013.
[12]. Bivins, A., North, D., Ahmad, A., Ahmed, W., Alm, E., Been, F., & Bibby, K. (2020). Wastewater-based epidemiology: global collaborative to maximize contributions in the fight against COVID-19.
[13]. Corman, V.M., Albarrak, A.M., Omrani, A.S., Albarrak, M.M., Farah, M.E., Almasri, M., Muth, D., Sieberg, A., Meyer, B., Assiri, A.M., 2016. Viral shedding and antibody response in 37 patients with Middle East respiratory syndrome coronavirus infection. Clin. Infect. Dis. 62, 477–483. doi:10.1093/cid/civ951.
[14]. Ogorzaly, L., Bertrand, I., Paris, M., Maul, A., Gantzer, C., 2010. Occurrence, survival, and persistence of human adenoviruses and F-specific RNA phages in raw groundwater. Appl. Environ. Microbiol. 76, 8019–8025.

FEEDSTOCKS AND PRETREATMENT METHODS FOR BIOETHANOL PRODUCTION

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Abstract

The increasing global energy demand and depleting fossil fuels lead to the search for fuel alternatives. Biofuels produced from renewable biomass sources have received great attention in recent years. Bioethanol is a fuel alternative or fuel blend that can be produced by the fermentation of sugars. Cellulosic and lignocellulosic biomasses are considered as important feedstock for the production of biofuel. Lignocellulosic biomass materials are widely available in nature which may include forest residues, rice straw, barley straw, sugarcane baggase etc. The recalcitrant nature of these renewable resources is the primary bottleneck in bioenergy production. This has to be overcome by suitable pretreatment methods. Prevalent pretreatment strategies involve physical, chemical and biological methods. Pretreatment methods are followed by hydrolysis, fermentation and distillation. This paper reviews mainly on different biomass sources and pretreatment methods that can be used for the production of bioethanol.

Keywords: bioethanol, pretreatment, biomass, lignocellulose, fermentation

Introduction

Energy crisis is one of the major problems facing the world and fossil fuels contributes over 85% of the world's energy supply. Fossil fuels like petroleum, coal and natural gas are being utilized at a rapid rate. They are gradually depleting and will be unavailable in the near future. It causes adverse effects on the environment such as release of carbon dioxide which results in global warming. It also causes release of gases such as sulphur dioxide, nitrogen oxides, methane etc which causes environmental damage directly or indirectly. These make a great concern about environmental pollution and lead to the search for alternative sources of fuels.

Biofuels have been found to be one promising solution to the declining reserves of fossil fuels [22]. Biofuel can be defined as fuels that are made from biological origin such as plants, which can be used as a substitute for petroleum-based fuels. Bioethanol has been trusted as the most promising biomass-based fuel. According to Renewable Fuel Association, the global bioethanol production is approximately 26 billion gallons in 2020, among which US and Brazil contributes over 80% [6]. Bioethanol is a renewable energy resource, environmental friendly and it significantly contributes to reducing pollution. Liquid biofuels like bioethanol can be used as an excellent transportation fuel as well as a blending agent [15]. So, they are considered as sustainable alternative to improve the energy security.

Microorganisms are good candidates that are capable of converting different types of feedstocks into bioethanol through the process of fermentation. There are two types of fermentation. One is

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OF PARTICIPATION

This is to certify that

Dr.Anoop M S

Sree Chitra Thirunal College of Engineering, Thiruvananthapuram

has participated and authored a paper titled

STRUCTURAL DESIGN OF UTEV SUSPENSION SYSTEM

in the AICTE sponsored Third International Conference on Computing in Mechanical Engineering (ICCME'21) organised by the Department of Mechanical Engineering, SCMS School of Engineering and Technology during 22nd - 24th September 2021.

Dr. VIDYA CHANDRAN
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PARTICIPATION CERTIFICATE

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Evaluation of Strategic Decision taken by Autonomous Agent using Explainable AI

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***Abstract*—Autonomous intrusion detection systems assess the data intelligently and take strategic decision to detect and mitigate cyber-attacks. These decisions have to be explained and evaluated for the transparency and correctness. Explainable Artificial Intelligent (XAI) methods that explore how features contribute or influence a decision taken using an algorithm can be useful for the purpose. XAI method of Testing with Concept Activation Vectors (TCAV) has been used recently to show the importance of high level concepts for a prediction class in order to deliver explanations in the way humans communicate with each other. This work explores the possibility of using TCAV to evaluate the strategic decision made by autonomous agents. A case study in the context of DoS attack is analysed to show that TCAV scores for various DoS attack classes and normal class of KDD99 data set can be used to evaluate the strategic decisions. The proposed method of analysis provides a quantifiable method to justify the current strategy or change in the strategy if required.**

***Index Terms*—Autonomous agents, Explainable AI, Evaluation of decision, TCAV, Information Security**

I. Introduction

An autonomous agent is perceived to be capable of taking independent decision by responding to the situation that it faces. In order to arrive at a decision about the response, the agent has to analyse the data. Both unsupervised and supervised machine learning techniques can be employed for analysing the data. The knowledge obtained from the analysis is utilised for assessing the situation for decision making. If the autonomous agent has to be a completely independent and self-evolving, then it should be driven by specific goals. The idea is apparent from the analysis of living beings in a biological ecosystem. The importance of having specific goals is that it gives a reference point for the evaluation of decision taken by the agent. So, it can be assumed that agent takes a decision that maximises the goal satisfaction. For biological beings, the fundamental goals are preservation of self and preservation of species. The motivation for the action of living beings can be traced to the satisfaction of these fundamental goals. In a similar manner, for artificial autonomous agents, assumption of being driven by specific goals helps to establish the motivation for the decision and will act as a tool to evaluate the decision. The autonomous agent that is considered for a case study in this work is an intelligent intrusion detection system that detects DoS cyber-attack and responds with a suitable mitigation strategy while it is deployed for protecting a server. Since the aim of the DoS attack is to adversely affect the availability of the server, we consider the goal of the autonomous agent as ensuring availability. Hence, the strategy suggested by the autonomous agent should be capable of preserving the availability of the server. For evaluation of the strategy, the criterion to be analysed is how far the suggested strategy helps to maximise the availability of the server.

Explainable Artificial Intelligence (XAI) explores the possibilities of explaining the black box reasoning of machine learning algorithms that are used in these autonomous agents. XAI explores how the input features contribute or influence the decision taken using a machine learning algorithm. In this paper, we propose a novel method based on Testing with Concept Activation Vectors (TCAV) [1] by exploring the relationship between strategy, goals, and the most influencing features, thereby addressing the following questions:

- How far the goals of the decision making agent are satisfied by the applying a particular strategy?
- How can a decision be justified in the case of change of strategy, if needed?

The research contributions of this work are:

- Used TCAV to explore the relationship between strategy, goals, concepts, and features.
- Proposed a novel method based on TCAV to evaluate the strategic decision of autonomous agent.
- Applied the proposed method to a cyber security scenario to analyse the choices of strategic decisions.

The paper is organised as follows. Section II explores the choices of XAI methods to be used in in goal based autonomous agents. In section III, TCAV method for measuring concept influence is explained. Section IV describes the case study scenario. In section V the approach to model the scenario is discussed. Section VI explains the details of the experimental evaluation undertaken in this work. In section VII the

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Thermophysical and Heat transfer Characteristics of R134a-TiO_2 Nanorefrigerant: A Numerical Investigation.

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Abstract. Nanorefrigerants are new class of nanofluids in which nanoparticles are suspended in the refrigerant host fluid. They have superior thermophysical and heat transfer characteristics than conventional refrigerants. Present study investigates the thermophysical, heat transfer and pressure drop characteristics of TiO_2-R134a nanorefrigerants flow boiling in a mini tube. Studies have been conducted at various heat fluxes, vapour qualities and particle concentrations. From the studies it is observed that the presence of nanoparticles in refrigerant can enhance the thermophysical and heat transfer characteristics. Studies show that with TiO_2-R134a nanorefrigerant, the heat transfer coefficient increases by 30.2% when particle concentration is 1.5 %.

1. Introduction

Nanorefrigerants are a new research frontier described by the application of nanoparticles as additives into various refrigerants. The studies of nanorefrigerants are still in the embryonic stage. Recently scientists used nanoparticles in refrigeration and air conditioning systems because of its remarkable improvement in thermo-physical, and heat transfer capabilities. M. Akbari et al. [1] conducted a comparative study on heat transfer of nanofluids. CFD predictions of laminar mixed convection of Al_2O_3-water nanofluid in a horizontal tube with uniform heat flux by, single-phase and different two-phase models were compared. The numerical predictions of the convective heat transfer coefficient are compared with experimental data. Based on the study the authors reported that, the predictions by the three two-phase models are essentially the same and the less expensive model was VOF. Jacqueline et al. [2] conducted experimental studies on flow boiling heat transfer and pressure drop of pure R134a in a mini tube. The results show that in the low quality region, there is a significant influence of heat flux on heat transfer coefficient.The COP and freezing capacity of vapour compression system enhances by using refrigerant-nanolubricant mixtures [3]. Experimental studies on flow condensation heat transfer studies show an increased heat transfer coefficient for nanorefrigerant [4]. However, research works in the area of nanorefrigerants is scarce due to complexity of the phenomenon of flow boiling heat transfer. This necessitates more studies regarding thermophysical and heat transfer characteristics of nanorefrigerants through mini tubes. Present study includes Modelling of thermal conductivity of R134a based nanorefrigerants and numerical investigations by simulation of flow boiling of R134a-TiO2 nanorefrigerant through a mini channel using ANSYS FLUENT. Parametric studies also been performed to evaluate the effect of addition of nanoparticles to the refrigerants.

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Modified Cryptographic System Using Double Random Phase Encoding And Chaotic Shuffling

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Abstract—**In a well-developed digital world, security plays a key role in transmission of images. An Optical architecture that transforms a primary image into Stationary white noise with the help of random phase mask is proposed. Unlike the traditional Double Random Phase encryption, the encoding is performed using Discrete Wavelet Transform and Fast Fourier Transform. Although it is simple, in practice it is vulnerable to various attacks. Chaotic shuffling is performed as preprocessing step of encryption and post processing step of decryption to enhance security and verified the idea in simulation. Extensive simulation studies have been performed and Discrete Wavelet Transform based Double Random Phase Encoding with Henon shuffling is found to be good.**

Keywords—Arnold Cat Map; Double Random Phase Encryption; Henon Chaotic Map; Peak Signal to Ratio; Structural Similarity Index

I. INTRODUCTION

Optical techniques for image security [1] have caused much interest due to their solitary advantages, such as parallel processing, high speed and many degrees of freedom to handle optical parameters like amplitude, phase and wavelength [2]. They can provide a better and safe method for image communication The foregoing optical image encryption approaches [2],[3],[4] confirmed that these algorithms are secure and vigorous to the natural image processing attacks [5],[6].One of the important optical image encryption method is the Double Random Phase Encoding (DRPE)[7]. But it is vulnerable to various attacks and hence it is required to combine various other techniques to enhance more security.

Fourier transform is an important image processing tool which is used to decompose an image into its sine and cosine components. Taking the Fourier transform of an image converts the straightforward information in the spatial domain into a scrambled form in the frequency domain. There exist a fast Fourier transform(FFT) algorithm that computes 1D Fourier transform for N points in $O(N \log N)$ which makes FFT a practical and important operation on computers [7].

The Discrete Wavelet Transform (DWT) is an efficient and useful tool for signal processing [7]. As with other wavelet transforms, a key advantage DWT has over Fourier transforms is temporal resolution. It captures both frequency and location information.

Here, for the first time traditional DRPE is replaced by DWT and combined with scrambling in optical image encryption which gives a very good technique that is robust to most types of attacks. This paper introduces a novel Discrete Wavelet Transform (DWT) based DRPE technique combined with Chaotic maps that has been compared with Fast Fourier Transform (FFT) based DRPE as a traditional technique. Finally, we will present for our proposed DWT based DRPE algorithm that has given high performance and high robustness against all types of attacks that have been imposed to encrypted image during transmission which makes it more realistic than the traditional technique. For quality evaluation, methods like Entropy, Structural Similarity Index and Peak Signal to Noise Ratio is evaluated for the encrypted images.

II. DOUBLE RANDOM PHASE ENCODING (DRPE)

A random phase mask plays a significance role in encryption/decryption of images. The double-random-phase encoding (DRPE) is a very popular optical encryption method due to its simplicity. Moreover, it is robust against many different attacks in practical use. There have been numerous improvements to the DRPE including the full phase processor applying the DRPE in the Fresnel domain or incorporating the DRPE with digital holography. In addition, the DRPE has had applications in data storage and biometrics [8].

Fig 1 represents the FFT based DRPE is illustrated using the following equations

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