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Study on the use of selective catalytic reduction technique for NOx emission reduction in an diesel engine fuelled with Methyl ester of Water Hyacinth

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ABSTRACT

The emission standard is a big challenge to Automobile Manufacturers in bringing down the diesel engine emissions. Use of renewable fuel which substitutes conventional fuel in diesel engine which results in enhanced pollution levels, specifically NOx. In the present work an initiative is made to analyse the efficacy and pollution attributes of diesel power train propelled with Methyl Ester of water Hyacinth(B20) was investigated. Magnesium Oxide (MgO) and Zinc oxide (ZnO) nano additives at various proportions were added to Water Hyacinth biodiesel (B20). To reduce the NOx emission levels an improved methodology named as selective catalytic reduction (SCR) system was used. The experiment was performed with and without SCR to study the NOx emission characteristics. The results revealed that Methyl Ester of Water Hyacinth was found to be proper alternate instead of Diesel fuel without any engine alterations. The Brake thermal Efficiency(BTE) for diesel fuel was 28.4% and for B20 it was 27.1%, for B20 with 100 ppm NAM it was 27.3%. For B20 blend with 100 ppm NAM, the NOx emission was 786 ppm, and this NOx emission reduced to 596 ppm when SCR was used for B20 blend with 100 ppm NAM.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Advanced Materials and Modern Manufacturing.

1. Introduction

Trial was performed on a mono barrel CI engine to check the variation in Thermal Efficiency and exhaust emission for various combinations of Kapok Methyl Ester (KME). NOx emission, Exhaust Outlet Temp. and Specific fuel usage (SFC) improved for mixtures of Kapok Methyl Ester (KME), BTE, CO, HC and smoke viscosity inclined combinations of B20 and B40 of KME to charge the requirements[1]. The consequences of blending nanoparticles with create some important properties to biodiesel. The nanoparticles behaves as oxygen contributing agent and supplies oxygen through CO oxidation and distracts the O_2 through NOx. The mixtures of nanoparticles can perform as both catalyst and an energy source where it is used along base fuel in diesel engines[2]. Many people investigated the impact of blending Zinc oxide nanoparticles to biodiesel. The facts reveal that the rate of rise in fuel consumption, BTE, NOx, EGT and decline in CO, HC and smoke emissions is significant. The fuel consumption improved by 5.2%, carbon monoxide and smoke discharges dropped by 13% and 9%, NOx discharges raised by 5%. The BTE, pressure rise, heat release rate, NOx discharge will be improved due to the presence of particles [3,4]. Karthikeyan et al. [5] analysed the impact of blending ZnO_2 nano additives in palm oil biofuel. Results revealed that the BTE, EGT, NOx increased, and CO, HC and smoke pollution dropped tremendously. Sajith et al. [6] studied the impact on certain physical characteristics of biofuel by blending cerium nanoparticles to it. It can be noted that adding nanoparticles enhances the fluid flow resistance consequences in the rise in absolute viscosity of the mixture. The presence of nanomaterials in the mixtures encourages comprehensive burning equated to the diesel and increases the efficiency of fuel.

2. Materials and methods

2.1. Manufacturing of biofuel

2.1.1. Transesterification process

The process of producing biofuel from any oil extracted from seed is named as transesterification. The process of production of

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Heat transfer enhancement in oblique finned curved microchannel using hybrid nanofluid

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Curved microchannel
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Drop in pressure

ABSTRACT

The significant development of power converters in electric vehicles demands higher energy consumption and in turn larger heat generation. To prevent overheating of power converters, a newly designed curved microchannel is being developed with different cooling fluids. The objective of present experimental study is to analyze the heat transfer characteristics of oblique finned curved microchannel heat sink (MCHS) with various working fluids like Deionized water, nanofluid and hybrid nanofluid. Here heat sink has been designed with cross sectional area of 80 × 53 mm^2. The DI water, Al_2O_3/water nanofluid and Al_2O_3+CuO/water hybrid nanofluid was utilized separately with rate of mass flow varied between 0.1 and 0.5 lpm maintaining steady heat flux of 25.5 kW/m^2. Investigational output exposed that the rate of heat transfer, PEC and fall in pressure for the curved MCHS enhanced by 11.98%, 16.5% and 30.1% respectively in comparison to the heat sink which has straight channel. Also using hybrid nanofluid, the rate of heat transfer increased by 3.5% and 2.1%with curved MCHS in comparison to water and nanofluid. This is endorsed to the secondary flow generated by curved MCHS which improved the rate of heat transfer significantly. Overall, the curved MCHS with hybrid nanofluid is suggested as a preferred cooling medium for power converter in electric vehicles.

1. Introduction

To avoid environmental pollution, conserve energy and also to solve the problem of energy crisis, internal combustion engine vehicles are converted in to dedicated electric vehicles (EV) and hybrid electric vehicle (HEV) by automobile giants. During this technological change, the problem of overheating of power converters comes in to picture. Battery with power converters which acts as power source plays major role in converting the conventional vehicles into EV's and HEV's. The power electronic control device is being widely used to convert and to control electrical energy in both domestic and industrial appliances. The efficiency, size of the power control unit has been optimized to have high heat dissipation rate and heat density significantly. Because of less area of contact with atmospheric air, the power converters produce more heat flux. Due to overheating of the power converters there has been a surge in the failure rate of element. These demands led to the invention of MCHS by Tuckerman (1981). To achieve higher cooling rate in front of the present generation, some modification needs to be done in the existing MCHS or a novel cooling fluid may be developed. Since conventional fluids have poor thermal conductivity as compared to nanofluids and hybrid nanofluid. So it is not suitable for larger cooling applications. In addition to prevent overheating of power converters they are cooled using high thermal conductivity fluid and forced flow required. A Hybrid nanofluid is the one where more than one nanoparticle is added to the nanofluid.

Many attempts were made for the design modification of the MCHS for electric vehicle application which are discussed as follows. Hong et al. [1] developed a heat exchanger with plain louvered fins to improve the frosting and defrosting property of air source heat pump in the electric vehicles. It was found that the plain louvered fin was found to be a favourite open-air heat exchanger in the air source heat pump for electric vehicles. Lyu et al. [2] analyzed the battery thermal management system through forced air cooling, thermoelectric cooling and liquid cooling. Results revealed that the shell temperature falls by 430 °C with TEC-based aqua cooling medium with 40 V supply to the heater and 12 V supply to the TEC module for single cell along copper holder. Krishnadash et al. [3] investigated the heat proliferation by utilizing a combined PCM and MC plate cooling system in the electric vehicle

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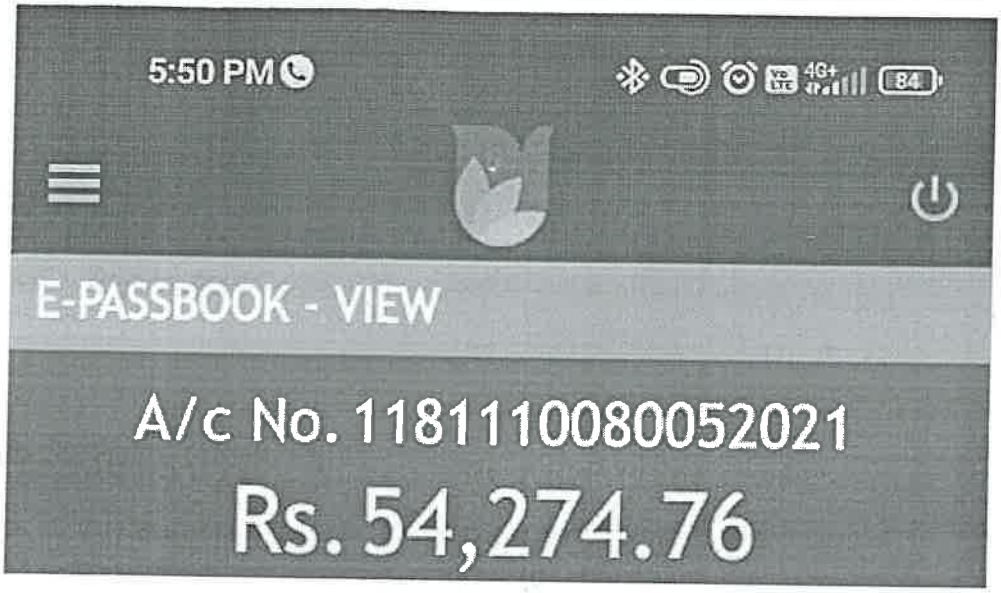

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Experimental study of heat transfer and pressure drop characteristics of microtube condenser using R134a

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ABSTRACT

The condensation heat transfer coefficient and the pressure drop were investigated experimentally and numerically in a microtube condenser using R134a. The microtube condenser comprises of trapezoidal oblique finned microchannel at the top and rectangular fins at the bottom of the tube. Water and air are used as cooling fluids on both sides of the microtube condenser. The experimental setup is validated initially with the existing work of Shah. The condensations effect included the vapour quality and mass flux ranging from 0.25 kg/m^{2}s to 0.9, 99 to 468 kg/m^{2}s, respectively. The results indicate that the condensation heat transfer coefficient and pressure drop enhance with mass flux and vapour quality. The experimental and numerical results are compared with existing experimental work. The microtube condenser enhances the heat transfer coefficient to 22.4% and a pressure drop of 5.6% more than the existing model. The heat transfer coefficient and pressure drop obtained from the numerical study is in superior agreement with the experimental results.

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KEYWORDS
Microtube condenser; trapezoidal microchannel; R134a; heat transfer coefficient; pressure drop

Nomenclature

A	Area [m^2]
C_p	Constant pressure specific heat [J/kg-K]
d	Tube diameter [m]
G	Mass velocity [kg/m^{2}s]
h	Heat transfer coefficient [W/m^{2}K]
k	Thermal conductivity [W/m K]
l	Length [m]
$\dot{m}$	Mass flow rate [kg/s]
Re	Reynolds number $= \rho ud/\mu$
Nu	Nusselt number $= hd/k$
p	Pressure [N/m^2]
Q	Heat transfer [W]
q	Heat flux [W/m^2]
T	Temperature [°C, K]
u	Velocity [m/s]
x	Vapour quality
μ	Dynamic viscosity [Pa-s]
v	Kinematic viscosity $= \mu/\rho$ [m^{2}s]
ρ	Density [kg/m^3]
f	Fluid
g	Gas phase
l	Liquid phase

1. Introduction

The drift towards the miniaturisation and advancement in microtechnology led to the development of microtube condenser. Also, getting higher demand for the compact refrigeration system has been increased, which accelerates the manufacturers to improve the design of condenser that explores approaches, opportunities and solutions already having an impact. Moreover, the strategies focus on increasing the effectiveness of the condenser by decreasing the vapour quality from 1 to 0.65 over the length of the tube. The effects of reducing the pressure drop on the airside cause a raise in the heat transfer coefficient on the refrigerant. The refrigerant used here is R134a which is eco-friendly and safe to use. The impact of miniaturisation of the condenser is, by drop the tube diameter in the condenser that leads to boost in the heat transfer coefficient and enhances the condensation effect. The main applications of the microtube condensers include the compact refrigeration system and compact heat exchangers in the electronics industry. Several types of research have investigated the condensation effect in microtube condenser with microchannel by experimentally and numerically. Goss and Passos (2013) carry out a study on heat transfer coefficient (condensation) using R134a in an eight parallel microchannel through 0.77 mm hydraulic diameter. The heat flux and mass velocity ranging from 17 to 53 kW/m^2 to 230–445 kg/m^{2}s respectively. The result shows the heat transfer coefficient raise with mass velocity and the vapour quality. Also, they study the pressure drop through convective condensation of R134a in eight circular microtube condensers. The result shows that the pressure drop augments with a raise in mass flux. The maximum pressure drop was obtained in a microtube condenser is 10 kpa at 445 kg/m^{2}s. Melanie Derby et al. (2012) proceeds the study on the condensation heat transfer in the triangular, square and semi-circular mini-channels to found the mass flux and vapour quality which have an influence on condensation effects. The experimental and numerical studies

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Child Safety Wearable and Visually Impaired Assistive Device with Location Tracking System Using IoT

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Abstract

The idea of a smart wearable system for children and visually impaired is discussed in this paper. The key advantage of this wearable above others is that it can be used with any cell phone and does not required an expensive smart phone are a very tech-savy individual to operate. The GPS, GSM, Wi-Fi and Arduino technologies were used to create a smart wearable gadget for kid safety and to assist visually impaired people with a location tracking system. The prototype system uses a heartbeat and temperature sensor to monitor the health of children. The child will be safe from threads as a result of this. There are many wearable's available now a days that crack children's everyday habits and activities and also assist in locating them utilizing Wi-Fi and Bluetooth services. However, it appears that both the parent and the child are communicating in securely. As a result, the goal is to create a text and Email enabled link in between child's wearable and the relevant parent via SMS. Global System for Mobile Communication is the primary concept behind this. For issuing an emergency alarm, the proposed solution is wearable gear with cellular network and Wi-Fi connectivity. When the push button is touched, an alarm is sent in variety of ways, including SMS and Email, in the event of emergency.

Keywords: GPS, GSM, Wi-Fi, Arduino, Wearable device.

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I. INTRODUCTION

Security becomes an important issue. In 2020 there were 31.6 million in population are visually impaired and 34.33 percent were children. Basically children or blind persons cannot able to complaint about their abusement which they face their daily life to their parents and

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Scheme :PRESTIGE SALARY ACCOUNT
Currency :INR

Statement of Account No :914010033463088 for the period (From : 04-09-2022 To : 05-09-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			[redacted]	
04-09-2022		ATM-CASH/THIRUNAGAR BR SALE/SALEM/040922	2000.00		[redacted]	
05-09-2022		SRI RENGASWAMY /EXCEL PAYMENT		2500.00	[redacted]	
05-09-2022		SRI RENGASWAMY /Excel Salary Aug 22		[redacted]	[redacted]	
05-09-2022		UPI/P2A/224893404045/PREETHI R/Axis Bank/UPI		11000.00	[redacted]	
05-09-2022		UPI/P2A/224894941729/MURUGESAN/Axis Bank/UPI		500.00	[redacted]	
		TRANSACTION TOTAL	**2000.00**	**61970.00**		
		CLOSING BALANCE			[redacted]	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

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VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM
CWDR - Cash Withdrawal through ATM
PUR - POS purchase
TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
RATE.DIFF - Difference in rates on usage of card internationally
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Int.Coll - Interest collected from the customer

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Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

S.No:5

Date: 10.08.2022

FACULTY INCENTIVE FORM

FACULTY ID: 21479

Staff Name	Dr.M.P.MURUGESAN			
Designation / Department	ASSOCIATE PROFESSOR / FOOD TECHNOLOGY			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)	Inventor (Rs.2,500)	
	Patent-Granted	Applicant (Rs.15,000)	Inventor (Rs.10,000)	
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
Participation	IITs/NITs/up to NIRF Top 100 colleges	Registration Fee - Actual (Max.Rs.5,000)		
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme	NIRF Ranking	
	0.925	https://doi.org/10.22.98/CICFQ.2105.50249		
Approved amount in Rs.	5000/-			

Investigator / Coordinator — Dept. IRRP Coordinator — HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator (10/8) Added in Google Scholar — IRRP Chief-Coordinator (10/8/22)

Director - IRRP (10/8/22) — Director (Admin.) / Principal — Approved — Executive Director (11/08/22)

Amount Already Received - 5000/-

Full 10,000/- ... not eligible to claim for 22-23

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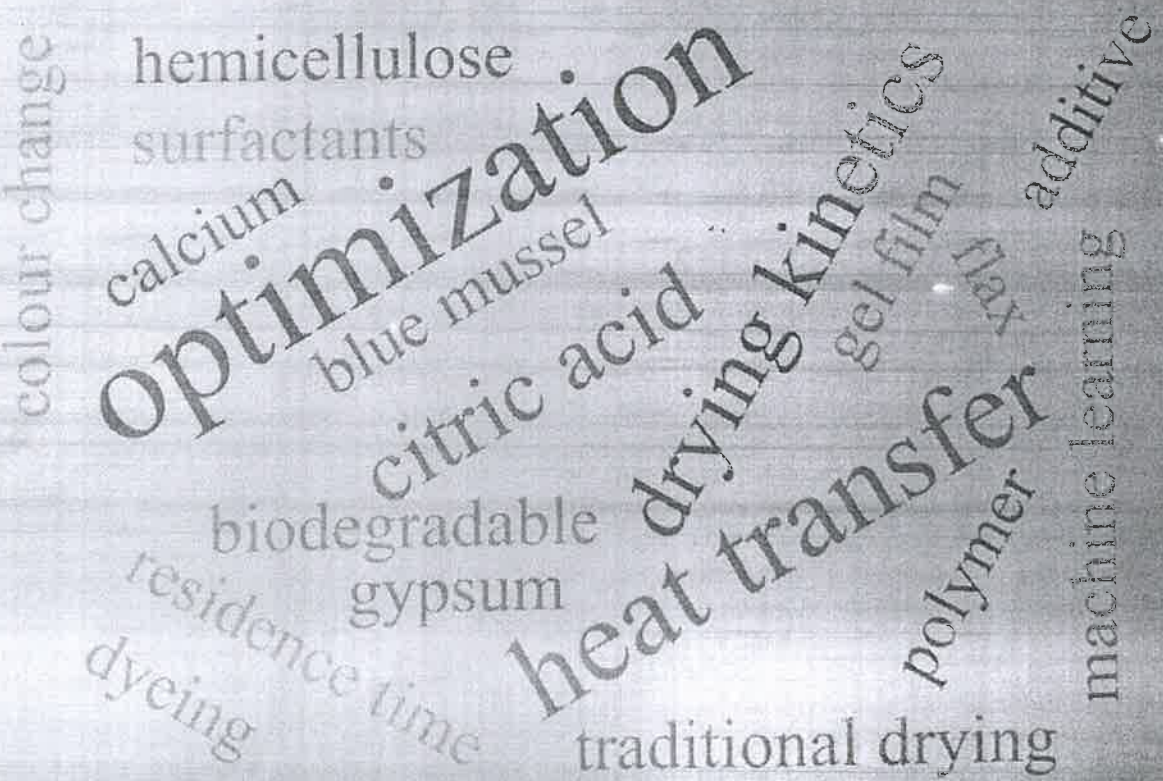

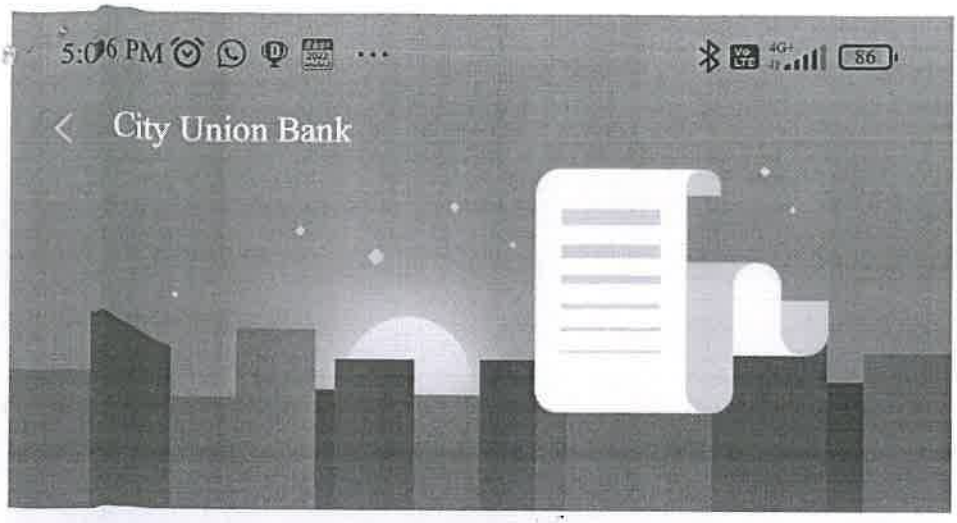

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ASP / Food Tech

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Available online at
Association of the Chemical Engineers of Serbia AChE
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Chem. Ind. Chem. Eng. Q. 28 (2) 103–113 (2022) CI&CEQ

MURUGESAN M. PALANISAMY[1]
KANNAN KANDASAMY[2]
VENKATA R. MYNENI[3]

[1] Department of Food Technology, Excel Engineering College, TN India
[2] Department of Chemical Engineering, Kongu Engineering College, TN, India
[3] Department of Chemical Engineering, Mettu University, Ethiopia

SCIENTIFIC PAPER

UDC 628.4.034:66:502

TWO-PHASE LEACHING FOR METAL RECOVERY FROM WASTE PRINTED CIRCUIT BOARDS: STATISTICAL OPTIMIZATION

Article Highlights

- Two-stage leaching was employed for the efficient recovery of heavy metals from PCBs
- Optimization by RSM results in a leaching efficiency of 97.06% Cu, 94.66% Sn, 96.64% Zn, and 96.89% Pb
- Simultaneous extraction has proved to be successful in separating and recovering heavy metals

Abstract

The rapid growth of technology is inevitable in humankind's life and has a significant stint in electronic waste (e-waste) generation. Electronic waste possesses tremendous environmental and health effects, and one such major contributor to it is printed circuit boards (PCBs). The present work deals with the recovery of heavy metals from PCBs by using aqua regia as a leaching reagent in two stages (first stage HCl and HNO_3 and second stage HCl and H_2SO_4). The response surface methodology was used to determine the optimal recovery conditions for the heavy metal ions: the recovery time of 5 h, the pulp density of 25 g/L, and the temperature of 90.1 °C with desirability 0.761. These optimized values provide a maximum recovery rate of Cu (97.06%), Sn (94.66%), Zn (96.64%), and Pb (96.89%), respectively. EDXs are used to analyze the metal concentrations of the sample before and after treatment.

Keywords: aqua regia, e-Waste, printed circuit board, response surface methodology, two-step leaching.

Electronic waste (e-waste) means electrical or electronic waste. Technological advancement, business expansion, economic growth, and shorter electrical and electronic equipment (EEE) have contributed to a significant rise in e-waste. PCBs are the main components of this e-waste, which typically includes 40% metals, 30% ceramics, and 30% plastics [1,2]. The metallic composition consists primarily of 10-30 % of cu and other metals such as Sn Zn, Pb Ni, Fe, Ag, Cd, Au, etc., in different proportions based on PCB sources [3]. The recovery of metals from PCBs is very difficult due to the heterogeneous distribution of materials in PCBs. An analysis of PCBs by atomic adsorption spectroscopy shows that 2 kg of PCBs contains 5.94% of Sn, 21.3% of Cu, 3.2% of Pb, and 2.24% of Fe [4]. Informal processing of e-waste in developing countries can lead to adverse effects on human health and environmental pollution. In 2016, 44.7 million metric tons of e-waste were produced worldwide [1,2]. An estimated 3.8 tons of e-waste were produced annually in India, of which only 19,000 tons were recycled. India faces a considerable challenge to dispose of an estimated 4.5 tons of e-waste per year produced domestically and imports from abroad [5]. If the e-waste was directly disposed of by filling the soil without removing metal ions from PCBs, the pollution of land and water supplies would result.

E-waste recycling has been accomplished through formal and informal techniques in several countries [6]. While formal recycling techniques ensure protection and efficient separation but are costly to install and

Correspondence: M.M. Palanisamy, Department of Chemical Engineering, Erode Sengunthar Engineering College, TN, India.
E-mail: engineermurugesh@gmail.com
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Paper revised: 21 April 2021
Paper accepted: 15 June 2021

https://doi.org/10.2298/CICEQ210115022M

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Centre for Industrial Relation and Research Projects (IRRP)

Date : 30/8/22

FACULTY INCENTIVE FORM

Staff Name	Dr. M. P. MURUGESAN			
Designation / Department	ASSOCIATE PROFESSOR / FOOD TECHNOLOGY			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
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Research Grants	Upon Receiving Fund	PI / Co PI	10 %	
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	3.38	https://doi.org/10.1155/2014/483913		
Approved amount in Rs.	5000/-			

Investigator / Coordinator | Dept. IRRP Coordinator | Dr. HOD

SUBMITTED TO THE PRINCIPAL

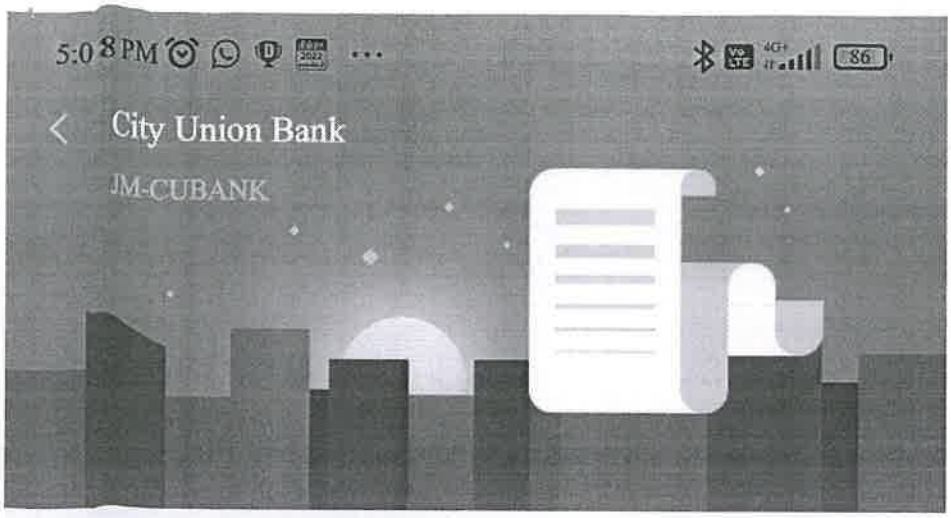
The details were checked and updated. The above mentioned incentive amount is recommended for approval.

1/8/22 Added in google Scholar.

R&D Coordinator | IRRP Chief-Coordinator

Director - IRRP | Director (Admin.) / Principal | Executive Director

Amount Received thread (2022-23) - NIL - 1/8/22



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Volume 2022, Article ID 4839913, 8 pages
https://doi.org/10.1155/2022/4839913

Hindawi

Research Article

Treatment of Municipal Wastewater in a Fixed Aerated Bed: Use of Natural Fibrous Materials

Murugesan Manikkampatti Palanisamy,[1] **Minar Mohamed Lebbai**,[2] **and M. Venkata Ratnam**[3]

[1]*Department of Food Technology, Excel Engineering College, Namakkal, Tamil Nadu, India*
[2]*Department of Chemical Engineering, Erode Sengunthar Engineering College, Erode, Tamil Nadu, India*
[3]*Department of Chemical Engineering, Mettu University, Metu Zuria, Ethiopia*

Correspondence should be addressed to M. Venkata Ratnam; mvratnam81@gmail.com

Received 23 April 2022; Revised 16 June 2022; Accepted 2 July 2022; Published 19 July 2022

Academic Editor: Samch Ali

The municipal wastewater may be treated using a number of different types of fixed beds that have a larger surface area. Since the fibrous materials have such a large specific surface area, they are frequently considered to be the best option for greater microbiological support and treatment efficacy. In this research, natural fibre materials such as coir fibre and areca husk were investigated for their potential to function as fixed aerated beds for the treatment of municipal wastewater. During the experiment, variations in the chemical oxygen demand (COD), biological oxygen demand (BOD), total dissolved solids (TDS), and total suspended solids (TSS) of the effluent were used to determine how well the aerated fixed bed work in treating the wastewater. The most efficient operating parameters for the successful treatment of wastewater were determined to be a contact period of 72 hrs, a filter medium depth of 5 cm, and a packing density of 10 kg/m^3. The reductions in BOD, COD, TDS, and TSS for coir fibre are 55%, 58.8%, 57.8%, and 51.89%, respectively, whereas the reductions for areca husk are 38.3%, 37.78%, 31.76%, and 30.56%, respectively. In the course of this experiment, the coir fibre was discovered to be marginally more effective in comparison to the areca husk.

1. Introduction

Water is an essential component of the planet and is one of its most vital substances. Water is essential to the survival of all living things, including plants and animals. The availability of clean water for drinking and several other uses is a major concern for people all around the world. Many people believe that the growth of modern industry and the destruction of the natural environment are two sides of the same coin, which highlights the need of having stricter rules for the management of pollutants [1, 2]. The quality of the water is being put in jeopardy by a number of different variables, some of which include recurrent droughts, seasonal and geographical changes in precipitation, excessive use of groundwater, and an absence of uniform distribution of groundwater [2]. The water that is used for drinking must not include any microbes or contaminants. Monitoring the quality of the water is essential in order to maintain a sanitary and risk-free atmosphere [3, 4]. Wastewater is a word that is used to represent liquid waste that is disposed of by a variety of sources, including households, companies, industries, and agriculture, and which frequently contains toxins as a result of the mixing of wastewater from multiple sources [5]. Wastewater is a word that is used to represent liquid waste that is disposed of by a variety of sources, including households, companies, industries, and agriculture.

It is imperative that the wastewater collected from a variety of sources be thoroughly cleaned and disinfected before being released back into the environment. A problematic situation will develop in the event that adequate plans for the collection, treatment, and disposal of all of the

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LAYAM KOMARAPALAYAM NAMAKKAL
NAMAKKAL
TAMIL NADU-INDIA
637001

Customer No :837318162
Scheme :PRIME SALARY ACCOUNT
Currency :INR

Statement of Axis Account No :911010000462398 for the period (From : 27-08-2022 To : 10-09-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			87642.84	
27-08-2022		POS/SRI M R S PETROL/TIRUCHENGODE/270822/12:45	500.00		87142.84	170
27-08-2022		INB/NEFT/AXIR222397348189/HARIHARA/CANARA /TNSCST	1875.00		85267.84	170
27-08-2022		INB/NEFT/AXIR222397348620/ARJUNPR/CANARA /TNSCST	1875.00		83392.84	170
27-08-2022		INB/NEFT/AXIR222397348424/ASHIRAZ/STATE B/TNSCST	1875.00		81517.84	170
27-08-2022		INB/NEFT/AXIR222397348823/AJITHM/CANARA /TNSCST	1875.00		79642.84	170
28-08-2022		UPI/P2M/224023854432/PhonePe/Axis Bank/Payment	255.00		79387.84	170
28-08-2022		UPI/P2A/224006497665/Bank Acco/EQUITAS S/Payment	400.00		78987.84	170
29-08-2022		POS/AARTHI AGENCIES I/SALEM/280822/23:18	500.00		78487.84	170
29-08-2022		POS/BALAJI TRADERS/SALEM/290822/08:29	500.00		77987.84	170
30-08-2022		UPI/P2A/224255247487/Bank Acco/State Ban/Payment	1750.00		76237.84	170
30-08-2022		UPI/P2M/224234303349/Bharti Ai/Yes Bank /Payment	267.00		75970.84	170
30-08-2022		UPI/P2M/224279672639/Aruljothi/Paytm Pay/Payment	1300.00		74670.84	170
30-08-2022		UPI/P2M/224225181827/CAUVERY S/HDFC BANK/Payment	92.00		74578.84	170
31-08-2022		POS/ANANYA FUELS/NAMAKKAL/310822/12:52	150.00		74428.84	170
01-09-2022		UPI/P2A/224428753804/Mr NAGARA/Indian Ba/Payment		10000.00	84428.84	170
01-09-2022		UPI/P2M/224441768414/NANDHAKUM/Paytm Pay/Payment	280.00		84148.84	170
02-09-2022		UPI/P2M/224537275656/SRI MRS P/Yes Bank /Payment	100.00		84048.84	170
03-09-2022		UPI/P2M/224606557227/SRI MRS P/Yes Bank /Payment	100.00		83948.84	170
03-09-2022		UPI/P2M/224645482497/Aruljothi/Paytm Pay/Payment	307.00		83641.84	170
03-09-2022		UPI/P2A/224641756020/MEENASHI /Indian Ov/Payment	500.00		83141.84	170
04-09-2022		UPI/P2A/224772394859/Bank Acco/Karur Vys/Payment	15000.00		68141.84	170
04-09-2022		UPI/P2M/224718495786/Flipkart /Axis Bank/Payment	299.00		67842.84	170
05-09-2022		UPI/P2A/224881196925/SANJAY MU/Axis Bank/UPI		7500.00	75342.84	170
05-09-2022		UPI/P2M/224803140760/SRI MRS P/Yes Bank /Payment	100.00		75242.84	170
05-09-2022		SRI RENGASWAMY /Excel Salary Aug 22		26025.00	101267.84	170
07-09-2022		UPI/P2M/225039229173/SRI MRS P/Yes Bank /Payment	100.00		101167.84	170

07-09-2022		UPI/P2M/225009839681/Rajendran/Paytm Pay/Payment	440.00		100727.84	170
07-09-2022		UPI/P2A/225084862609/Bank Acco/Indian Ov/Payment	600.00		100127.84	170
08-09-2022		POS/THE PALLIPALAYAM/TIRUCHENGODE/080922/12 :07	100.00		100027.84	170
08-09-2022		ATM-CASH/Pallipalayam Namak/SPB colony/080922	4000.00		96027.84	170
08-09-2022		ATM-CASH/Pallipalayam Namak/SPB colony/080922	4000.00		92027.84	170
08-09-2022		UPI/P2A/225116596986/DHANASEKA/Axis Bank/Payment	4000.00		88027.84	170
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08-09-2022		IMPS/P2A/225120623408/Raja/ALLAHAB/X427 698/Regi	48005.90		39021.94	170
08-09-2022		INB/NEFT/AXIR222513095573/KUBERAN /STATE B/TNSCST	1875.00		37146.94	170
08-09-2022		INB/NEFT/AXIR222513095097/RAGURAJ /CANARA /TNSCST	1875.00		35271.94	170
08-09-2022		INB/NEFT/AXIR222513095274/SATHYAPR/IN DIAN /TNSCST	1875.00		33396.94	170
08-09-2022		INB/NEFT/AXIR222513096833/RAJKUMAR/C ANARA /TNSCST	1875.00		31521.94	170
09-09-2022		POS/M S K A PRADEEP K/KARUR/090922/03:41	500.00		31021.94	170
09-09-2022		UPI/P2M/225294130523/Rajendran/Paytm Pay/Payment	140.00		30881.94	170
10-09-2022		NACH-DR- LICHOUSINGFINLTD	7549.00		23332.94	2567
10-09-2022		NACH-DR- LICHOUSINGFINLTD	4013.00		19319.94	2567
		TRANSACTION TOTAL	**111847.90**	**43525.00**		
		CLOSING BALANCE			**19319.94**	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

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We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

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REV SWEEP - Interest on Linked fixed Deposit

SWEEP TRF - Transfer from Linked Fixed Deposit / Account

VMT - Visa Money Transfer through ATM

CWDR - Cash Withdrawal through ATM

PUR - POS purchase

TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips

RATE.DIFF - Difference in rates on usage of card internationally

AXIS BANK

7-S (31)

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NAMAK KAL
TAMIL NADU-INDIA
637303

Customer No :84974475#
Scheme :LIBERTY SALARY ACCOUNT
Currency :INR

Statement of Axis Account No :913010034960220 for the period (From : 16-08-2022 To : 20-08-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			11633.30	
16-08-2022		NEFT/IOBAN22228199121/CHIEF CON/INDIAN OV//REF/		2000.00	13633.30	248
16-08-2022		SRI RENGASWAMY /Excel Tnsest payemnt		7500.00	21133.30	170
18-08-2022		ATM-CASH/MUNIAPPAN KOVIL/Kumarapalayam/180822	500.00		20633.30	170
18-08-2022		IMPS/P2A/223020524850/RAMACH/INDIANO/ X036529/	3005.90		14621.50	170
18-08-2022		INB/903765263/INDIAN INSTITUTE OF TECHNOLOGY(BILL	1117.70		13504.30	170
18-08-2022		INB/903767539/INDIAN INSTITUTE OF TECHNOLOGY(BILL	1117.70		12386.60	170
18-08-2022		IMPS/P2A/223021958809/ISMAIL/KARNATA/ X953101/	4505.90		7880.70	170
20-08-2022		UPI/P2A/223246881588/GAYATHRI /Bank of B/marriag	3000.00		4880.70	170
		TRANSACTION TOTAL	**13247**	**9500.00**		
		CLOSING BALANCE			4880.70	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

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We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord.login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

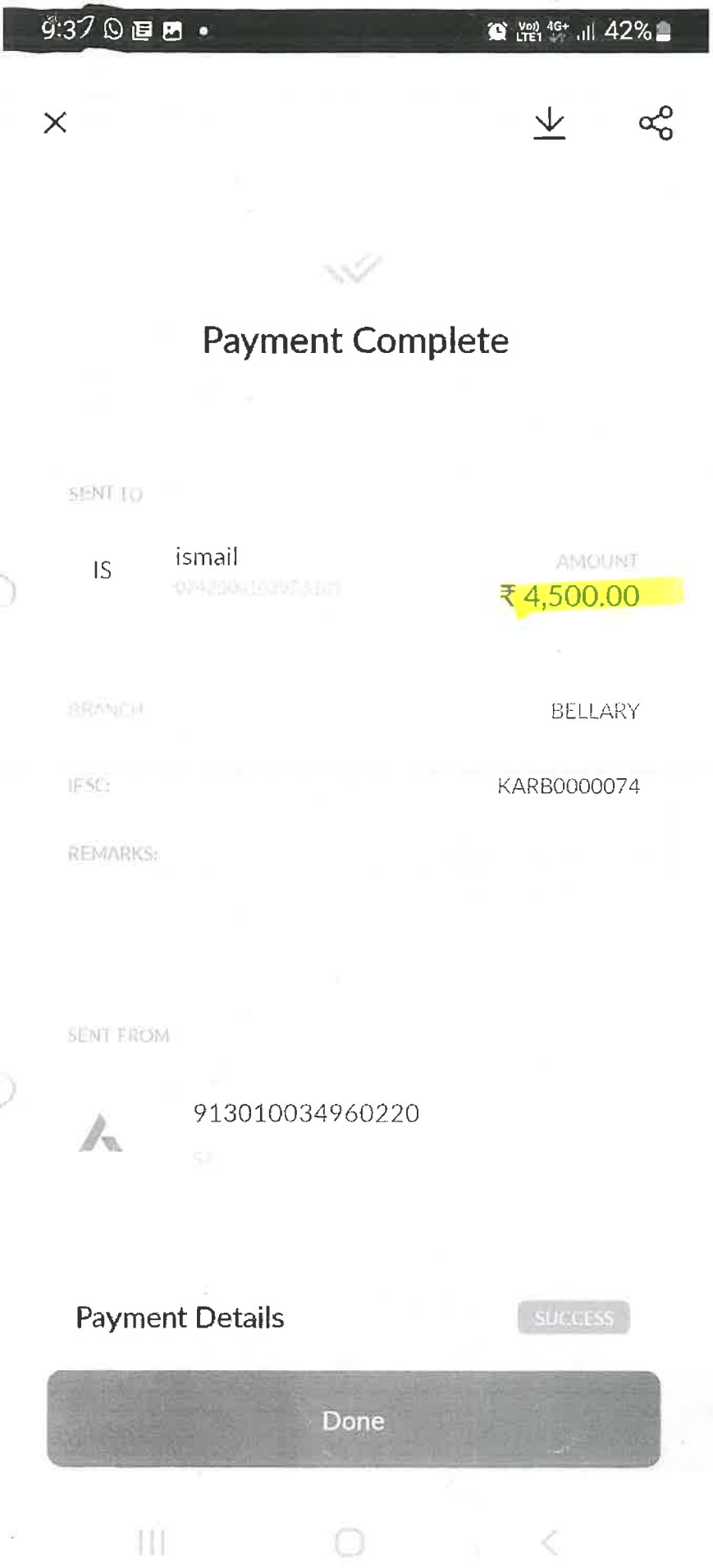
With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges,please visit www.axisbank.com

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Bank's deposits, such as savings, current, fixed, recurring etc.* up to maximum amount of Rs 5 Lakh including principal &interest both* (*for exceptions and details please refer http://www.dicgc.org.in/)

REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad 380006.This is a system generated output and requires no signature.

Legends :

ICONN - Transaction trough Internet Banking
VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM


9:37
42%
Payment Complete
SENT TO
IS
ismail
AMOUNT
₹ 4,500.00
BRANCH
BELLARY
IFSC:
KARB0000074
REMARKS:
SENT FROM
913010034960220
Payment Details
SUCCESS
Done

Payment Complete

SENT TO

RA Ramachandran

AMOUNT

₹ 3,000.00

BRANCH: KATTUR

IFSC IOBA0000107

REMARKS:

SENT FROM

913010034960220

Payment Details

SUCCESS

Done

8-S (33)

AXIS BANK

TAMILSELVAN N (AIPI MEM)
Joint Holder :- -
EXCEL ENGG COLLEGE SALEM MN RD NH-47
PALLAKKAPALLAYAM KOMARAPALAYADA
NAMAKKAL
TAMILNADU-INDIA
638183

Customer No :837194766
Scheme :PRIME SALARY ACCOUNT
Currency :INR

Statement of Axis Account No :910010049818557 for the period (From : 15-08-2022 To : 24-08-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			34426.09	
15-08-2022		UPI/P2M/222777274630/Chatraram/Paytm Pay/Slepers	1050.00		33376.09	170
15-08-2022		UPI/P2A/222702746326/P. AUGUS/State Ban/Belt	550.00		32826.09	170
15-08-2022		UPI/P2M/222758145141/ANTHONYSA/Paytm Pay/Lunch b	400.00		32426.09	170
15-08-2022		UPI/P2M/222751581356/ANTHONYSA/Paytm Pay/Travel	700.00		31726.09	170
15-08-2022		UPI/P2M/222765717899/RAVINDRAN/Paytm Pay/Juice	210.00		31516.09	170
15-08-2022		UPI/P2M/222711182797/V ANAND/Paytm Pay/Lunch	146.00		31370.09	170
15-08-2022		ATM-CASH/RN PUDUR NEW/Rn Pudur New/150822	1000.00		30370.09	170
15-08-2022		UPI/P2A/222725204732/SINIVASAN/State Ban/Tea	33.00		30337.09	170
16-08-2022		UPI/P2M/222802528352/PhonePe/Axis Bank/Payment	481.00		29856.09	170
16-08-2022		ATM-CASH-AXIS/LWCW17024/5519/160822/NAMAKKAL	3800.00		26056.09	170
16-08-2022		SRI RENGASWAMY /Excel Tnscst payemnt		7500.00	33556.09	170
17-08-2022		UPI/P2A/222970444128/Sathyadev/State Ban/UPI	8000.00		25556.09	170
17-08-2022		UPI/P2A/222955584308/SELVARAJU/Tamilnad /Soup	80.00		25476.09	170
17-08-2022		UPI/P2A/222984763482/SEKH SAJ/State Ban/Briyani	180.00		25296.09	170
18-08-2022		ATM-CASH/KON THEATRE/Kumarapalayam/180822	1000.00		24296.09	170
21-08-2022		POS/K C P AGENCIES/ERODE/210822/08:24	450.00		23846.09	170
21-08-2022		ATM-CASH-AXIS/TWCW14493/8555/210822/ERODE	1000.00		22846.09	170
21-08-2022		ATM-CASH-AXIS/TWCW14493/8557/210822/ERODE	500.00		22346.09	170
21-08-2022		UPI/P2M/223325862140/SAKTHE KR/Paytm Pay/Wife sa	1300.00		21046.09	170
21-08-2022		ATM-CASH/RN PUDUR NEW/Rn Pudur New/210822	500.00		20546.09	170
21-08-2022		ATM-CASH/R N PUDUR ERODE/Erode/210822	500.00		20046.09	170
22-08-2022		NEFT/MB/AXMB222345036804/JAGAN R/BANK OF/	1.00		20045.09	170
22-08-2022		NEFT/MB/AXMB222345116070/JAGAN R/BANK OF/	1875.00		18170.09	170
22-08-2022		NEFT/MB/AXMB222345119834/GOWTHAM /INDIAN /	1875.00		16295.09	170
22-08-2022		NEFT/MB/AXMB222345119285/GOVINDAR/INDIAN /	1875.00		14420.09	170
23-08-2022		PTLSCG/21.08.22/K C P AGENCIES	2.12		14417.97	100
23-08-2022		NEFT/MB/AXMB222355656866/DINESH K/UNION B/	1875.00		12542.97	170

	TRANSACTION TOTAL	**29383.12**	**7500.00**		
	CLOSING BALANCE			**12542.97**	

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REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

Legends :

ICONN - Transaction trough Internet Banking

VMT-ICON - Visa Money Transfer through Internet Banking

AUTOSWEEP - Transfer to linked fixed deposit

REV SWEEP - Interest on Linked fixed Deposit

SWEEP TRF - Transfer from Linked Fixed Deposit / Account

VMT - Visa Money Transfer through ATM

CWDR - Cash Withdrawal through ATM

PUR - POS purchase

TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips

RATE.DIFF - Difference in rates on usage of card internationally

CLG - Cheque Clearing Transaction

EDC - Credit transaction through EDC Machine

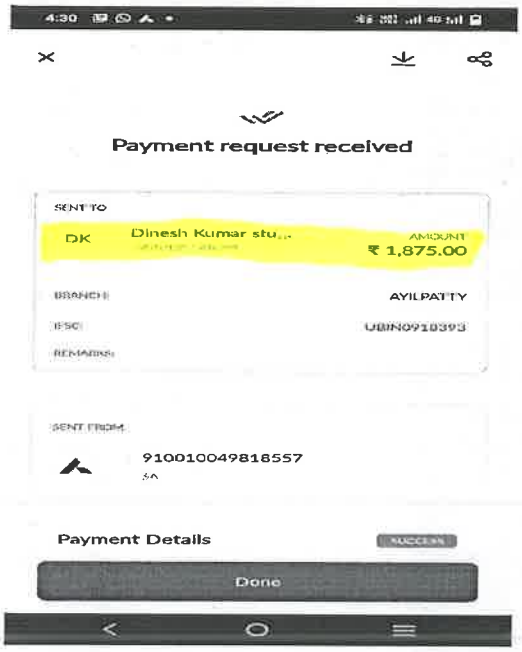
SETU - Seamless electronic fund transfer through AXIS Bank

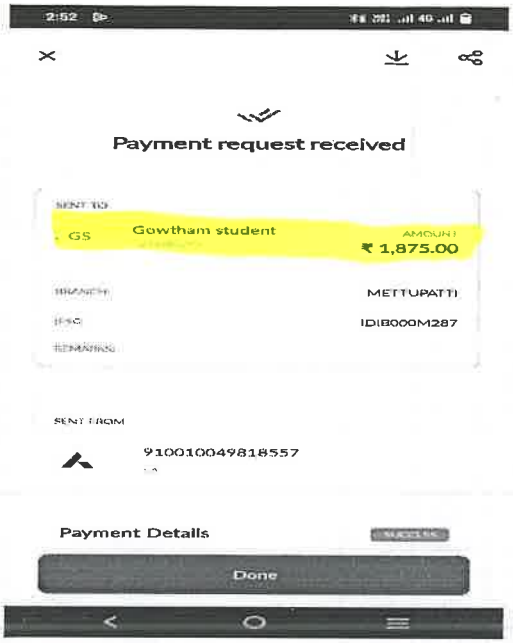
Int.pd - Interest paid to customer

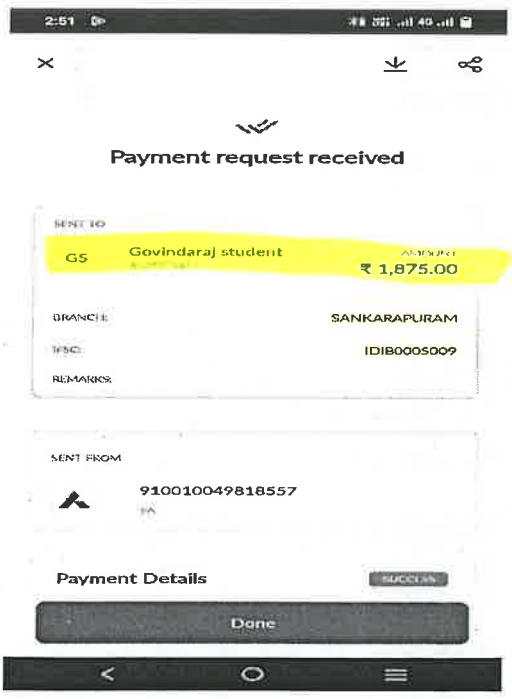
Int.Coll - Interest collected from the customer

++++ End of Statement ++++

Request From: 10.9.71.13


4:30
Payment request received
SENT TO
DK
Dinesh Kumar stu...
AMOUNT
₹ 1,875.00
BRANCH
AYILPATTY
IFSC
UBIN0910393
REMARKS
SENT FROM
910010049818557
Payment Details
SUCCESS
Done


2:52
Payment request received
SENT TO
GS
Gowtham student
AMOUNT
₹ 1,875.00
BRANCH
METTUPATTI
IFSC
IDIB000M287
REMARKS
SENT FROM
910010049818557
Payment Details
SUCCESS
Done


2:51
Payment request received
SENT TO
GS
Govindaraj student
AMOUNT
₹ 1,875.00
BRANCH
SANKARAPURAM
IFSC
IDIB0005009
REMARKS
SENT FROM
910010049818557
Payment Details
SUCCESS
Done


2:49
Payment request received
SENT TO
JR
jagan student
AMOUNT
₹ 1,875.00
BRANCH
BRANCH
IFSC
BARBOPALLIP
REMARKS
SENT FROM
910010049818557
Payment Details
SUCCESS
Done

34 A

bob World

बैंक ऑफ़ बड़ौदा
Bank of Baroda

Account statement from 07-12-2021 to 22-08-2022

Transaction Details

Date	Description	Amount	Type
22-08-2022	NEFT-AXMB222345116070-TAMILSELVAN N	1,875.00	Credit
22-08-2022	NEFT-AXMB222345036804-TAMILSELVAN N	1.00	Credit

इंडियन बैंक Indian Bank
इलाहाबाद ALLAHABAD

STATEMENT OF ACCOUNT from 22/08/2022 to 22/08/2022 for Account Number 6329975483.

INDIAN BANK
SANKARAPURAM
IFSC CODE:IDIB000S009
Usman Building Kallakurichi Main Road , Sankarapuram Villupuram Dist. , Tamil Nadu
Branch Code :00158
Account Number : 6329975483
Product type : SB NONCHQ-GEN-PUB-SU/RURAL-INR

GOVINDARAJ S
S/O/SADAIYAN NO/91 PERUMAL KOIL ST
MOOTTAMPATTI SPM TK VPM DT - 606401
Nominee Name :No
Email :
Statement Date :Mon Aug 22 20:11:42 IST 2022
Cleared Balance :1879.17
Uncleared Amount :0.00
Drawing Power :0.00
Interest Rate : 2.750

Value Date	Post Date	Remitter Branch	Description	Cheque No	DR	CR	Balance
			BALANCE B/F				4.17CR
22/08/2022	22/08/2022	MUMBAI FORT	BY TRANSFER NEFT/UTIB TAMILSELVAN N /AXMB22234511 9285 TRANSFER FROM 97161000121			1875.00	1879.17CR

* Statement Downloaded By GOVINDARAJ S on Mon Aug 22 20:11:42 IST 2022

Unless a constituent notifies the Bank immediately of any discrepancy found by him/her in this statement of a/c, it will be taken that he has found the a/c correct.

END OF STATEMENT - from Internet Banking.

35A

इंडियन बैंक Indian Bank
इलाहाबाद ALLAHABAD

STATEMENT OF ACCOUNT

Customer Name	: Gowtham Sakthivel	CIF	: 30470705535
Address	: D NO 5-143,Mettupatti Salem,Tamil Nadu,636111	Account Type	: SB
State	: TAMILNADU	Account Status	: Active
PIN	: 636106	Account Number	: 7234883295
Mobile No	: 916379151798	Currency	: INR
Email ID	: Not Available	Home Branch	: METTUPATTI
Branch Code	: 02543	Branch IFSC	: IDIB000M287

Statement Period : From 22/08/2022 To 22/08/2022 Statement Date : 23/08/22 23:21:14

TRANSACTION DATE	PARTICULARS	WITHDRAWALS	DEPOSIT	BALANCE
22/08/2022	TAMILSELVAN N /AXMB222345119834 NEFT/UTIB	-	1875.00	2613.00 CR

Available Balance: 2613.00(Two Thousand Six Hundred Thirteen Rupees Only)

Statement Legends:
NEFT: National Electronic Fund Transfer, UPI: Unified Payment Interface, RTGS: Real Time Gross Settlement, INT: Intra Fund Transfer, BBPS: Bharat Bill Payment Service

This statement is system-generated and does not require a signature. Customers are requested to notify immediately in case of discrepancies.
Registered Office: Indian Bank, Corporate office, PB No: 5555, 254-260, Avvai Shanmugam Salai,Royapettah, Chennai- 600 014.
Email : ebanking@indianbank.co.in , Website: https://indianbank.in

9-S (36)

Dr. S. Jayapoovarti
Prof/ECE.

Send Money

Payees | Self | Send Money Abroad | Upcoming | History

+ Add Payee

RECENT

1 BU Buvaneswari ₹ 1,875.00

2 PA parkavi ₹ 1,875.00

3 NI nikitha ₹ 3,750.00

FAVOURITES

VK Hindi tution miss

KS Karthi ag

Name

36 A

Gmail

sowmya s <sowmyasv97@gmail.com>

Photo from JOTHIGA

1 message

jothigam <jothigam18@gmail.com>
To: sowmyasv97@gmail.com

Tue, Aug 23, 2022 at 2:47 PM

IMG-20220823-WA0000.jpg
40K

Transaction Successful

12:22 PM on 21 Aug 2022

Paid to

Kowsi Pekku ₹1,875

9080855615

4)

Banking Name : Mr. Gowher Jan J

Transfer Details

Transaction ID

T22082112223196612558 85

Debited from

******3274 ₹1,875

UTR: 223391438032

Detailed Statement

(Dr. S. Jayapoorani
Prof/ECE.

Account Number: 919010053455457
Duration: Last Month
Transaction Type: Debit/Credit

Advanced Search

Date	Description	Amount
AUG 21 2022	NEFT/MB/ AXMB222334864874/ NIKITHA/STATE B/	₹ 3,750.00
AUG 17 2022	UPI/P2A/222971156943/ ANANDAKUM/Punjab Na/ UPI	₹ 65.00
AUG 16 2022	NEFT/MB/ AXMB222283297573/ senthil /HDFC BA/	₹ 1,200.00
AUG 16 2022	SRI RENGASWAMY /Excel Tnscst payemnt	₹ 7,500.00

Previous Next

Gmail

sowmya s <sowmyasv97@gmail.com>

Photo from JOTHIGA

1 message

jothiga m <jothigam18@gmail.com>
To: sowmyasv97@gmail.com

Tue, Aug 23, 2022 at 2:47 PM

IMG-20220823-WA0000.jpg
40K

Payment request received

SENT TO

PA

parkavi
6237440031

AMOUNT
₹ 3,750.00

BRANCH: VELAGOUNANPATTI

IFSC: IDIB000V014

REMARKS:

SENT FROM

919010053455457
SA

Done

Gmail

Dr Sasikala S <sasiinfotech45@gmail.com>

Notification from Axis Bank

1 message

Axis Bank Alerts <alerts@axisbank.com> Tue, Aug 16, 2022 at 6:40 PM
To: sasiinfotech45@gmail.com

INR 7500.00 credited to A/c no. XX4434 on 16-08-22 at 18:38:15 IST. Info- SRI RENGASWAMY /Excel Tnscst payemnt. Avl Bal- INR 7507.62 - Axis Bank

If you haven't done this transaction please click here OR Call us at 1860-419-5555, 1860-500-5555 and Press 0 to report.

- Transfer funds and pay online in a simple step using UPI. All this with exciting offers. Download Axis Pay today. Click here

- Have queries? Want to do fund transfers or bill payments? Now do all this with a simple chat. Use Axis Aha! today on Axis Mobile or axisbank.com.

- Get all your banking needs resolved through one app. Download Axis Mobile today from the App Store/Play Store or give a missed call on 9243308900 to get the Axis Mobile download link.

- NRI Customers/Travel currency card customers may call on 24x7 Toll Free numbers click here to know the number basis your country

Please do not reply to this mail as this is an automated mail service.

41

K

To KEERTHANJALI VIJAYKUMAR

₹1,875

Completed • August 22, 2022 at 11:39 AM

Axis Bank XXXX764434

UPI transaction ID
223478571143

To
•••• 2010

From: SASIKALA SENGODAN (Axis Bank)
sasiinfotech45@okaxis

Google transaction ID
CICAgJDEgr6zNg

POWERED BY UPI

G Pay

A

To AJITHKUMAR

₹1,875

TNSCST

Completed • August 22, 2022 at 12:07 PM

Axis Bank XXXX764434

UPI transaction ID
223479160295

To
•••• 4886

From: SASIKALA SENGODAN (Axis Bank)
sasiinfotech45@okaxis

Google transaction ID
CICAgJDEwoPVcw

POWERED BY UPI

G Pay

A

To ANJALI R

₹1,875

TNSCST

Completed • August 22, 2022 at 12:11 PM

Axis Bank XXXX764434

UPI transaction ID
223479170175

To
•••• 4886

From: SASIKALA SENGODAN (Axis Bank)
sasiinfotech45@okaxis

Google transaction ID
CICAgJDEwoPCcw

POWERED BY UPI

G Pay

A

To ABDULRAGUMAN A

₹1,875

TNSCST

Completed • August 22, 2022 at 12:27 PM

Axis Bank XXXX764434

UPI transaction ID
223479163232

To
•••• 4886

From: SASIKALA SENGODAN (Axis Bank)
sasiInfotech45@okaxis

Google transaction ID
CICAgJDEwgPDcw

POWERED BY UPI

G Pay

EXCEL ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE,New Delhi and Affiliated to Anna University Chennai

Accredited by NBA and NAAC With" A+"

KOMARAPALAYAM-637303

Research and Development [Incentive consolidation -2021-22]

S. No.	Name of the Faculty	Dept	Name of the Scheme	Title of the proposal	Fund Received	Remaining Eligibility	Status
1	Dr.S.Balakrishnan	MECH	Journal Publication	Development of a new improved structural integrity assessment correlation for throughwall axially cracked 90◦ shape imperfect pipe bends under in-plane opening bending moment	5000	5000	
2	Dr.A.Vasantharaj	ECE	Patent Publication	Novel Architecture For Design And Evaluation Of Asynchronous System On Chip For Vlsi Technology	2500	7500	Completed
	Dr.A.Vasantharaj	ECE	Journal Publication	Automated Brain Imaging Diagnosis and Classification Model using Rat Swarm Optimization with Deep Learning based Capsule Network	5000	2500	
	Dr.A.Vasantharaj	ECE	Journal Publication	IOT Smart sensing device for sensitive Nanoclusters Modification in sensing properties	2500	NIL	
3	Dr.S.Sreethar	CSE	Journal Publication	SARC: Search and rescue optimization-based coding scheme for channel fault tolerance in wireless networks	5000	5000	Completed
	Dr.S.Sreethar	CSE	Journal Publication	A Group Teaching Optimization Algorithm for Priority Based Resource Allocation in Wireless Networks	5000	NIL	
4	Dr. N.Nandhagopal	ECE	Journal Publication	RE-PUPIL: resource efficient pupil detection system using the technique of average black pixel density	3500	6500	Remaining 3000/-
	Dr. N.Nandhagopal	ECE	Journal Publication	Trust Management-Based Service Recovery and Attack Prevention in MANET	3500	3000	
5	Mr.V.Karthikeyan	MECH	Journal Publication	Design and Performance Analysis of Air Pre heater for Water Tube Boiler to improve its Efficiency	5000	5000	
6	Ms.R.Preethi	ECE	4 week induction Programme	College:Ramanujam College(NIRF Ranking:53)	1950	8050	
7	Sankarananth	EEE	Book Chapter indexed in scopus	Challenges and Opportunities of big data integration in Patient centric Health care analytics using Mobile Networks	1500	8500	Rejected due to long leave
8	Dr.Arulmurugan	EEE	Patent Publication	Sustainable Tree Based Smart Power Generation System	5000	5000	Completed
	Dr.Arulmurugan	EEE	Patent Publication	Smart Health Monitoring System Enabled Smar Grid Using Machine Learning Al	5000	NIL	
9	V.Arun Antony	ECE	Patent Publication	New Digital software Technology to Indentify the Variety of Dangerous	5000	5000	

10	V.Ramya	CSE	Patent Publication	Analysis and Monitoring of Network Traffic using Deep Learning	5000	5000	
11	Ms.R.Preethi	ECE	Patent Publication	An Image Processing Based Technique to help HR Predict the Pulse of Working Environment	5000	3050	
	Ms.R.Preethi	ECE	Journal Publication	Improve Safety and Bloavialability of Meicinesin Pharmaceuticals	3500	Rejected Due to Irrelevant of Specialization	
12	Dr.R.Vinoth	MECH	Journal Publication	Study on the Heat Transfer characteristic of Al2O3-CUO/Water hybrid Nanofluids in a shell and rotating wavy tube heat exchanges	2500	7500	Remaining 4000/-
	Dr.R.Vinoth	MECH	Journal Publication	Environment impact on the use of diesel waste plastic oil nano additive blends in a DI Diesel Engine	3500	4000	
13	Mrs.A.Anitha Rani	ECE	Patent Publication	Precision Analysis of Digital Agriculture	5000	5000	
14	Dr.N.Venkatachallam	Mech	Journal Publication	Application of Analytical Hierarchy Process(AHP) for assessment of collection and Transportation of solid Waste :An Empirical Study	1500	8500	
15	Dr.S.Anbukaruppusamy	ECE	Journal Publication	Forest Fire Prediction using IOT and Deep Learning	1000	9000	Remaining 5500/-
	Dr.S.Anbukaruppusamy	ECE	Journal Publication	Greedy Weight Matrix Topological Adaptive Ad -Hoc On demand Multipath Distance Vector Protocol for Qos Improvement in Manet	3500	5500	
16	Dr.M.P Murugesan	FT	Journal Publication	Toxic Metal Recovery from waste Printed Circuit Boards :A Review of Advanced Approaches for sustinable Treatment Methodology	5000	5000	Completed
	Dr.M.P Murugesan	FT	Journal Publication	A comparitive Review on recovery of heavy metals from printed circuit boards (PCB'S)by chemical and bio leaching	5000	NIL	
17	Mrs .M.Ramya	ECE	Patent Publication	Machine Learning based Approach to identify the postive traits of a Successful Entrepreneur	5000	5000	
18	V.Arun Antony	ECE	Patent Publication	New Technology To Prevent CPU Overheating	2500	2500	
19	Dr.K.Tamilarasi	ECE	Patent Publication	Performance And Accuracy Analysis Of Signature Verification Using Integer Wavelet Transform And Back Propagation Neural Network	5000	5000	
20	Mr.M.Sambath Kumar	Mech	Patent Publication	Machine Learning and IOT based Approach Monitoring and Prediction of Air Quality Pollution	2500	7500	
21	Dr.N .Tamilselvan	Mech	Journal Publication	Heat Transfer Enhancement In Spiral Type Heat Exchanger Using Non- Newtonian Nanofluids	2500	7500	
22	Dr.K. Geetha	CSE	Journal Publication	An Optimized Data Replication Algorithm in Mobile Edge Computing Systems to Reduce Latency in Internet of Things	1500	8500	

109950(Excluding Rejected amount)

25/7

[R+D coordinator]

EXCEL ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with 'A+' Grade (3.20) and Recognised by UGC (2f & 12B)
Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

(31)

Date : 16.07.2022

FACULTY INCENTIVE FORM

Staff Name	Dr. N. NATARAJAN			
Designation / Department	Professor & Head / Mech. Engg.			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500) ✓	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
		doi.org/10.1016/j.matpr.2022.05.214		
Approved amount in Rs.	1,500/-			

16/7/22
Investigator / Coordinator

16.07.22
Dept. IRRP Coordinator

16/7/22
HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

16/7/2022
R&D Coordinator

Added in Google Scholar

18/7/22
Director - IRRP

Director (Admin.) / Principal

IRRP Chief-Coordinator

Executive Director
04/08/22

Amount Received already - NIL (2021-22)

ScienceDirect

Materials Today: Proceedings
Available online 23 May 2022
In Press, Corrected Proof ⓘ

Experimental analysis on evaporative emission from ceramic coated fuel tank

B. Saravanan [a] ✉, N. Natarajan [b], S. Deepankumar [a], S. Dhayaneethi [a], S.M. Praveen [c], S. Neha [a]

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Outline | Share | Cite

https://doi.org/10.1016/j.matpr.2022.05.214

Abstract

Variations in the ambient temperature cause a type of emission called Diurnal emissions. When the fuel in a vehicle fuel tank vaporizes, they give rise to these emissions. To control the fuel evaporation at the most possible level, this research work deals with the coating of the fuel tank at its exterior with low heat-conducting ceramic materials which in turn lead to controlled evaporation due to external heat sources. Modeling of the coated fuel tank is done using modeling software, SOLIDWORKS, and the model is subjected to thermal analysis so as to choose a better material for the ceramic coating. Hence, the research work aims in determining the effects of ceramic coating over the fuel tank and compare the emission test results such as permeability test and break out fuel test with conventional fuel tank.

Keywords

Evaporative emission; Ceramic coating; Transient thermal analysis; Fuel evaporation

Scopus Preview

Source details

Feedback > Compare sources >

Materials Today: Proceedings

Scopus coverage years: 2005, from 2014 to Present

Publisher: Elsevier

E-ISSN: 2214-7853

Subject area: Materials Science: General Materials Science

Source type: Conference Proceeding

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CiteScore 2021 counts the citations received in 2018-2021 to articles, reviews, conference papers, book chapters and data papers published in 2018-2021, and divides this by the number of publications published in 2018-2021. Learn more >

CiteScore 2021

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Calculated on 05 May, 2022

CiteScoreTracker 2022

$$2.4 = \frac{50{,}208 \text{ Citations to date}}{20{,}804 \text{ Documents to date}}$$

Last updated on 05 July, 2022 • Updated monthly

CiteScore rank 2021

Category	Rank	Percentile
Materials Science General Materials Science	#280/455	38th

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09/19/2022

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Last 10 Transaction Details

(845639252)

Account Number 912010043732367

Transactions List

Date	Description	Transactional Amount
09 Sep 2022	ATM-CASH-AXIS/TWAW1450/809/090922/SAKTHI	- Rs.1000.00
09 Sep 2022	ATM-CASH-AXIS/TWAW1450/808/090922/SAKTHI	- Rs.2000.00
09 Sep 2022	POS/BHAVANI KOMARAPAL/ERODE/090922/08:50	- Rs.300.00
07 Sep 2022	ATM-CASH-AXIS/SWCW17009/6782/070922/NAMA	- Rs.500.00
07 Sep 2022	ATM-CASH-AXIS/SWCW17009/6781/070922/NAMA	- Rs.3000.00
07 Sep 2022	INB/NEFT/AXIR222502134663/N NATARA/STATE	- Rs.37000.00
07 Sep 2022	Dr Card Charges ANNUAL 5346XXXXXXXX1580	- Rs.354.00
06 Sep 2022	INB/905937640/ELECTRICITY BOARD OF TAMIL	- Rs.627.90
05 Sep 2022	SRI RENGASWAMY /Excel Salary Aug 22	+ Rs.75862.00
05 Sep 2022	SRI RENGASWAMY /EXCEL PAYMENT	+ Rs.1500.00

This is a computer generated statement and is not required to be signed by any official of the bank

S.No: 38 13-S (50)

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Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 16-07-2022

FACULTY INCENTIVE FORM

Staff Name	Dr. N.NATARAJAN			
Designation / Department	Professor & Head / Mech. Engg			
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		doi.org/10.1016/j.matpr.2022.04.012		
Approved amount in Rs.	1,000/-			

N.Natarajan 16/7/22 — **Investigator / Coordinator**

[signature] 16.07.22 — **Dept. IRRP Coordinator**

N.Natarajan 16/7/22 — **HOD**

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator **IRRP Chief-Coordinator**

Added in Google scholar

(37) & (38) same Journal

[initials] 16/7/22

38 - Rejected

Director - IRRP **Director (Admin.) / Principal** **Executive Director**

Materials Today: Proceedings xxx (xxxx) xxx

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Exploration of mechanical properties of jute fiber and copper wire reinforced hybrid polymer composites

V. Vadivel Vivek [a,*], C. Boopathi [a], N. Natarajan [b], E L.Pradeesh [a], MC. Pravin [a]

[a] Bannari Amman Institute of Technology, Sathyamangalam, Erode-638401, Tamil Nadu, India
[b] Excel Engineering college, Namakkal-637303, Tamil Nadu, India

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Structural applications
Natural fiber
Composites
Polymer matrix
Jute fiber
Mechanical properties

ABSTRACT

Fibers like coir, jute, sisal and hemp are used for thousands of years, but fiber-resin composites have only recently been investigated. The superior sustainability properties of these materials when compared to traditional building materials are a major motivator for such applications. Nonetheless, there has been a huge in interest in composite materials reinforced with natural fibers in recent years. Natural fibers are a better alternative to glass or carbon fiber reinforced composites due to their ease of fabrication and low cost of raw materials, as well as the possibility of recycling, decomposability, and safe production and processing. Natural composites usage as construction materials is limited, however, due to their poorer mechanical qualities. While there is a lot of information available about natural fiber composites materials, few studies have looked into their structural applications. The main aim of this work to study the mechanical performance of jute fiber and copper wire reinforced composites in polyester matrix. The mechanical characteristics of composite specimens were investigated using a hand layup approach and various tests such as compression, impact, flexural, and tensile. According to the findings, jute fiber with 5% copper wire reinforced polyester composites produce 15.38 % high compression strength, 66.67 % better flexural strength and 34.50 % higher tensile strength than pure jute fiber composites. The impact test values of jute with copper is 0.7 J where as that of jute without copper is 0.4 J.

1. Introduction

A composite is a material with superior properties obtained by combining two or more dissimilar materials. Fiber-reinforced composites are widely used in a variety of fields due to their superior properties, including defence, aerospace, engineering applications, sports goods, and so on.

The characteristics of composites in polymer matrix were investigated by Asheesh Kumar et al [1]. Composites with natural fiber reinforcement are gaining importance than synthetic fiber reinforcements due to their environmental friendliness, biodegradability, and sustainability. Milanese et al [2] examined the mechanical performance and the tensile behaviour of four composites in their work. The influence of moisture content on sisal fiber physico-mechanical characteristics was examined. They discovered that the tensile strength at yield of castor oil-based polyurethane is 2.5 MPa, with a corresponding elongation of 29 % indicating ductile behaviour. Mulinari et al [3] looked into the mechanical properties of polyester composites reinforced with coconut fibers. Chemical treatment of coconut fibers modified the surface of the fiber and they are used in polyester matrix. A 1 percent wt/v sodium hydroxide solution was applied to coconut fibers for 1 h. The properties of hybrid glass fiber-sisal/jute reinforced epoxy composites were examined by M. Ramesh et al [4]. In a range of engineering and technology disciplines, natural fibers such as sisal/jute are increasingly being employed in glass fiber composites. Rana et al. [5] demonstrated that using a compatibilizer improves the mechanical properties of jute fibers. At 60 percent by weight of fiber load, the compatibilizer increased flexural strength to 100 percent, tensile strength to 120 percent, and impact strength to 175 percent. The mechanical characteristics of jute-reinforced fibers and glass-reinforced fibers are compared by Shah and Lakkad et al [6]. The findings reveal that adding jute fibers as reinforcement to the resin matrix improves mechanical characteristics significantly. Vivek Mishra et al examined the Physico-Mechanical of Bi-directional jute Polymer Composites [7]. There has been an increase in interest in employing particle fibers as polymer reinforcement in recent years. M.S. Sreekala Sabu Thomas et al [8] evaluated the properties of oil palm fibers

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2214-7853/

ScienceDirect

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Available online 13 April 2022
In Press, Corrected Proof

Exploration of mechanical properties of jute fiber and copper wire reinforced hybrid polymer composites

V. Vadivel Vivek [a], C. Boopathi [a], N. Natarajan [b], E L.Pradeesh [a], MC. Pravin [a]

Show more

Outline | Share | Cite

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Abstract

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Keywords

Structural applications; Natural fiber; Composites; Polymer matrix; Jute fiber; Mechanical properties

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Industrial Relation and Research Projects

Details of Smart India Hackathon 2022 (SIH 2022)

S.No	Department	Name of the Guide	Domain Name	Team Name	Title of the Project	Name of Students (Max 6 Per team)	PS Code
1.	Civil	Mr.S.Sasikumar	Environmental Engineering	TEAM INSANE	Most Economical Water Storage And Management for remote (Rural) Area	1. Rubel Das 2.Rupesh Kumar Prakash 3.Manjita Yadav 4. Vishwas Kumar Singh 5. Raghav Kumar Singh 6. Trishna Thatal	AU1057
2.	CSE	P.Jayaprabha	Agriculture Food take and Rule Development	1PHOENIX	A web portal to manage and strengthen dairy sector	1. Sachin 2. Nandhakumar 3. Yugapraveenj 4.Suhail Ahamed 5.M.Tamilarasi 6.T.Mohanapriya	DV1082
3.	CSE	A.SureshKumar	Fitness & Sports	CS Coders	Tracking the Impact of PM POSHAN on a child nutrition states and physical health and Wellbeing	1. Samuel 2. Srimathy 3. Thamariselven 4.Praveen 5.Sugunthar 6.Gurusamy	RK779
4.	ECE	Dr.N.Nandhagopal	Heritage and Culture	Future of change	Hologram with Speech Synthesis	1.Sura Vishnuvardhan Reddy 2. S.Amutha 3. G. Pradeep 4.P. Kalayan varma 5.C.Sivakumar	GM747

1. Scrutiny
2. Prize amount

5.	ECE	Dr.K. Tamilarasi	Blockchain and Cyber Security	Creative developers	Network Traffic Analyzer	1.Pallav Karn, 2.Sahil Kumar 3.Devika,Ashish Kumar 4.S.Thamaraikannan 5.R. Devika 6.M.Manikanta	DR706
6.	AI&DS	Dr.R.Geetha	Smart Education	E.D.I.T.H	How to use Aadhaar number of students to identify fake enrolment, Duplication and authentication of students	1.Gopalakrishnan D 2.Krishna Kumar 3.Sobika M 4.Sakthi Dinesa S 5.MD Kalam 6.Aditya Kumar	OS 870
7.	IT	MS. S. Mouna	Transport and logistics	Innovative thinkers	A System of IOT devices to measure to load weigh in dumper	1.A.MADHUMITHA 2.A.MENAGA 3.S.KIRANKUMAR 4.N.GOPIKRISHNA 5.V.MANOJ 6.K.KRISHNA	NC741
8.	IT	MS.E.Annal Sheeba Rani	Smart Education	Dreamerss	Student Innovation	1.SUMITJAISWAL 2.SHWETHA KUMARI 3.KUMARSHIVAM 4. MD MAZID ALI 5.RANJAN KUMAR YADHAV	SM972
9.	Mech	Mr.Nandha Kumar	Robotics and Drones-Student Innovation	MECH SQUAD	Human Defense Drones (HDD) for landslide and Earthquake Rescue	1.JijithPrashanth S 2.Elbin George 3.Mahesh Kumar S 4.Anish Kumar R 5.Gowtham S 6.Vijisri A	SM963

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Research and Development

TNSCST Student Project Actual Expenditure and Amount Request Details

Academic Year:2021-22 **Batch:2018-2022**

S.No	Project Title	Name of the Guide	Actual Expenditure	Total Amount Sanctioned	Amount Requesting
1	GPS and Sensor Using wildlife animal tracking System	Mr.N.Sreenivasaraja/AP/Aero	9000	7500	7500
2	Tracking of light aircraft at low altitude using smartphone	Mr.M.Sanjay/AP/Aero	24340	7500	7500
3	PLC-SCADA Based automated boiler Controller	Dr.S.Jayapoorani/Prof/ECE	21000	7500	7500
4	Covid Patients and Vaccine side effects real time pateint analysis Monitorring System using Wearable Devices	Mr.M.Ramesh/AP/ECE	7590	7500	7500
5	Intelligent Emission Controlleg	Dr.N.Venkatachallam,ASP/MECH	12170	7500	7500
6	Design and Fabrication of Gearless Transmiission System for Automobiles and Industrial Machines	Dr.S.Balakrishnan/AP/MECH	8047	7500	7500
7	Drone Based Smat Agriculture and animal Monitoring System	Dr.S.Sasikala/AP/CSE		7500	7500
		Total	**82147**	**52500**	**52500**

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Research and Development

10000

S. No.	Name of the Faculty	Dept	Name of the Scheme	Journal Name/SCI/SCOPUS/ WOS	Title of the proposal	Fund Received	Remaining Eligibility
1	Dr.S.Balakrishnan	MECH	Journal Publication		Development of a new improved structural integrity assessment correlation for throughwall axially cracked 90◦ shape imperfect pipe bends under in-plane opening bending moment	5000	5000
2	Dr.A.Vasantharaj	ECE	Patent Publication		Novel Architecture For Design And Evaluation Of Asynchronous System On Chip For Vlsi Technology	2500	7500
3	Dr.A.Vasantharaj	ECE	Journal Publication		Automated Brain Imaging Diagnosis and Classification Model using Rat Swarm Optimization with Deep Learning based Capsule Network	5000	2500
4	Dr.S.Sreethar	CSE	Journal Publication		SARC: Search and rescue optimization-based coding scheme for channel fault tolerance in wireless networks	5000	5000
5	Dr. N.Nandhagopal	ECE	Journal Publication		RE-PUPIL: resource efficient pupil detection system using the technique of average black pixel density	3500	6500
6	Dr. N.Nandhagopal	ECE	Journal Publication		Trust Management-Based Service Recovery and Attack Prevention in MANET	3500	3000
7	Mr.V.Karthikeyan	MECH	Journal Publication		Design and Performance Analysis of Air Pre heater for Water Tube Boiler to improve its Efficiency	5000	5000
8	Dr.A.Vasantharaj	ECE	Journal Publication		IOT Smart sensing device for sensitive Nanoclusters Modification in sensing properties	2500	NIL
9	Ms.R.Preethi	ECE	4 week induction Programme		College:	1950	8050

10	Dr.S.Sreethar	CSE	Journal Publication		A Group Teaching Optimization Algorithm for Priority Based Resource Allocation in Wireless Networks	5000	NIL
11	Sankarananth	EEE	Book Chapter indexed in scopus		Challenges and Opportunities of big data integration in Patient centric Health care analytics using Mobile Networks	1500	8500
12	Dr.Arulmurugan	EEE	Patent Publication		Sustainable Tree Based Smart Power Generation System	5000	5000
13	V.Arun Antony	ECE	Patent Publication		New Digital software Technology to Indentify the Variety of Dangerous	5000	5000
14	V.Ramya	CSE	Patent Publication		Analysis and Monitoring of Network Traffic using Deep Learning	5000	5000
15	Ms.R.Preethi	ECE	Patent Publication		An Image Processing Based Technique to help HR Predict the Pulse of Working Environment	5000	3050
16	Dr.R.Vinoth	MECH	Journal Publication	Scopus	Study on the Heat Transfer characteristic of Al2O3-CUO/Water hybrid Nanofluids in a shell and rotating wavy tube heat exchanges	2500	7500
17	Dr.R.Vinoth	MECH	Journal Publication	WOS	Environment impact on the use of diesel waste plastic oil nano additive blends in a DI Diesel Engine	3500	4000
18	Mrs.A.Anitha Rani	ECE	Patent Publication		Precision Analysis of Digital Agriculture	5000	5000
19	Dr.N.Venkatachallam	Mech	Journal Publication	WOS	Application of Analytical Hierarchy Process(AHP) for assessment of collection and Transportation of solid Waste :An Empirical Study	1500	8500
20	Dr.Arulmurugan	EEE	Patent Publication	Applicant	Smart Health Monitoring System Enabled Smar Grid Using Machine Learning Al	5000	NIL
21	Dr.S.Anbukaruppusamy	ECE	Journal Publication	Scopus	Forest Fire Prediction using IOT and Deep Learning	1000	9000
22	Dr.S.Anbukaruppusamy	ECE	Journal Publication	SCI	Greedy Weight Matrix Topological Adaptive Ad -Hoc On demand Multipath Distance Vector Protocol for Qos Improvement in Manet	3500	5500
23	Dr.M.P Murugesan	FT	Journal Publication	SCI	Toxic Metal Recovery from waste Printed Circuit Boards :A Review of Advanced Approaches for sustinable Treatment Methodology	5000	5000
24	Dr.M.P Murugesan	FT	Journal Publication	SCI	A comparitive Review on recovery of heavy metals from printed circuit boards (PCB'S)by chemical and bio leaching	5000	NIL
25	Mrs .M.Ramya	ECE	Patent Publication	Applicant	Machine Learning based Approach to identify the postive traits of a Successful Entrepreneur	5000	5000
26	V.Arun Antony	ECE	Patent Publication	Applicant	New Technology To Prevent CPU Overheating	2500	2500

27	Dr.K.Tamilarasi	ECE	Patent Publication	Inventor	Performance And Accuracy Analysis Of Signature Verification Using Integ Wavelet Transform And Back Propagation Neural Network	5000	5000
28	Mr.M.Sambath Kumar	Mech	Patent Publication	Inventor	Machine Learning and IOT based Approach Monitoring and Prediction of Air Quality Pollution	2500	7500
29	Ms.R.Preethi	ECE	Journal Publication	WoS	Improve Safety and Bloavialability of Meicinesin Pharmaceuticals	3500	Rejected Du of Speci
30	Dr.N .TamilsELVAN	Mech	Journal Publication	Scopus	Heat Transfer Enhancement In Spiral Type Heat Exchanger Using Non- Newtonian Nanofluids	2500	7500
31	Dr.K.Geetha	CSE	Journal Publication	scopus	An Optimized Data Replication Algorithm in Mobile Edg	1500	8500

= 114950 − 3500

= 111450

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Total Amount Given - 104900/-

Research and Development

10000

S. No.	Name of the Faculty	Dept	Name of the Scheme	Title of the proposal	Fund Received	Remaining Eligibility	Status
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17	Dr.R.Vinoth	MECH	Journal Publication	Environment impact on the use of diesel waste plastic oil nano additive blends in a DI Diesel Engine	3500	4000	
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23	Dr.M.P Murugesan	FT	Journal Publication	Toxic Metal Recovery from waste Printed Circuit Boards :A Review of Advanced Approaches for sustinable Treatment Methodology	5000	5000	
24	Dr.M.P Murugesan	FT	Journal Publication	A comparitive Review on recovery of heavy metals from printed circuit boards (PCB'S)by chemical and bio leaching	5000	NIL	Completed
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26	V.Arun Antony	ECE	Patent Publication	New Technology To Prevent CPU Overheating	2500	2500	Submitted
27	Dr.K.Tamilarasi	ECE	Patent Publication	Performance And Accuracy Analysis Of Signature Verification Using Integer Wavelet Transform And Back Propagation Neural Network	5000	5000	Submitted

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Centre for Industrial Relation and Research Projects (IRRP)

Not approved

Only relevant e-bills accepted

Date : 17.06.2022

FACULTY INCENTIVE FORM

Staff Name	MS R. PREETHI			
Designation / Department	AP / ECE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500) ✓	3rd Author (Rs.1,500)
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	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
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Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
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ORIGINAL ARTICLE OPEN ACCESS

Improve safetyand bioavailability of meicinesin Pharmaceuticals

D. Yuvaraj,[1] R. Preethi,[2] P. Vanitha,[3] Ankur Agrawal,[4] A. Vasantharaj,[5] Niraj Gupta.[6]
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ABSTRACT

The goal of this work would have been to create a new mix of micelles technology made up of 2Pluronic copolymers & biocompatible Soluplus to enhance the viscosity & oral absorption of the intractable medication Apigenin (AP), which was used as a standard drug. The alcohol thin-film hydrating approach was used to make the AP-loaded microparticles (AP-M). The generated ideal formulations of AP-MS had a tiny size (178.5 nm) & spherical shape at a 4: 1 proportion, and also increased solubility in water to 5.61 mg/ml, which would be around 3442-fold more than free AP.According to the in vitro dissolution studies investigation, the encapsulation efficiency & drug loading of AP-MS were 95.72 percent & 5.32 percent, correspondingly, and even a controlled release of AP-M has been achieved. The cell absorption of AP was boosted in Caco-2 cell modeling techniques, according to transcellular transportation research. In SD rats, the oral bioavailability of AP-M has been 4.03 times that of free AP, demonstrating that the Soluplus& Pluronic mix microspheres have become an industrial applications practical delivery of drugs method for promoting intractable drug oral absorption in the gastrointestinal tract.

Keywords: *bioavailability; copolymers; drug delivery system; Transcellular*

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INTRODUCTION

Apigenin was therefore considered a new chemotherapy agent against many types of cancer depending on epidemiologic & research papers [1-4]. In both JAR & JEG3 cells, apigenin lowered survival, migration characteristics, induction of apoptosis, & suppressed mitochondrial function [5]. In human cancer cell models, it guarded against carcinogen-induced breast tumor formation in mice, decreased breast cancer cell growth, produced G2/M induction of apoptosis, & promoted apoptosis, but did not damage regular, normal tissue [6].

Apigenin has been shown to suppress STAT1-dependent PD-L1 transcription in tumor tissues after treatment [7]. Apigenin may efficiently modify the NFB activation in the pulmonary of NF-B luciferase transgenic mice in vivo, indicating that dietary apigenin & apigenin-rich meals can exhibit the immune-regulatory function of an organ-specific way. Apigenin's capacity to block IKK & downstream pathways impacting the NF-B signaling pathway was thought to be responsible for its reduction of tumor growth, intrusiveness, & tumor formation [8].Even though apigenin has strong anti-tumor action, its insolubility seriously restricted its medical utilization.

RELATED WORKS

Researchers investigated a unique mix micelles structure created of Soluplus& Pluronic to solve the obstacle of AP's poor solubility & oral absorption [9].In several formulations like solid dispersions, microcapsules, & lipid membranes, all Soluplus& Pluronic have also been employed as pharmaceutical solubilizers, absorbing, & developmental [10-11]. Soluplus would be an amphoteric nonpolar surfactant made out of a graft copolymer of polyvinyl caprolactam, polyvinyl acetate, & polyethylene glycol [12-14].

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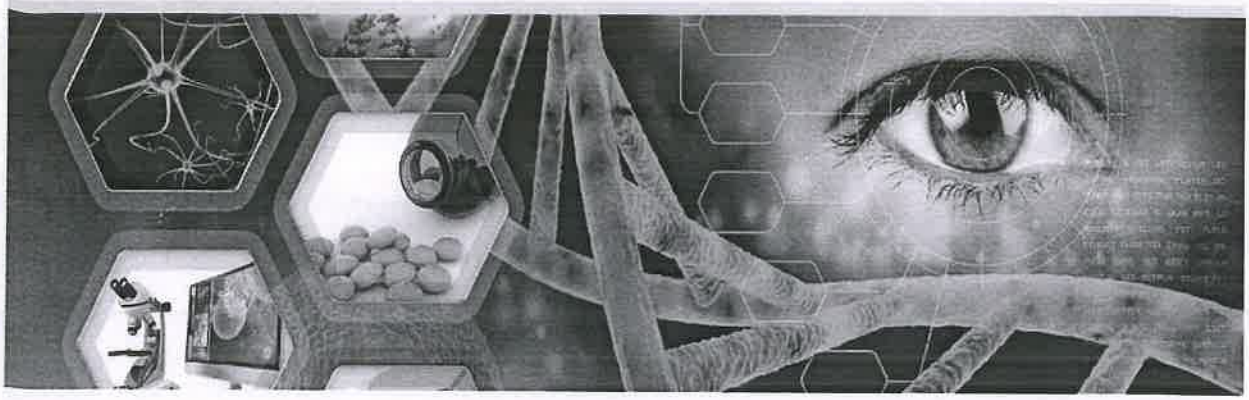

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HEAT TRANSFER ENHANCEMENT IN SPIRAL TYPE HEAT EXCHANGER USING NON-NEWTONIAN NANOFLUIDS

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ABSTRACT

Nanofluids with their improved thermal conductivity are held to be a promising coolant in heat transfer applications. Heat transfer by nanofluids gained incredible interest among researchers due to its enhanced thermal conductivity. The efficiency of nanofluids such as alumina dispersed in sodium alginate (SA) non-newtonian fluid in spiral type heat exchanger resulting in enhancement of turbulent heat transfer was investigated. The experiment was carried out for various flow rates and for various Reynolds number. Results show that heat transfer enhancement is promoted due to the presence of alumina but enhancement is minimized due to increase in concentration of Sodium Alginate (SA).

KEYWORDS - Nanofluids, non-Newtonian, heat transfer, turbulent flow, spiral type heat exchanger.

I. INTRODUCTION

Efficient energy transfer is vital to render processes economically viable. More efficient heat exchangers is essential to make this possible. Various engineering techniques have been proposed since 1950's to reduce the size and cost of the equipment, to enhance the heat transfer rate thus saving up energy. One of the innovative techniques recently proposed is the use of 'nanofluids'. The concept that thermal conductivity for solids is higher than liquids, it is expected that thermal performance will be enlarged significantly by addition of nanoparticles to heat transfer fluids. Such fluids containing well dispersed nanoparticles into the base fluid is termed as 'nanofluids'. Main reason for higher thermal conductivity of nanofluids is due to Brownian motion and better effective mixing. It should be noted that the size of nanoparticles plays an important role in the enhancement of thermal conductivity of nano fluid. Nanofluid is prepared by adding metals, metal oxides, carbon nanotubes or any other solid nanomaterials to a base fluid like water, ethylene glycol or engine oil. Solid nanoparticles can be directly produced in a base fluid through chemical techniques [1 –5].

Enhancement characteristics for various nanoparticles have been studied by various researchers. Amirhossein Zamzamian et al investicated the forced convective heat transfer coefficient in nanofluids of Al2O3/EG and CuO/EG in a double pipe and plate heat exchangers under turbulent flow and also calculated the forced convective heat transfer coefficient of the nanofluids using theoretical correlations in order to compare the results with the experimental data [6]. Kamali.R, and A.R. Binesh, Numerically studied the convective heat transfer of multi-wall carbon nanotube (MWCNT)-based nanofluids in a straight tube under constant wall heat flux condition [7]. Wen and Ding [8] have experimented Al2O3/water nanofluid heat transfer in laminar flow under constant wall heat flux and found an increase in nanofluid heat transfer coefficient with Reynolds number and nano articles concentration particularly at the entrance region. They expressed that thermal developing length for nanofluid was greater than pure water. The reason for heat transfer enhancement for nanofluids is the decreased thermal boundary layer thickness due to non-uniform distribution of thermal conductivity and viscosity resulting from Brownian motion of nanoparticles. Palm et al. [9] numerically investigated the laminar flow heat transfer of Al2O3/ethylene glycol (EG) and Al2O3/water nanofluids in a radial flow system and reported

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considerable improvement in heat transfer rate. Also they showed that wall shear stress increased with nanoparticles concentration and Reynolds number. Putra et al. [10] have reported suppression of natural convection heat transfer by nanofluid of Al2O3/water and CuO/water and concluded that this could be due to several factors such as nanoparticles settling and velocity difference between nanoparticles and base fluid. The thermal conductivity of nanofluids varies with the size, shape, and material of nanoparticles dispersed in the base fluids. Past studies showed that nanofluids exhibit enhanced thermal properties, such as higher thermal conductivity and convective heat transfer coefficients compared to the base fluid [11 -14].

Several researches have been carried out in Newtonian fluids such as water, ethylene glycol whereas very few researches alone have been carried out by the use of Non-Newtonian nanofluids. Non-Newtonian nanofluids are widely encountered in many industrial and technology applications, such as melts of polymers, biological solutions, paints, tars, asphalts, and glues. High heat transfer capacity and low pumping power of some non-Newtonian fluids make them attractive as a coolant for various applications such as microchannel heat exchangers. Non-Newtonian fluids exhibit a non-linear relation between shear stress and shear rate. In this study, heat transfer characteristics of alumina nanoparticles dispersed in Non-Newtonian nanofluids and their enhancement in heat transfer is also investigated.

II. SAMPLE PREPARATION

Nanofluids are prepared by first dispersing appropriate amount of Al_2O_3 nanoparticles in deionised water. Average sizes of nanofluids used were 20-30 nm. The solution is subjected to mechanical agitation using mechanical stirrer and then proper amounts of SA solution is prepared separately and were added to the suspension and stirred well to achieve homogenous nanofluids of desired concentration. A base fluid used in this investigation is Sodium Alginate. Since no sedimentation is observed, the experiments are repeated by using same nanofluids. In order to test stability, density of samples of nanofluids was measured before and after test which no significant change is observed.

III. EXPERIMENTAL SETUP

A Spiral heat exchanger that consists of a copper coil of height 150 mm spiral with a gap of 10 mm approximately is taken for experimental studies. The experiments are carried out for spiral heat exchangers both in parallel and counter flow patterns for non-newtonian fluids with an without nanoparticles. One centrifugal pump of 0.5 hp , two instant water heaters(3kW), three rotameters an three storage vesses of 100 liter capacity are installed for carrying out the experiment. The schematic diagram of spiral heat exchanger is shown in figure 2.1. The experimental setup of the spiral type heat exchanger with all accessories is shown in figure 2.2.

IV. EXPERIMENTAL PROCEDURE

The experimental studies involve the determination of outlet temperature of both cold and hot fluids for various flow rates. The hot fluid used here is water. The fluid on cold side is non-newtonian fluid of various concentrations.

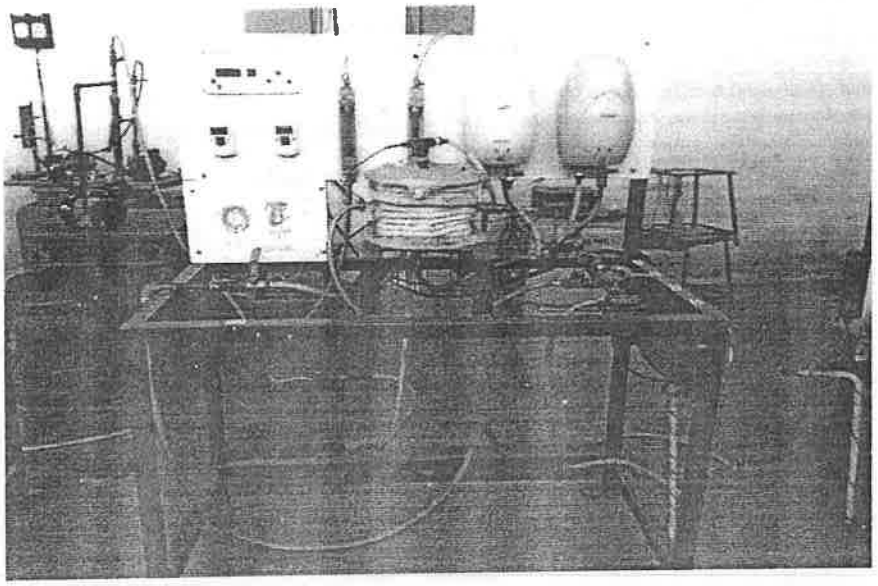

Fig. 1 : Spiral Type Heat Exchanger Experimental Set up

Cold fluid (Sodium Alginate) is pumped at a inlet temperature of 31 ± 3°C and hot fluid (Water) is pumped at a inlet temperature of 60 ± 3°C. Constant hot water flow rate of 4LPM is maintained throughout the experiment. Flow of rate of cold fluid is varied from 2 LPM to 8 LPM and corresponding inlet and outlet temperatures are noted. Times taken for filling definite volume are noted at the exit to reduce uncertainty in flow measurements. The system is allowed to reach steady state condition before the temperatures are noted. For each test fluids, the experiments are repeated for few readings to minimize the uncertainty in measured experimental parameters and reproducibility were found to be within ± 2%.

V. DATA ANALYSIS

Thermo-physical properties of test fluids are assumed to be constant along the length of the spiral and evaluated at the average temperature. Physical properties of non-newtonian fluids such as density, thermal conductivity and specific heat were taken to be same as that of water, as taken by Rajasekharan et. al.[14]

All nanofluids used exhibit shear thinning behavior. Physical Properties of nanofluids at average bulk temperatures are calculated from base fluids and nanofluids properties by following correlation [15]

$$\rho_{nf} = \phi\rho_p + (1-\phi)\rho_{bf}$$

$$(\rho C_p)_{nf} = \phi(\rho C_p)_p + (1-\phi)(\rho C_p)_{bf}$$

Their base fluids follow power law model. The base fluids and all nanofluids employed in this study exhibiting the power-law rheological behavior expressed as

$$\tau = K\gamma^n$$

For purely non-newtonian fluid (pseudoplastic) , dimensionless numbers are defined as follows:

$$Re = \frac{\rho u^{2-n} D^n}{K}$$

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$$Pr = \frac{C_p K (\frac{u}{D})^{n-1}}{k}$$

Convective heat transfer coefficient for nanofluids is calculated as follows

$$h_{nf} = \frac{C_{pnf}\rho_{nf}.u.A.(T_{b2} - T_{b1})}{\pi D L . LMTD}$$

VI. RESULTS AND DISCUSSION

. The Nusselt number calculated using the experimental data were compared with the Nusselt numbers predicted by well accepted Dittus Boelter equations for turbulent flow, given by the following equations

$$Nu = 0.023\, Re^{0.8} Pr^{0.4}$$

The results of this comparison are presented in fig. 2. This figure shows very good agreement between the results of the present study and those predicted by the Dittus-Boelter equation. Thus it gives a assurance that the experimental setup and procedure can provide reliable heat transfer for experiments that were be conducted in this investigation.

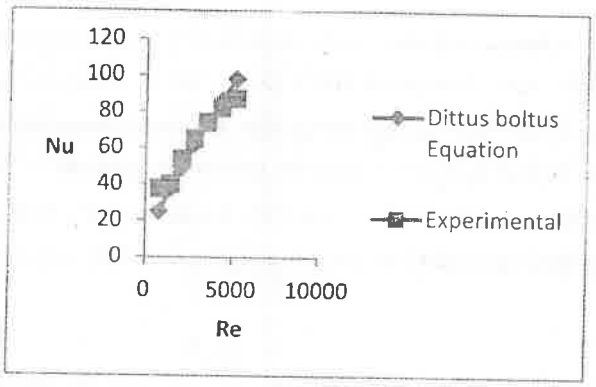

Fig 2: Nusselt number of water vs. Reynolds number

Fig. 3(a-f) shows variation of heat transfer coefficient for non-newtonian nanofluid of Alumina nanoparticle concentration of 0.01% and 0.05% by weight as a function of various Reynolds numbers and different SA concentrations for both parallel and counter flow arrangements. Results clearly show that addition of nanoparticles increases significantly the heat transfer coefficient of the fluids and enhancement in the heat transfer coefficient increases with increase in the Reynold's number.

It can also be observed that for a given Reynolds number, the heat transfer coefficient decreases with increase in non-Newtonian fluid concentration. For example, for reynolds number of about 811.18, heat transfer coefficient for nanofluid containing CMC of concentration 0.01% counter flow is found to be 1511.4 W/m^2 K whereas for alginate of concentration 0.05%, heat transfer coefficient is found to be 1198 W/m^2 K and for 0.1% it decreases to 1075 W/m^2 K., Whereas heat transfer coefficient increases with increase in nanoparticle concentration. For Reynolds number of about 811.14 heat transfer coefficient of 0.01%alumina nanofluids is increased to 1550 W/m^2 K and for 0.05%alumina nanofluids heat transfer coefficient is about 2126.896 W/m^2 K. An increase in thermal conductivity is an effective reason for increase in heat transfer coefficient of nanofluids. However enhancement is attributed to various other properties like density, Specific heat. But increase in non newtonain fluid concentration decreases the effect of nanoparticles as it leads to increase

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The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator 14/6/22 Added in Google Scholar. IRRP Chief-Coordinator 14/6/2022

Director - IRRP 16/6/2022 Director (Admin.) / Principal 16/6/22 Executive Director 18/06/22

Amount Received Already - NIL

May 2016

(12) PATENT APPLICATION PUBLICATION
(19) IN DIA
(21) Application No.202241029669 A
(22) Date of Filing of Application :24/05/2022
(43) Publication Date : 03/06/2022

(54) Title of the invention : MACHINE LEARNING AND IOT BASED APPROACH MONITORING AND PREDICTION OF AIR QUALITY POLLUTION

(51) International classification :C06N0020000000, C01N0013600000, C06Y0003080000, C06K0009620000, C05B0013040000
(86) International Application No :PCT// 01/01/1900
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4)DR. HARISHCHANDER ANANDARAM
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7)SHEIK JAMIL AHMED
8)TRILOK SUTHAR
9)DR.P.ARULPRAKASH
10)SATAM SACHIN BAJIRAO
11)M.SAMBATHKUMAR
12)DR. N. VENKATACHALAM
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(57) Abstract :
Machine learning and IOT based approach monitoring and prediction of Air Quality Pollution is the proposed invention. The invention focuses on implementing the algorithm of machine learning to analyze the quality of air. The IOT unit is integrated to monitor the air pollution and its impact on the particular geographical location.

No. of Pages : 11 No. of Claims : 4

Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion
Ministry of Commerce & Industry,
Government of India

INTELLECTUAL PROPERTY INDIA

Application Details

APPLICATION NUMBER	202241079609
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	24/05/2022
APPLICANT NAME	1 . Dr. SAI VENU PRATHAP KATARI 2 . SEEMA RANI 3 . VIRENDRA KUMAR VERMA 4 . DR. HARISHCHANDER ANANDARAM 5 . DR SURENDRA KUMAR YADAV 6 . DR. S. DARWIN PAUL EDISON 7 . SHEIK JAMIL AHMED 8 . TRILOK SUTHAR 9 . DR.P.ARULPRAKASH 10 . SATAM SACHIN BAJIRAO 11 . M.SAMBATHKUMAR 12 . DR. N. VENKATACHALAM
TITLE OF INVENTION	MACHINE LEARNING AND IOT BASED APPROACH MONITORING AND PREDICTION OF AIR QUALITY POLLUTION
FIELD OF INVENTION	COMPUTER SCIENCE
E-MAIL (As Per Record)	sgowthami12@gmail.com
ADDITIONAL-EMAIL (As Per Record)	sgowthami12@gmail.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	03/06/2022

EXCEL ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA (Aero, CSE, ECE & Mech.) NAAC with "A" Grade (3.26) and Recognised by UGC (2f & 12B)
Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 19/05/2022

FACULTY INCENTIVE FORM

Staff Name	V. ARUN ANTONY			
Designation/Department	AP / ECE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	—
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	—
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	—	202241013634 A		—
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19/05/22
Investigator / Coordinator

19/5/22
Dept. IRRP Coordinator

HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

20/5/22
R&D Coordinator
Added in Google Scholar

20/5/2022
IRRP Chief-Coordinator

20/5/2022
Director - IRRP

Director (Admn.) / Principal

Executive Director

Already Amount Received - 5000/-
20/5/22

nt

74A

ARUN ANTONY VARGHESE

₹ 168.56

View

Particulars	Withdrawals	Deposits
I RENGASWAMY E/ ISP00294010753 NEFT/	-	2500.00
PMSBY PREMIUM LLECTION A/C 9	-	12.00
TE -(MMDD) 0604 TIME HMMSS) 204224	901.60	-
I TRANSFER/	-	1000.00

M-Passbook Account

ARUN ANTONY VARGHESE

SB-65[illegible]8330

Available Balance ₹ 168.56

Last Updated [illegible]

View

Advance Search

Date	Particulars	Withdrawals	Deposits	Balance
07/06/2022	SRI RENGASWAMY E/ AXISP00294010753 NEFT/		2500.00	₹ 3212.86 CR
06/06/2022	IB-PMSBY PREMIUM COLLECTION A/C 9		12.00	₹ 712.86 CR
04/06/2022	DATE -(MMDD) 0604 TIME -(HHMMSS) 204224	901.60		₹ 700.86 CR
04/06/2022	UPI TRANSFER/ [illegible]		1000.00	₹ 1602.46 CR

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(19) INDIA
(22) Date of filing of Application :13/03/2022

(21) Application No.202241013634 A
(43) Publication Date : 25/03/2022

(54) Title of the invention : NEW TECHNOLOGY TO PREVENT CPU OVERHEATING

(51) International classification :H04W0024000000, G06F0013420000, H04W0024040000, H04N0005262000, G01S0007520000
(86) International Application No :PCT// Filing Date :01/01/1900
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA Filing Date :NA
(62) Divisional to Application Number :NA Filing Date :NA

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(57) Abstract :
ABSTRACT There are many types of problems while working in the computer, because it is a technology, it is not possible to not face any kind of problem in the technology. When a technology works, some technical glitches definitely arise. Among the various types of technical malfunctions that occur in the computer, overheating of the CPU too quickly is also a big problem. For this, a small fan is installed in the computer, but that too does not stop the computer from heating up due to excessive workload. We define this phenomenon as a problem and consider an alternative technique to solve it

No. of Pages : 11 No. of Claims : 4

EXCEL ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A" Grade (3.26) and Recognised by UGC (2f &12B)
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Centre for Industrial Relation and Research Projects (IRRP)

Date : 23.05.2022

FACULTY INCENTIVE FORM

Staff Name	Dr. K. TAMILARASI			
Designation/Department	ASP/ECE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs 1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published ✓	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	—
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	—
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	—	202241026586		—
Approved amount in Rs.	Rs. 5000/- (Rupees Five thousand only)			

K. 23/5/22
Investigator / Coordinator

K. 23/5/22
Dept. IRRP Coordinator

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HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

23/5
R&D Coordinator
Added in Google Scholar

23/5/2022
IRRP Chief-Coordinator

23/5/2022
Director - IRRP

23/5/22
Director (Admin.) / Principal

May be Approved
24/5/22
Executive Director

Amount Received Already - NIL
23/5/22

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :08/05/2022

(21) Application No.202241026586 A
(43) Publication Date : 20/05/2022

(54) Title of the invention : PERFORMANCE AND ACCURACY ANALYSIS OF SIGNATURE VERIFICATION USING INTEGER WAVELET TRANSFORM AND BACK PROPAGATION NEURAL NETWORK

(51) International classification :G06K0009000000, G06N0003080000, G06T0001000000, G07C0009350000, H04L0009320000
(86) International Application No :PCT// Filing Date :01/01/1900
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA Filing Date :NA
(62) Divisional to Application Number :NA Filing Date :NA

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3)M.Ramya
4)Dr.J.Chandramohan
5)A.Parimala
6)Dr.N.Nandhagopal
7)Dr.V.Nivedita
Name of Applicant : NA
Address of Applicant : NA
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Address of Applicant :Assistant Professor, Deparment of CSE, M.I.E.T Group of Institutions, Trichy-620007 ---------- ----------

(57) Abstract :
The biometric system is an accurate, reliable and rugged tools with traditional identification techniques for various applications. A person uses signature verification to avoid automatic entries of forgers. The proposed handwritten signature verification system is initially pre-processed for the reduction of unwanted noise and the features like angle, pressure, input vector and sequence of impulses are extracted using Integer Wavelet Transform (IWT)finally the obtained values are evaluated with the proposed Back Propagation Neural Network (BPNN)classifier for the identify of genuine and forgery signature. The IWT with BPNN approach will produces the error ratio of the signature verification system at 0.0882 for SVC 2004 and 0.0921 for GPDS data set.

No. of Pages : 10 No. of Claims : 1

77A

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Department of Industrial Policy & Promotion,
Ministry of Commerce & Industry,
Government of India

(http://ipindia.nic.in/index.htm)

INTELLECTUAL PROPERTY INDIA

(http://ipindia.nic.in/index.htm)

Application Details

APPLICATION NUMBER	202241026586
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	08/05/2022
APPLICANT NAME	**1 . Dr.K.Tamilarasi** **2 . Dr.M.Dharmalingam** **3 . M.Ramya** **4 . Dr.J.Chandramohan** **5 . A.Parimala** **6 . Dr.N.Nandhagopal** **7 . Dr.V.Nivedita**
TITLE OF INVENTION	PERFORMANCE AND ACCURACY ANALYSIS OF SIGNATURE VERIFICATION USING INTEGER WAVELET TRANSFORM AND BACK PROPAGATION NEURAL NETWORK
FIELD OF INVENTION	COMPUTER SCIENCE
E-MAIL (As Per Record)	sthulasirocks@gmail.com
ADDITIONAL-EMAIL (As Per Record)	
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	20/05/2022

Application Status

AXIS BANK

TAMILARASI K
Joint Holder :- -
EXCEL ENGINEERING COLLEGE SALEM MAIND RD NEW
NH-47 PALLAKKAPALAYAM KOMARAPALAYAM
NAMAKKAL
TAMIL NADU-INDIA

638183

Customer No :836990360
Scheme :EASY ACCESS SALARY ACCOUNT
Currency :INR

Statement of Axis Account No :910010047131645 for the period (From : 01-06-2022 To : 10-06-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**3019.24**	
06-06-2022		Dr Card Charges ANNUAL 6522XXXXXXXX1374	236.00		2783.24	170
07-06-2022		SRI RENGASWAMY /Excel Bill Payment		5000.00	7783.24	170
09-06-2022		INB/894871355/RELIANCE JIO INFOCOM(BILLDESK)/NA	666.00		7117.24	170
09-06-2022		SRI RENGASWAMY /EXCEL SALARYMAY 22		27657.00	34774.24	170
		TRANSACTION TOTAL	**902.00**	**32657.00**		
		CLOSING BALANCE			**34774.24**	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

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REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

Legends :

ICONN - Transaction trough Internet Banking
VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM
CWDR - Cash Withdrawal through ATM
PUR - POS purchase
TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
RATE.DIFF - Difference in rates on usage of card internationally
CLG - Cheque Clearing Transaction
EDC - Credit transaction through EDC Machine
SETU - Seamless electronic fund transfer through AXIS Bank
Int.pd - Interest paid to customer
Int.Coll - Interest collected from the customer

20-S (79)

EXCEL ENGINEERING COLLEGE

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A+" Grade (3.26) and Recognised by UGC (2f &12B)
Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 22.6.22

FACULTY INCENTIVE FORM

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Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I ✓	1st Author (Rs.2,500)	2nd Author (Rs.1,500) ✓	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	–
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	–
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	–
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	–
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	0.6	https://doi.org/10.1007/978-3-030-96305-7-8		
Approved amount in Rs.	Rs.1,500/- One Thousand Five hundred only			

KG 22/6

Investigator / Coordinator

KG 22/6

Dept. IRRP Coordinator

22/6/22

HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

24.06.22

R&D Coordinator

Added in Google Scholar KG

22/6/22

IRRP Chief-Coordinator

22.6.22

Director-IRRP

Director (Admin)/Principal

29/06/22

Executive Director

Amount Received Already -NIL KG.

View expanded cover

International Conference on Hybrid Intelligent Systems

HIS 2021: **Hybrid Intelligent Systems** pp 76–87

An Optimized Data Replication Algorithm in Mobile Edge Computing Systems to Reduce Latency in Internet of Things

N. Saranya, K. Geetha & C. Rajan

Conference paper | First Online: 04 March 2022

Part of the Lecture Notes in Networks and Systems book series (LNNS,volume 420)

Abstract

The actual amount of data that was created applying the actuators, the sensors, and some other devices for the Internet of Things (IoT) has been showing a substantial level of increase in recent years. The data of IoT are handled using the cloud utilizing computing resources that are located in the data canters at a distance. As a result, the bandwidth of the network and the latency of communication have become major bottlenecks. The technology is known as Mobile Edge Computing (MEC) primarily seeks at

https://link.springer.com/chapter/10.1007/978-3-030-96305-7_8

47007548-c630-4de7-a1cf-862bdf0a7a50 (899×1599)

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Cited by 0 documents

Related documents

Lecture Notes in Networks and Systems

Document type

Source type

Resource allocation based on

offloading in mobile edge

An Optimized Data Replication Algorithm in Mobile Edge Computing Systems to Reduce Latency in Internet of Things

Abstract

level of increase in recent ... computing resources that are located in ... The data of IoT are handled using the ...

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82

2, 15:15

word

EXCEL ENGINEERING COLLEGE

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A" Grade (3.26) and Recognised by UGC (2f & 12B)
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Date ...7.4.22.....

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Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published ✓	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	—
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	—
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	—	202241015594		—
Approved amount in Rs.	Rs 5000/—			

Investigator / Coordinator

9/4/22
Dept. IRRP Coordinator

HOD 9/4/22

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

Verified 7/4/22
R&D Coordinator

IRRP Chief-Coordinator

7/5/2022
Director - IRRP

14/5/22
Director (Admin.) / Principal

07/05/22
Executive Director

Amount received already - NIL
7/4/22

Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion
Ministry of Commerce & Industry
Government of India

Application Details

APPLICATION NUMBER	202241015594
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(57) Abstract :
Machine learning based approach to identify the positive traits of a successful entrepreneur is the proposed invention. The invention aims at pointing out the important aspects that are required to guide an entrepreneur. The algorithms of machine learning such as predictive and decision tree algorithms are used to analyze the traits of a successful entrepreneur.

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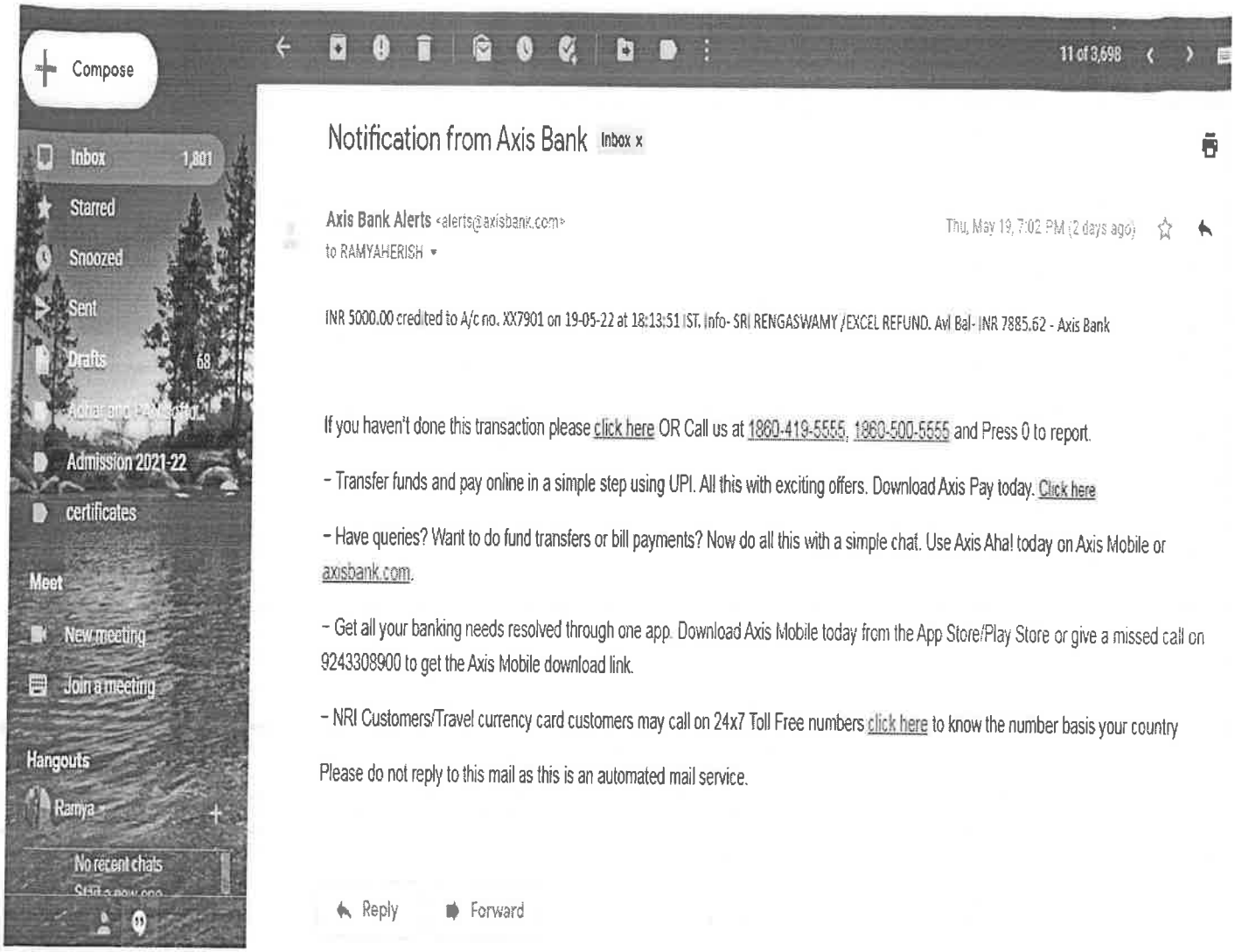
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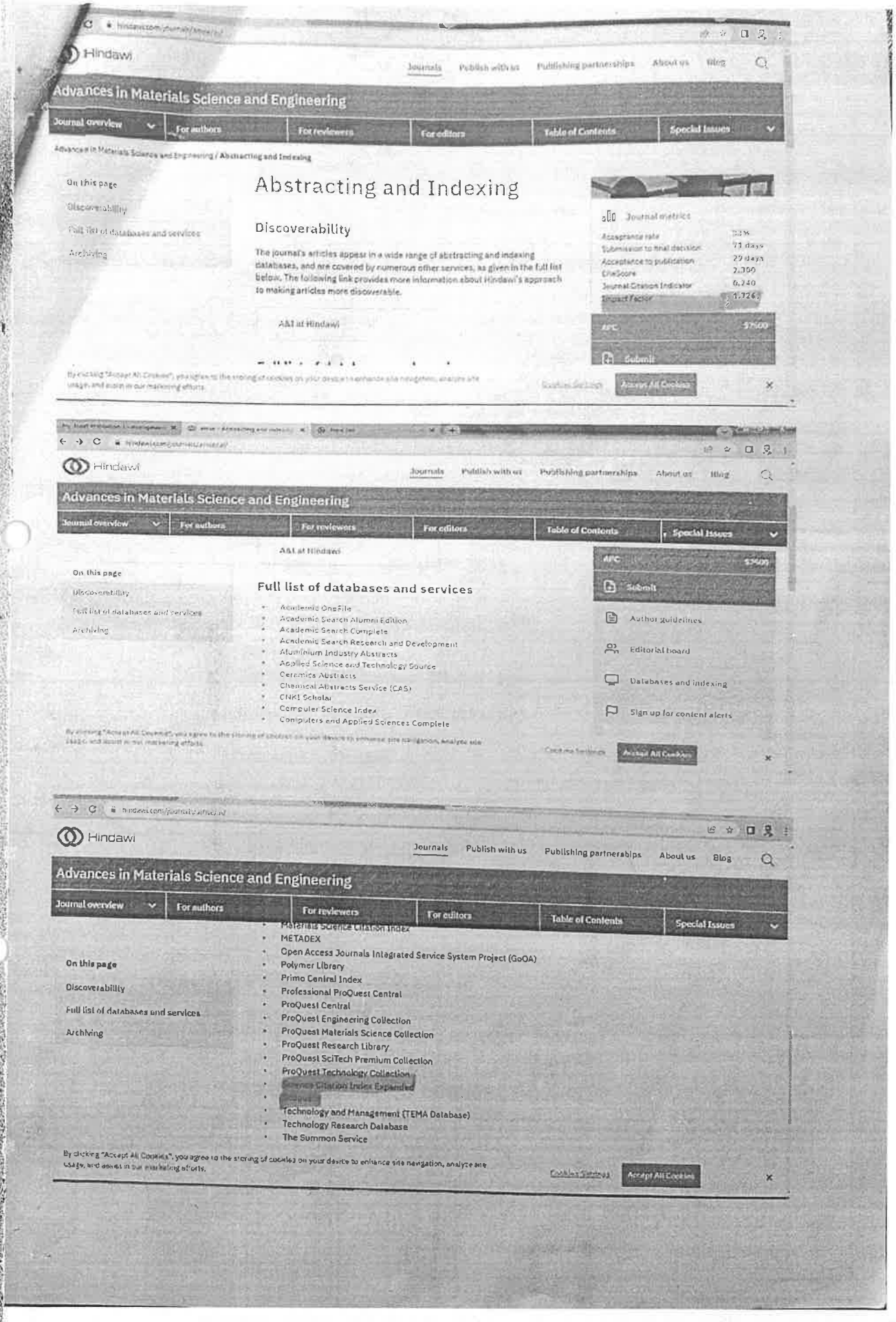
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Review Article

Toxic Metal Recovery from Waste Printed Circuit Boards: A Review of Advanced Approaches for Sustainable Treatment Methodology

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The rapid advancement of technical advancements has resulted in the generation of substantial amount of electronic trash (e-waste). The volume of e-waste created, as well as the presence of both dangerous and beneficial elements, enhances the business potential of recovery and recycling significantly. Waste printed circuit boards (PCBs) include a number of hazardous heavy metals, including copper (Cu), tin (Sn), lead (Pb), and others (Zn, Ni, Fe, Br, Mn, Mg etc.). These discarded metals without treatment threaten the economy, the environment, and human health. Heavy metal recovery from PCBs is a big difficulty for researchers. The present review focuses on technological advances in the recovery of toxic, precious metals from PCBs.

1. Introduction

1.1. E→Waste Generation Scenario. Electronic garbage (e-waste) is becoming a major global problem due to rapid technological obsolescence and informal recycling and reuse techniques [1, 2]. Electronic equipment has a fixed lifespan and stop working after a certain time. These discarded items are repurposed after any necessary refurbishment. Products that can't be reused are recycled or thrown away in landfills as scrap. Due to the equipment's decreasing life-span and increased demand, this volume is projected to increase in the future [3, 4]. As a result, e-waste has become the world's fastest-growing rubbish volume, with an annual growth rate of 5% and a total volume of over 50 million tons by 2020. The issues that these compounds cause get more serious as they damage the ecosystem.

Over the previous two decades, the global market for e-waste has expanded significantly, while the lifespan of such devices has decreased. Many of the components in e-waste are dangerous and non-biodegradable, which causes concern. Toxic metals including lead, copper, tin, aluminum, nickel, zinc, and other hazardous components are discovered in e-waste and are either burned or recycled, depending on the treatment process. Several toxic chemicals were emitted throughout the procedure, resulting in a range of environmental difficulties, human health consequences, and ecological damage. In 2019, just 17.4% of the world's 53.6 million metric tonnes of e-waste was recycled [5]. China generated the most e-waste, with 10.1 million tonnes, followed by the United States, with 6.9 million tonnes. India, with 3.2 million tonnes, was third. These three countries accounted for around 38% of worldwide e-waste. The steady growth in E-waste generation rates is due to the country's population and ongoing technological advancements.

1.2. Printed Circuit Boards. A printed circuit board (PCB) is an electrical circuit board that connects components. Due to characteristics like as complex structure, high metal content

possible risks, discarded PCBs are known as the most challenging components of E-waste to recycle. A typical PCB is made up of 40% metals, 30% ceramics, and 30% plastic components [6–13]. Waste PCBs now account for 3–6 wt% of total e-waste created. On the one hand, discarded PCBs include heavy metal components, organic compounds, and chemical residues that are hazardous to the environment and human health. Waste PCBs, on the other hand, have a significant residual value since they include high-grade precious metals such as Au, Ag, Cu, Pd, and so on by about 28% weight. As a result, recycling discarded PCBs is vital for both environmental preservation and economic development. Figure 1 shows a sample PCB.

1.3. Components in PCBs. A typical PCB trash may include up to 60 unique components, some of which are useful while others are hazardous. PCBs comprise metals (Cu, Sn, Pb, Ag, Au, Pd, Fe, Ni, and Cr), nonmetals (glass fibers, electronic component insulators, capacitors, resistors, and so on), and organic compounds (epoxy resin, paints...). Copper is the primary component of PCB, which is employed as an electric current conductor. PCBs, particularly electronic PCBs, contain precious metals. Palladium is utilized in contacts and multilayer ceramic capacitors, whereas silver is used in solder and contacts, gold as a protective later on contacts. Table 1 shows the typical metallic concentration of PCBs based on literature [6–18]. In our previous studies [4], the principal components of the PCBs were analyzed using SEM and EDX analysis, as shown in Figures 2(a) and 2(b).

1.4. Environmental and Health Impacts of Toxic Metals of PCBs. The improper disposal of abandoned PCBs aggravates environmental problems while also harming human health. Toxic metals contained in PCBs discharged into water, air, or landfills stimulate the formation of micronuclei and chromosomal anomalies, resulting in genetic instability in individuals exposed [19, 20]. When hazardous substances reach the human body, they spread to a number of tissues and organs, where they are metabolized and can participate in a variety of physiological processes. Previous researchers reported the following toxic effects: Pb (affects reproductive, mental instability, cytotoxicity, ischemia and trauma, and damages human DNA) [21–27], Cu (headache, dizziness, irritation in eye, nose, mouth) [28–30], Sn (effects in central nervous system disorders and visual defects) [31], Ni (lung disfunction, asthma, skin allergy, carcinogenic effects) [30, 32–34], As (breathing issues, increased risk of blood). Figure 3 highlights the e-waste sources in various sectors and their effects on human health.

1.5. Need for Study. The extraordinary growth in the use of electronic products creates massive amounts of e-waste all around the world. Metals can enter the water system at any moment through industrial and consumer waste, releasing potentially hazardous heavy metals into streams, lakes, rivers, oceans, and groundwater [35, 36]. As a result, a reliable method of extracting metal from PCBs is required. The selection of an appropriate recovery method will be critical to the successful treatment of PCBs. The primary research priority is the development of breakthrough technology for removing harmful heavy metal ions from discarded PCBs. The present state of PCBs treatment via pyrometallurgical and hydrometallurgical processing, as well as technical breakthroughs for sustainable waste PCBs recycling were described in this study.

2. Technologies for Recovery of the Metals

Many recycling approaches have been investigated in traditional operations, including pyrometallurgy, hydrometallurgy, and a combination of the two. In terms of price, environmental effect, and metal recovery, each process offers benefits and disadvantages. The uniqueness of effective treatment alternatives is determined by the choice of an appropriate recovery plan [37, 38]. The research and development of innovative heavy metal recovery technology is a major scientific undertaking. Several approaches used in previous research to extract harmful compounds from PCBs were addressed in this study.

2.1. PCBs Recovery through Pyrometallurgical Processing. The science and technique of extracting or refining nonferrous metals from metallurgical materials at extreme temperatures is known as Pyrometallurgy. Pyrometallurgy of PCBs refers to the use of burning and other methods to remove nonmetallic components from the circuit board, allowing the metal to be enriched and recycled further. In comparison to hydrometallurgical technology, the use of pyrometallurgy technology to dispose of discarded circuit boards has a high processing volume and is a straightforward, easy-to-operate operation [39]. It primarily recovers metal components at a low cost and with high efficiency.

2.1.1. Incineration and Pyrolysis. The incineration of abandoned PCBs is a straightforward and effective method for accomplishing successful disposal and energy recovery. It inhibits the formation of melts rather than smelting. The approach is useful in the small-scale processing of electronic waste with a high concentration of valuable metals. The temperature of the smelting furnace is generally set above 1000°C to limit dioxin emissions. Pollutants from incineration harm the environment and stifle industrial development [40, 41]. The thermo chemical decomposition of organic material at high temperatures is known as pyrolysis. Pyrolysis recycles PCBs by converting the organic part into low molecular products (liquids or gases) and making the PCB brittle and easily crushed [42]. The pyrolysis of discarded PCBs inhibits the formation of dioxins since it is performed in the absence of oxygen. Although there has been a lot of study done on the pyrolysis of PCBs, the most of it has been done in nitrogen settings using analytical pyrolysis methods or laboratory size reactors with kinetics measurement and product characterization. Much research on incineration and pyrolysis has been undertaken, and it has been discovered that they cause a variety of

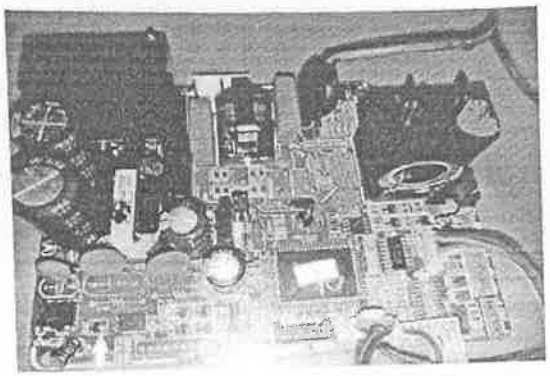

Figure 1: Schematic diagram of sample PCB.

Table 1: Metal composition present in printed circuit boards reported in previous literature.

Metals elements in PCBs	Metals presents in PCBs according to previous reports (Wt %)								
	[6] %	[7] %	[12] %	[13] %	[14] %	[15] %	[16] %	[17] %	[18] %
Pd				0.025	0.021	0.022		0.003	
Pb	3	2		4.19	0.3	2.96	2.50	1.3	
Al	7	2	4.7	4.78	1				
Sn		4	1			5.62	4.79	3.8	
Au	0.011	0.1	0.008	0.725	0.035	0.025	0.014	0.0068	
Mg									0.12
Ni	2	2	1.5	0.95	0.1	1.65	0.41		0.61
Cr						0.356			
Zn	0.4	1	0.45	2.17			0.18		
Sb		4	0.06				0.05		
Cd							0.1183		
Cu	24	20	26.8	6.5	13	14.6	14.2	28.7	24.2
Ag	0.028		0.33	0.223	0.134	0.045		0.0079	
Fe	12	8	5.3	0.11	5	4.79	3.08	0.6	0.18

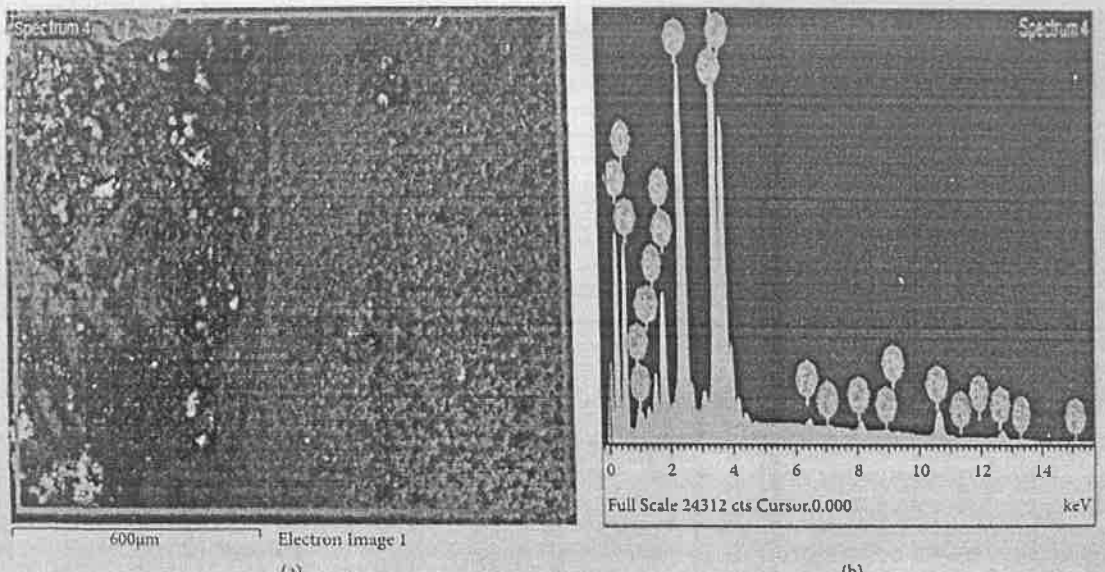

Figure 2: (a) SEM spectrum analysis of sample PCBs, (b) EDXs spectrum analysis.

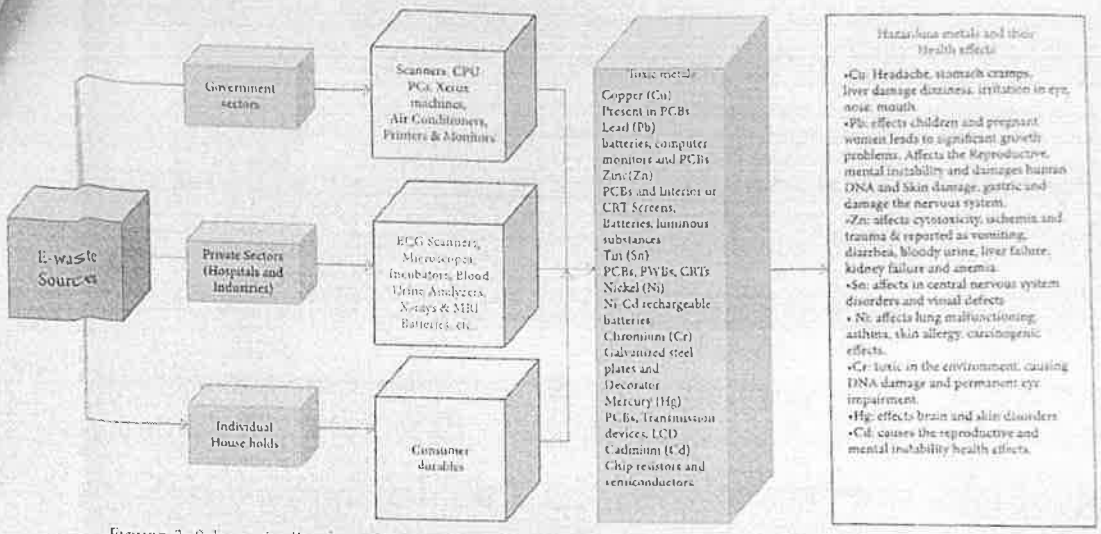

FIGURE 3: Schematic diagram of E waste sources in various sectors, and their effects on human health.

environmental concerns, including global warming, as well as health impacts due to carbon monoxide and sulphur dioxide emissions. At the moment, the two practicable options to handle the nonmetallic component physically removed from PCBs on a wide scale are incineration and landfill.

2.2. Hydrometallurgical Process. When compared to pyrometallurgy, the hydrometallurgical process has lately been investigated due to its advantages, which include low capital costs, less environmental impact, and simplicity of management. Metal leaching, purification, and recovery are the main parts of the hydrometallurgical process.

2.2.1. Chemical Leaching. Chemical leaching, which involves dissolving heavy metal ions in a leaching media, is a common approach for removing heavy metal ions from PCBs. Several investigations have been conducted on the extraction of metals from PCB waste. Because of their potency and low reagent cost, various inorganic acids, such as H_2SO_4, are used in the literature. Inorganic acid leaching, on the other hand, uses more water and chemicals while producing secondary waste. Previous studies employed a range of chemical reagents to extract metals from PCBs, including nitric acid, hydrochloric acid, sulfuric acid, cyanide, ammonia, thiosulfate, hydrogen peroxide, ammonium per sulfate, and aqua regia. Leaching is performed in a one-of-a-kind ultrasonically aided treatment technique, followed by reduction, recovery, and separation. Copper and iron were entirely recovered by separating PCB waste sludge into copper sulphate and ferric chloride solutions [43]. To extract metals from PCB waste sludge, the technique has a high separation and recovery efficiency. This technique's efficiency for a metal recovery plant handling PCB waste sludge comprising 3.14–4.85% copper and 3.7–4.23% iron yields a copper recovery efficiency of 95.2–97.5% and an iron recovery efficiency of 97.1–98.5%. 10 g of sample and 50 ml of distilled water were utilized in the supercritical water oxidation (SCWO) treatment studies, with hydrogen peroxide as a source. For various time durations, the experiment was carried out in a 200 ml high-pressure reactor. Within 11 hrs of treatment, about 84.2% of copper was recovered in the cathode compartment, of which 74% was deposited on the cathode with a purity of 97.6% and may be immediately reused [44]. Furthermore, [42] showed effectively that copper was leached by six ionic liquid (IL) acids. The concentration of IL acid, quantity of hydrogen peroxide, solid to liquid ratio, and temperature all have varied impacts on copper leaching from waste PCB. When IL acid is mixed with sulfuric acid, copper is considerably simpler to leach out of discarded PCB powders. In this case, IL acid diffusion is critical to the surface reaction, whereas copper leaching by inorganic acids normally regulates the surface reaction. It was given increased environmental impacts owing to the usage of more harmful acids.

The use of acidic ferric chloride solutions in electrochemical oxidation proved to be an efficient way for simultaneously recovering copper and separating gold-rich residue from discarded PCB. The experimental results show that the longer length of the scaling process may improve copper extraction performance and raise the gold content of the solid residue to a greater extent. A laboratory-scale leaching unit was built, allowing 99.04% recovery of a high purity copper deposit [45]. The chemical leaching of copper from abandoned refrigerators was investigated using several techniques that were optimal in different scenarios. Studies were performed on the removal of Cu to identify the optimum disposal conditions for E-waste given the constraints of sound environmental handling using decision analysis tools [46]. Research [47] has tested the effect of hydrogen peroxide on sulfuric acid leaching of zinc, copper, iron, aluminum, and nickel.

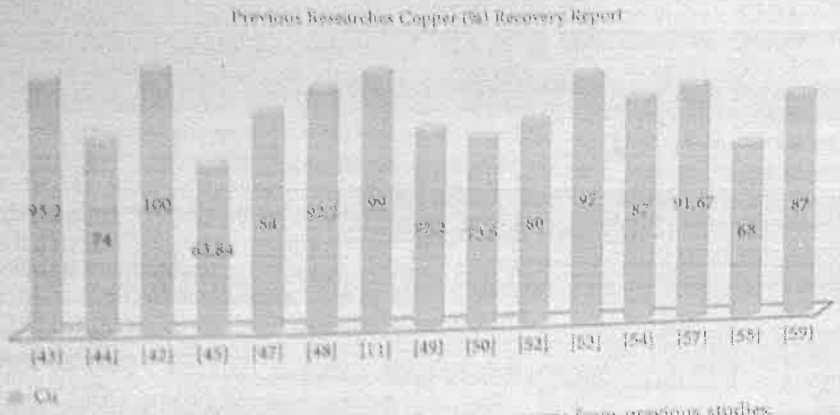

Figure 4: Graphical representation of copper recovery from previous studies.

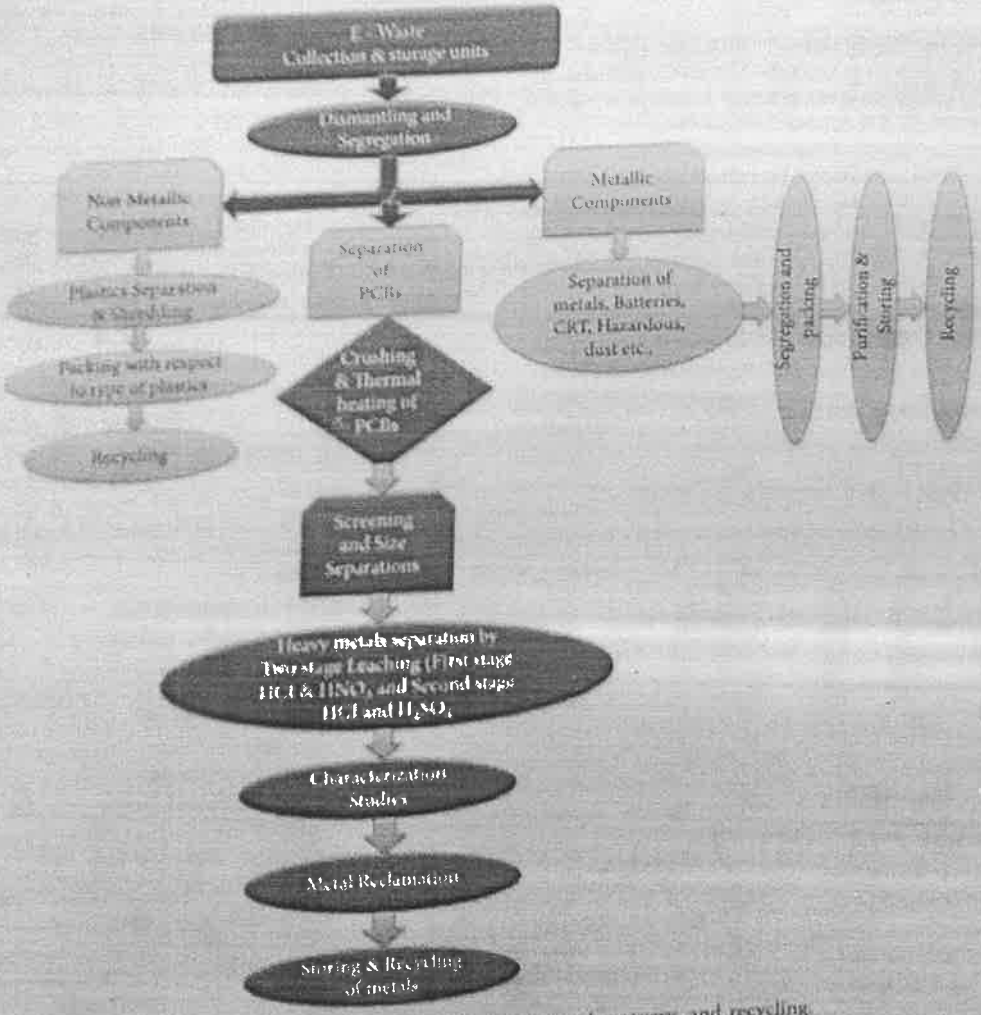

Figure 5: Flow diagram for metal treatment and recovery, and recycling.

The recovery of gold and silver from PCB waste was added using ammonium thiosulphate in the presence of cupric sulphate and ammonia. Leaching with sodium chloride was used to assess lead and tin recovery. With some waste unrecoverable, the overall efficiency of recovered metals was 84% Cu, 82.1% Fe, 77.6% Al, 76.6% Zn, 70% Ni, 90% Pd, and 88.6% Pb. The research examined the developing issue of e-waste, which is being driven by the fast expanding volume of complicated end-to-end life of electronic equipment. There are significant fluxes of both harmful and useful compounds at the global level of production, consumption, and recycling. Despite the fact that knowledge and preparedness for implementation and improvement are quickly rising, there are several barriers to managing end-of-life items safely and efficiently in industrializing countries. Support ensures the economic and long-term viability of the e-waste management system by increasing the value-added and enhancing the collection and recycling system's efficacy. The quantity of copper removed in the study's leaching system was 92.7%; the precipitate produced by neutralizing the leach liquid was 9.77% [48]. For PCB removal, chemical leaching has been used, in which the PCBs are broken using a crusher and sieved with a screener. The metal content was evaluated by AAS by dissolving it in aqua regia. The study reported that at optimum conditions, about 99.9% of copper was leached with 60.0% of zinc, 9.0% of nickel, and a nondetectable amount of iron. At the cathode, 99.97% pure copper was obtained after electrowining the leached solution. From this study, it could be concluded that the metal leaching from waste PCB in an alkaline solution is feasible [11].

The study investigated and reported on the various methods and conditions utilized to recover heavy metals found in PCBs, such as gold, silver, nickel, and copper. PCBs contain 80% precious metals in particle sizes ranging from 3.33 mm to 0.43 mm. According to column leaching data, the gold dissolving rate is higher than that of silver and copper during the first 10 days of the method. On day 11, gold and silver recovery rates began to fall due to a reduction in precious metal contact area caused by copper oxide and copper hydroxide layers on the material surface. In a column, cyanidation of PCBs yielded recoveries of 47.9% Au, 51.6% Ag, and 77.2% Cu [49]. To recover tin and copper, an 18% nitric acid solution was created, and 500 g of PCB were dissolved in it for 2 hours, until all of the solder was dissolved. The PCB components were removed, and the solution was filtered using filter paper to get copper nitrate and stannic acid in the precipitate. It was cooked for an hour in the muffle furnace at 600°C to produce stannic oxide. When the concentration of nitric acid was lowered, the leaching time rose dramatically. For more than 50% concentrated acid, the reaction was immediate and completed in 15 minutes. When the acid concentration was less than 20%, the process took around two hours to complete. Copper was recovered with 73.5% efficiency by cementation from a copper sulfate solution [50].

In the experiment [51], 15 g granules of the mobile PCB sample were leached in a 250 ml solution using a 500 ml glass beaker containing the predetermined quantity of ammonium thiosulfate and copper sulfate at different pH levels. All leaching studies were carried out at a speed of 250 rpm for the agitation. After 8 hours of leaching, the solution was withdrawn and filtered using Whatman 40 filter paper to remove the remaining PCBs. The residue was then dried in a vacuum oven at 130°C for 2 hours to eliminate all moisture from the sample. The samples were weighed, and the residue weight was computed. Under ideal circumstances, which comprised 0.1 M ammonium thiosulfate, a stirring speed of 250 rpm, and an 8 hr time period at room temperature, 56.7% gold could be leached from PCB granules. At thiosulfate 0.1 M, copper sulfate 40 mM, P^H 10–10.5, and a stirring speed of 250 rpm at room temperature for an 8 hr time period, the highest gold leaching was 78.8%. The cementation process by PCBs can create a solution and change the pH of the solution. They are then washed and filtered to eliminate the waste particles, yielding a pure copper tri-hydroxyl chloride filtrate. They begin the dissolve method by introducing hydrochloric acid. After being acidified with strong sulphuric acid, they react and convert to copper hydroxyl chloride, resulting in a copper sulphate solution. The final stage is the evaporation stage, in which the moisture is evaporated and the ultrafine copper sulphate crystals with 80% purity are obtained [52].

The copper was recovered using selective chemical leaching with sulphuric acid in the tests. The recovered PCBs are then mechanically crushed into a mesh size of 200. They are treated under working circumstances with 0.1 M sulfuric acid at pH 2.0 to 8.0 and temperatures ranging from 40 to 800°C. They were then analyzed using an atomic absorption spectrometer, and 97% of the copper was recovered [53]. Copper and tin were removed from approximately 75 kg of printed circuit boards using a heat treatment and a leaching process [54]. The trials were carried out in order to remove copper from printed circuit boards. They gathered different sized PCBs and evaluated their sizes using a filter mesh plate before dissolving the PCBs in acidic solutions. The copper is recovered with the greatest efficiency using sodium thiosulphate at a temperature of 200°C and leach durations of 10, 30, 60, and 120 minutes [55].

For the selective separation of electronic printed circuit boards, the study used a macro porous ion-exchange approach. The printed circuit boards are crushed to the appropriate size before being dissolved in nitric acid. They are then leached for 60 min at 25°C. The solution is then filtered. Cu is removed in 68.6% of the cases, Zn is removed in 56% of the cases, Ni is removed in 79.1% of the cases, and Fe is removed in 89.6% of the cases [56]. In the leaching studies of discarded printed circuit boards, sulphuric acid was employed to recover the valuable components of the sample after the PCBs were broken into tiny pieces and roasted for 1 hour at 600°C. Copper recovery is 87.6%, tin recovery is 94.0%, zinc recovery is 95%, nickel recovery is 81%, and Fe recovery is 58% [57]. For the cleaner manufacture of gold from secondary waste created during the leaching of base metals from PCBs, a novel recycling strategy based on electro- and solvo-chemical processes has been devised. In 0.2 mol/L solutions of thiosulfate and thiourea, respectively, 99 and 94% of the gold was recovered [58]. The copper

...ery is highly focused, and some of the process results ...depicted in Figure 4. In summary, Figure 5 represents the ...erall set of operations for metal recovery, and recycling.

2.3. *Bioleaching*. High reagent consumption, secondary pollution, and high energy requirements drive research interest in the development of microorganism-driven recycling technology (bio metallurgy), which has the potential to be one of the most promising technologies in terms of low capital investment, labour-intensiveness, and energy consumption [59–63]. In bioleaching, bacteria and metals interact via reduction, oxidation, sorption, and sulphate precipitation. Historically, bioleaching has been utilized in industrial applications to recover metals from ores by bacterial leaching. The leaching method was demonstrated to be extremely successful using the bacterial strains *Acidithiobacillus ferrooxidans*, *Thiobacillus thiooxidans*, and *Acidithiobacillus*. These treatments were particularly beneficial since they were both environmentally friendly and cost-effective. Chemolithotrophic, heterotrophic, and thermophilic bacteria, as well as fungus, have all been examined. Commercial scale-up is problematic because the process is yet to meet the chemical leaching yields. To satisfy the process scaling requirements, genetically modified and mutant strains can be introduced [63]. Microbial growth broths, cyanide capture and enrichment reactors, and leaching reactors can all be separated to maximize lixiviant concentration and process pulp density.

3. Future Perspectives

The current leaching processes are inadequate for extracting critical metals. Future research should focus on reducing energy use and the cost of the recovery process. The combination of processes might result in a more efficient approach of extracting precious metals. A novel method for recycling strategic critical metals (those required to aid in the transition to green energy) from discarded printed circuit boards is proposed [59]. It is based on the combination of microbial activity with solvo- and electrochemical reactions in the process. Recent advancements in process integration for primary and secondary resource processing have brought promising outcomes. So far, however, no attempt has been made to analyze the variables and basics involved in process integration, which will benefit the complicated metallurgy of various important and vital resources [59–62].

4. Conclusions

Several studies on the recovery of heavy metals from printed circuit board waste using hydrometallurgical techniques have been published. The process's sluggishness and lengthier processing times were revealed to be limitations, resulting in less efficient recovery and a considerable impact on the recycling economy. Several research have been conducted to create more cost-effective methods of hydrometallurgical leaching followed by selective metal extraction. Earlier chemical leaching techniques, when compared to two-step leaching, required huge expenditures in leaching reagents, high temperatures, pressure, and operations to be practicable for severe environmental problems. Bioleaching is yet to mature as technology for commercial usage. There is an ample scope in scale up of bioleaching process, which suffers with longer times, low yields.

Nomenclature

AAS: Atomic adsorption spectroscopy
EDXs: Energy-dispersive x-ray spectroscopy
EEE: Electrical and electronic equipment
IL: Ionic liquid
PCBs: Printed circuit boards
PCs: Personal computers
RSM: Response surface methodology
SCWO: Supercritical water oxidation
SEM: Scanning electron microscopy
WEEE: Waste of electrical and electronic equipment
WPCB: Waste printed circuit boards.

Data Availability

All the data are available within the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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A comparative review on recovery of heavy metals from printed circuit boards (PCB'S) by chemical and bio-leaching

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The electronics industry is the world's largest and fastest growing industry. This consumer-centric industry's combination of technology advancements and quick product obsolescence creates new environmental issues. There is an urgent need to address the volume and toxicity of electronic waste generated. Printed circuit boards (PCBs) are a significant component of electronic trash, containing mostly heavy metals such as copper (Cu), tin (Sn), zinc (Zn), and lead (Pb). Metal recovery and recycling from PCBs is an important step in pollution prevention. Researchers have devised many methods for recovering precious metals from PCBs, including gravity separation, magnetic separation, and electrostatic separation, as well as PCB separation using the organic solvent technique, leaching method, bioleaching method, or a combination of these methods. This research provides a brief summary of India's present e-waste status, environmental and health risks, continuing waste disposal and recycling activities, and emphasizes the recovery of heavy metals from PCBs by systematic leaching/bioleaching.

Keywords: Printed Circuit Board (PCBs), Metal extraction, Chemical Leaching, Biological leaching, Adsorption.

Introduction About Pcbs-Environmental Problem

The discarded Printed circuit boards (PCBs) include a large number of heavy metals as well as non-metallic components. PCB scrap consists primarily of ferrous components (50%), plastics (21%), non-ferrous metals (13%), and miscellaneous substances (16%). Copper, tin, lead, mercury, cadmium, arsenic, nickel, and hexavalent chromium are found in excess of permitted levels [1]. PCBs may be removed from a variety of electronic devices, including television boards, CD players, and mobile phones, among others. According to researchers, the average rate of PCB manufacturing has increased by 8.7% each year, resulting in rising environmental concerns that need to be addressed in (Table 1) [2]. The typical metallic compositions of several PCBs are shown in (Fig. 1) [3]. Furthermore, ecologically friendly polymers and ceramic elements such as SiO_2, Al_2O_3, polyethylene, polypropylene, PVC, and Nylon are present in electronic trash [4]. It is critical to evaluate alternative ways for dealing with these hazardous chemicals. A research [5] examined and proved that particle size reduction during milling operations boosted copper release to 100%. The metal concentrations were determined using hydro-metrological techniques, which yielded precious metal values of Ag 0.238 g kg^{-1}, Au 0.725 g kg^{-1}, Cu 6.5 g kg^{-1}, and Ni 16.38 g kg^{-1} [6]. In a separate case, study on the composition of desktop PCs revealed an average weight of 60lb of various metals. Switzerland generates 66,042 TPA of E-waste per year, Germany generates 1,100,000 TPA, the United Kingdom generates 915,000 TPA, the United States generates 2,124,400 TPA, Thailand, Denmark generates 118,000 TPA, Canada generates 67,000 TPA, and India generates 146,111 TPA [7]. Several investigations were also done on a variety of samples in various concentration ranges. In Japan in 2007, several different E-waste collecting facilities separated a sample of 20 personal computers (PCs). The chemical element analysis reveals metal concentrations ranging from 13.8% to 24.6%, Fe 0.2% to 4.79%, and Au 0.0076% to 0.02%, respectively [8].

E-waste is a huge rising concern throughout the world, with technological obsolescence accounting for around 80-90% of this trash. Several techniques of characterisation and therapy are described in the literature [9]. Metal recovery was proven in the bioreactor followed by precipitation, and variations in treatment

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Metal composition presents in printed circuit boards (wt %)

Metals /Elements in PCBs	Previous studies Recovery rate (Wt %)									
	[4]%[a]	[5]%[b]	[6]%[c]	[7]%[d]	[8]%[e]	[9]%[f]	[10]%[g]	[11]%[h]	[12]%[i]	%this study
Cu	24	20	26.8	6.5	13	14.6	14.2	28.7	24.178	3.15
Sn	3	2		4.19	0.3	2.96	2.50	1.3	-	24.77
Pb	0.4	1	0.45	2.17	-	-	0.18	-	-	1.16
Zn	-	4	1	-	-	5.62	4.79	3.8	-	42.4
Fe	12	8	5.3	0.11	5	4.79	3.08	0.6	0.182	0.54
Ni	2	2	1.5	0.95	0.1	1.65	0.41	-	0.612	-
Mg	-	-	-	-	-	-	-	-	0.118	3.60
Cr	-	-	-	-	-	0.356	-	-	-	-
Al	7	2	4.7	4.78	1	-		-	-	-
Sb	-	4	0.06	-	-	-	0.05	-	-	-
Cd (ppm)	-	-	-	-	-	-	1183	-	-	-
Pd (ppm)	-	-	-	250	210	0.022	-	33	-	-
Ag (ppm)	280	-	3300	0.223	1340	0.045	-	79	-	-
Au (ppm)	110	1000	80	0.725	350	0.025	142	68	-	1.58

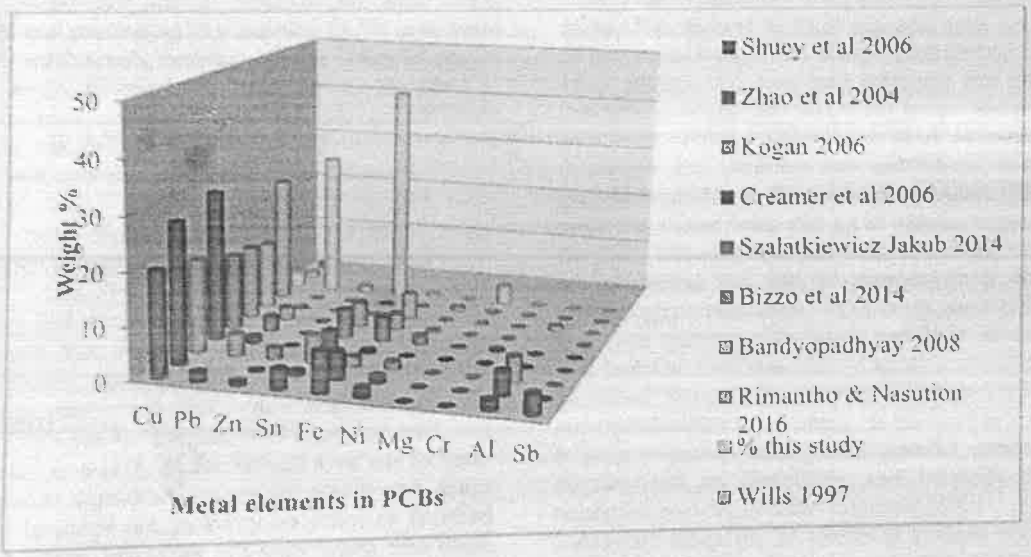

Fig. 1 Metal compositions present in PCBs.

metal concentrations for metals such as copper, gold, platinum, and others were recorded [10]. In addition, the prior study looked at the continuous rise in E-waste creation rates as a result of the country's population and technological advancements [11]. The increased usage of contemporary electrical and electronic equipment results in the disposal of old equipment and the creation of a huge amount of e-waste for all types of equipment, such as personal computers, mobile phones, and so on. Because of the release of poisonous and hazardous components into the atmosphere, it will generate severe environmental issues [12]. Scanning electron microscopy will be used to characterize mobile scraps with diameters of 1 mm, 0.71 mm, 0.60 mm, 0.425 mm, 0.18 mm, and 0.075 mm. The research revealed that the tested materials included significant amounts of copper, carbon, and silicon [13].

India is one of the countries most affected by the e-waste problem, yet until 2012, there was no comprehensive electronic waste law in existence. This might be because it was not seen as a potential threat that needed to be addressed appropriately. According to the Dangerous Wastes Rules (1989), e-waste is not deemed hazardous unless it is shown to have a higher concentration of specified substances. However, none of the above-mentioned environmental laws made a direct and specific reference to electronic waste processing as hazardous. In the Indian context, the study found that the yearly E-waste creation rate is predicted to be dangerously high [14], with Chennai (2 MT), Bangalore (21 MT), Mumbai (10.1 MT), and Delhi (9.1 MT) accounting for about 24% of total e-waste output. According to the research

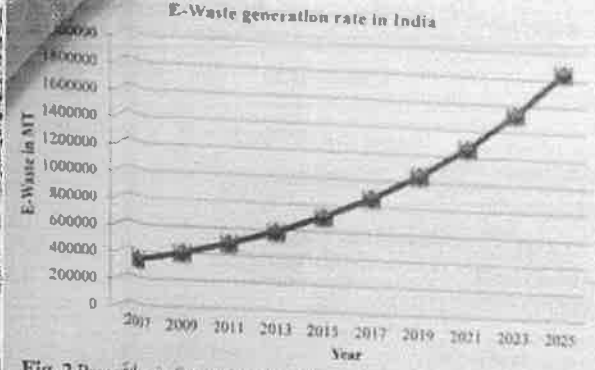

Fig. 2 Provides information about E-waste generation rate in India.

[15], the annual generation of E-waste has risen dramatically every year, as seen by the graph below (Fig. 2). More than 40% of obsolete electrical goods in India are believed to be sitting idle in homes or warehouses because people are unsure what to do with them. Recycling and processing of discarded PCBs in e-waste are nearly exclusively handled by the informal sector and are totally driven by market forces. Because of insufficient base and metal recovery, the use of crude techniques creates occupational and environmental risks, as well as a loss of valuable resources.

Toxic Substance in PCBs and Their Harmful Impacts on Mankind

The chemical composition of PCBs is an essential characteristic that may be determined via inductive coupled plasma mass spectroscopy [16]. The metal composition study indicates metal concentrations in PCBs of 35.70 gm L^{-1} copper, 44.91 gm L^{-1} lead, and 21.77 gm L^{-1} iron [17]. PCBs include a variety of toxic and dangerous chemicals, many of which can cause significant issues if not properly recycled or handled [18, 19]. E-waste comprises not only home and commercial electrical equipment, but also parts such as batteries, capacitors, castings, and so on.Recycling of such garbage has occurred both formally and informally in a number of nations, including China, India, Ghana, Thailand, and Vietnam [20]. Formal recycling systems are well-developed methods for ensuring protection and successful separation, but they are quite expensive to build and run. Compromise on treatment stages can result in the release of numerous pollutants into the atmosphere, causing a variety of health problems [21]. Metals contained in PCBs are very hazardous to living creatures. These metals enter the human chain via media such as dust, air, water, and soil.Metals such as lead (Pb) and cadmium (Cd) have been linked to reproductive health; development, mental disease, and DNA damage [22-25]. Low amounts of lead (Pb) exposure also cause major development difficulties, skin damage, sickness, ulcers, blood, and reproductive system problems in children and pregnant people [26, 27]. It was also shown that staff pulmonary dysfunction and Skin Allergy are carcinogenic as a result of inhaling nickel-contaminated air [28-30]. Exposure to copper (Cu) at waste sites causes health consequences such as headaches, dizziness, eye irritation, nose and mouth irritation, and so on [31,32].

Nausea, vomiting, discomfort, cramps, diarrhea, renal failure, and cytotoxicity are all side effects of PCBs, batteries, and luminous chemicals [33, 34]. Its hazardous components, which are combined with soil and air and have severe consequences, include acid discharge, poisonous compounds such as heavy metals, carcinogenic chemicals, and heavy metal bio-magnification [35]. Tin exposure from PCBs, PWBs, and CRTs causes intellectual impairment in children, as well as harm to the blood or reproductive systems and visual defects [36, 37]. Table 2 provides information on the negative impact on human health and the environment of the presence of dangerous hazardous components in various heavy metals.Researchers at PCB disposal sites are exposed to dangerous toxic metal components (primarily copper, lead, arsenic, tin, zinc, and mercury) and other toxic substances discharged into it via water, air, or landfills and food chains, which may lead to micronucleus formation and chromosomal aberrations, resulting in genetic instability in the exposed individual [38]. Metals enter the human body and go to various organs such as the liver, kidney, bone, pancreas, and brain, where they are processed and can be engaged in a number of physiological processes. PCB trash may pollute soil and food systems with heavy metals in diverse forms that humans consume. Heavy metal concentrations are increased through the biomagnification process. Occupational exposure to metals to the mother body leads to early pregnancy loss, genetic disorder, preterm bright, development of disabilities and behavior disorders, abnormal growth, and development [39].

Another study on 50 electrical gadgets reveals that the leachate is harmful to aquatic life. Acute toxicity assay, *Selenastrum capricornutum chronic algal* growth inhibition assay, Met plate acute test for heavy metal toxicity assay [40]. The impacts of hazardous components such as Pb, Cu, Sn, and Zn would create major human health and environmental concerns if PCBs were not properly disposed of and recycled. Previous research has included techniques for solidification and landfilling [43]. These techniques, however, contaminate the essence of the soil by decreasing the mass transfer rate of the interface and generating an atmosphere of pollution.

Metal Recovery from PCBs Followed by Chemical Leaching

There are numerous approaches, including as incineration, land filling, gasification, and pyrolysis processes

2. Hazardous toxic metals present in printed circuit boards and their Health effects

onstituents of Metals elements in PCBs	Occurrence	Health effects	Reference
Copper (Cu)	Present in PCBs and copper wires	• Headache, dizziness, irritation in eye, nose, mouth • It causes stomach cramps, liver damage	[33,34,39]
Lead (Pb)	Available in batteries, computer monitors and PCBs	• Effects children and pregnant women leads to significant growth problems. • Affects the • Reproductive, mental instability and damages human DNA • Skin damage, gastric and damage the nervous, headaches	[29,23,24,25, 26,27,28]
Zinc (Zn)	PCBs and Interior or CRT Screens, Batteries, luminous substances	• Cytotoxicity, ischemia and trauma • Reported as vomiting, diarrhea, bloody urine, liver failure, kidney failure and anemia	[35,13,36]
Tin (Sn)	PCBs, PWBs and CRTs	• Affects in Central Nervous System Disorders and Visual Defects	[38]
Nickel (Ni)	Present in Nickel-cadmium rechargeable Batteries.	• Lung misfunctioning, asthma • Skin allergy, carcinogenic effects,	[30,31,32,39]
Arsenic (As)	Gallium arsenide used lights	• Affecting breathing, increase in risk of blood cancer, liver and renal disease, reproductive health effects • Chronic effect lung cancer	[39]
Chromium (Cr)	Galvanized steel plates and Decorator	• Toxic in the environment, causing DNA damage and permanent eye impairment	[13,39]
Mercury (Mg)	Available in PCBs, Transmission devices in relays in buttons and lamps, batteries, Liquid Crystal Display	• Affect brain and skin disorders	[39]
Cadmium (Cd)	Available in chip resistors and semiconductors	• Affect the Reproductive and mental instability health effects	[23,31,25,26]

that have advantages in terms of cost, environmental impacts, and metal recovery. To remove metals from PCBs, chemical leaching has been routinely employed. One such research [42] involved the removal of the unique metal ion copper by the leaching agent ammonia persulphate (Aqua regia) followed by electro winning for 14 hours, with recorded findings showing Cu, Zn, and Ni recovery rates of 99, 60, and 9%, respectively. Effectively, the recovery of leaching liquids by electro deposition method is also efficient.These techniques, however, have certain downsides since they employ hazardous chemicals in the process, which would have a negative impact on the quality of the environment [43]. Another typical technique combines mechanical grinding, density separation, and acid leaching [44]. The experimental approach [45], which involves an ultrasonic acid leaching procedure, resulted in the recovery of many heavy metals from electroplating sludge. During the leaching process, less valuable metals (Cu-96.72%, Ni-97.77%, Zn-98%, Cr-53.03%, and Fe-0.44%, respectively) were separated from waste sludge. The experimental techniques essentially offered selective metal separation, and the schematic process flow diagram of ultrasonic enhanced leaching was presented [45]. Some research, however, used pyrolysis and thermo-chemical procedures to recover polymers and bulk metals from PCBs. There are several disadvantages to these pyrolysis and thermo-chemical methods, such as high heat needs (thermal cracking temperatures employed range from 470 to 800 °C polluted gas formations, and expensive prices [46].

One researcher [1] thoroughly investigated E-waste treatment approaches used in chemical and biochemical leaching methods based on numerous previous studies with various types of E-waste materials such as PCBs, PWBs, DVD players, cell phone boards, calculator scraps, TV scraps, and personal computer scraps. The aforementioned analysis recovers other metals such as Pb, Cu, Ni, Sn, Al, Fe, Au, Ag, and Zn. Chemical extraction and biological leaching procedures, according to the study, have their own advantages and disadvantages, and there may be various scientific, economic, and environmental reasons for selecting one approach over the other. Table 3 summarizes the different combined leaching solvents used. Study using H_2SO_4 and H_2O_2resulted in recovery of Cu 96.72%, Zn 98%, Cr 53.03% and Ni 97.7% [47], using the leaching agent HCl+ HNO_3, the removal of Cu 86.9% and Sn 98% [48, 49], using Sodium Cyanide, Cu 77.7%, Ag 51.6% and Au 47.9% recovered [50], Leaching solvents ammonium thiosulphate and copper sulfate are used to get Cu 78.8%, Zn 56.7% recovered [51] and H_2SO_4 +

Recovery data of metals with different leaching media

Leaching media	Cu	Sn	Pb	Ni	Au	Ag	References
H_2SO_4-NH_3	88.6	99.2	98	-	-	-	[46]
H_2SO_4-H_2O_2	96.77	-	-	-	-	-	[47]
HCl-HNO_3	86.9	92.7	93.5	-	-	-	[48]
HCl-HNO_3	92.7	-	-	-	-	-	[49]
Sodium Cyanide	-	-	-	-	-	-	[50]
Ammonium thiosulfate and copper sulphate	-	-	-	-	51.6	47.9	[51]
H_2SO_4-$CuSO_4$-NaCl	94%	-	-	-	-	-	[52]
HCl-$CuCl_2$-NaCl	-	-	-	-	58%	58%	[53]
$C_2H_4O_2$ & $C_6H_8O_7$	19.57%	-	-	-	64%	-	[54]
$CuSO_4.5H_2O$	98%	-	-	-	-	-	[55]
Thiourea leaching	-	-	-	-	-	-	[56]
Hydrogen peroxide	95%	-	-	-	90.8%	59.8%	[57,58]
EDTA	-	-	-	-	-	-	[59]
HCl, $FeCl_3$ and $CuCl_2$	-	20%	10%	-	-	-	[60,61,62]
			-	-	80%	-	[63]

NH_3 are Cu 88.6%, Zn 99.2%, Ni 98% recovered [46].

If hazardous chemicals are not properly disposed of, they can significantly contaminate the land and the natural environment [51]. With HCl-$CuCl_2$-NaCl as the solvent solution and different parameters adjusted with the use of RSM, Cu recovered 94%, Ni recovered 58%, and Fe recovered 58%. In contrast, hydrogen peroxide, $C_2H_4O_2$ and $C_6H_8O_7$ treatments showed poor metal dissociation, whereas HNO_3 increased metal solubility [52]. However, employing $CuSO_4.5H_2O$ as an oxidizing medium, the purity of precious metals (Cu) in PCBs is reported to be 98% [53]. The results indicated that utilizing Thiourea leaching media with varied adjusted settings, Au and Ag recovery from PCBs was 90.87 and 59.8%, respectively [54, 55]. 95% of copper was recovered using hydrogen peroxide as a solvent [56]. Chemical leaching also necessitates the use of different chelating agents to recover heavy metals, with EDTA as a leaching agent resulting in enhanced lead recovery [57]. Heavy metals including chromium, copper, zinc, and nickel are also recovered using EDTA [58]. Etching is also a type of strong chemical leaching reagent that entails the recovery of metals from waste PCBs using chemicals like HCl, $FeCl_3$, and $CuCl_2$ [59].

Through this focused extraction of copper, only tiny amounts of other metals may be retrieved. The PCB sample size of 4 cm × 4 cm resulted in the separation of Cu, Zn, Sn, and Pb with compositions of 117.33 mg/g, 28.97 mg/g, 10.41 mg/g, and 9.34 mg/g, respectively, when employing HCL as a leaching agent under specified conditions [60]. When compared to the usual PCB metal composition, the quantity of Zn and Pb leached was negligible. The grades of Cu, Pb, Zn, and Sn are 16%, 2%, 1%, and 1%, respectively, when crushed PCBs (size between 0.43 mm-3.33 mm) are leached with sodium cyanide solution [61]. The Response Surface Methodology is also used to improve experimental settings (RSM).Au and Cu were stated to have been [illegible] sulphuric acid and hydrogen peroxide and statistical optimization using RSM.

The recycling of PCBs is therefore a major issue, as [illegible] not only the recycling, reuse, and waste disposal but also the separation of valuable metals from their respective leaching media [60-62] is a an important aspect. Previous research findings have been recorded for the recovery of valuable metals from various PCB waste in various leaching media such as acid leaching, Aqua regia, NaOH, H_2SO_4+NH_3, H_2SO_4+H_2O_2, HCl+HNO_3, HCl+HNO_3, Sodium Cyanide, Ammonium thiosulphate, and copper sulfate, H_2SO_4-$CuSO_4$-NaCl, HCl-$CuCl_2$-NaCl, $C_2H_4O_2$&$C_6H_8O_7$, $CuSO_4.5H_2O$, Thiourea leaching, Hydrogen peroxide, EDTA, HCl, $FeCl_3$ and $C_6H_8O_7$. These leaching media have individual dissolving and dissolving properties of metals and also have advantages and disadvantages for the particular metal recovery method. As a result, several researchers have successfully extracted heavy metals from printed circuit boards using hydrometallurgical techniques. However, these processes are associated with certain disadvantages that limit their application to the treatment of [illegible] common limitations of hydrometallurgical methods for recovering PCBs are listed here [63].

- Hydrometallurgical processes are sluggish and time-consuming in general, and they have an influence on the recycling economy. Concerns have been raised about the hydrometallurgical process's economics when compared to pyrometallurgical techniques for extracting heavy metals from PCBs.
- Because cyanide leakage causes pollution of aquatic water, which poses a serious health risk to the population, strict safety requirements are required.

...de effective recovery of heavy metals takes longer when size reduction procedures are used. These kinds of procedures result in a considerable drop in overall revenue.

- The use of Halide and thiourea leachates are very difficult to implement due to strong corrosive acids, oxidizing conditions, and high cost for leaching of heavy metals from PCBs.

The recovery of hazardous metals from PCBs is considerably more evident, and prior research has mostly focused on the metals Cu and Pb. The focus currently is on selective leaching to recover trace amounts of metals including Sn, Cr, Ni, Zn, Au, and Fe. Because of the various metallic components present, the concentration of the leached solution fluctuates depending on the leaching agent, making concentrated metal separations extremely challenging. Numerous researches in various nations have concluded that informal metal recovery techniques are dangerous owing to toxic contamination, non-technical processes, environmental impacts, and human health implications dependent on the type of metal recovery medium utilized for recovery. This analysis, therefore, overcomes these kinds of drawbacks. It initially deals with the recovery of heavy metals from PCBs using aqua regia as a two-stage leaching agent (the first stage is HCl and HNO_3 and the second stage is HCl and H_2SO_4) and optimizes various operating parameters. Furthermore, experimental studies are carried out using the RSM to determine the recovery of heavy metal ions by central composite design (CCD). Currently, the electro-winning, electro-refining, and ion-exchange methods are used for the recovery of liquefied metals, but these methods have disadvantages. This study adsorption technique is therefore suggested to address environmental impacts and other disadvantages. Bentonite Clay (Bent) and Peanut Shell Carbon (PSC) are used in this study to be pristine. Thermally and chemically active types were used as adsorbents for the recovery of heavy metals from a leached solution.

Bioleaching of Heavy Metals From PCBs

Bioleaching of heavy metal ions, in particular, is regarded as one of the most promising technologies, with a cost-effective approach compared to chemical leaching and energy demands [64, 65]. The mainly acidophilic bacterial population plays an essential role in the bioleaching of heavy metals from PCB waste. *Acidithiobacillus ferrooxidans, Acidithiobacillus thiooxidans,* and *Leptospirillum ferrooxidans* [66] microorganisms, for example, are more actively involved in the breakdown of organic and inorganic materials.The most significant heavy metal breakdown microorganisms [67] are iron and sulfur-oxidizing chemolythotrophs (effectively increasing and automatically fixing CO_2 from the atmosphere). Bio-leaching is a cutting-edge technique for removing heavy metals from PCBs. *Acidithiobacillus ferrooxidans* [68], *Thiobacillus thiooxidans* [1, 69-72], and *Acidithiobacillus* [73-75] were shown to be extremely effective in the leaching process. Because they are both ecologically friendly and cost-efficient, these treatments have shown to be highly effective. Bacteria and fungi [60] that are *chemolythotrophic* [76], *heterotrophic* [77], and *haemophilic* [78] have been evaluated for the mobilization of basic metals such as Cu, Zn, Fe, Ni [1]. Scientists are concerned about this approach since it uses fewer reagents, uses less power, produces less pollution, and has other advantages. Rapid economic growth in Asia and the growing transboundary movement of secondary resources will progressively require both 3R endeavours (Reduce, Reuse, Recycle) in each country and private control of foreign material cycles, according to an excellently reviewed current status and research on e-waste issues in Asia [1]. In earlier research, critical analysis was performed by bacterial heavy metal leaching from different wastes, as shown in Table 4.

Previous research on the dissociation of heavy metals by microorganisms has used leaching operations under different controlled circumstances, such as temperature, duration, concentrations, and pH. Experiments are carried out with the appropriate variety of irons and the addition of a complexing agent, ensuring ideal circumstances for the microbe's development in the different parameters listed above. For the recovery of heavy metals from PCBs by microbial leaching, these conditional

Table 4. Recovery data of metals with different Microbes

Leaching media used (*Microbes/Species*)	Heavy metals Recovery %						References
	Cu	Sn	Zn	Pb	Cr	Ni	
Acidithiobacillus ferrooxidans and Acidithiobacillus thiooxidans	95.6	92	90	-	-	-	86
Aspergillus Niger	65	65	-	-	-	-	86
Penicillium simplicissimum	-	-	94	91	-	93	86
Acidithiobacillus ferrooxidans	99	-	-	-	-	-	87
Acidithiobacillus thiooxidans	74.9	-	-	-	-	-	87
Acidithiobacillus ferrooxidans and Acidithiobacillus thiooxidans	99.9	-	-	-	-	-	87
Sulfobacillus thermosulfidooxidans	89	-	83	-	-	81	89
Thermosulfido oxidans sulfobacillus Thermoplasma acidophilum	86	-	80	-	-	74	90

...eters are used [79-82]. *Acitithiobacillus ferrooxidans* ... *Acitithiobacillus thiooxidans* are Cu 95.6%, Sn ...%, Zn 90% recovered, *Aspergillus Niger* Cu 65% and Sn 65% recovered, *Penicillium simplicissimus* mare Zn 94%, Pb 91% recovered, Ni 93% recovered [78], *Acidithiobacillus ferrooxidans* 99% recovered, *Acidithiobacillus thiooxidans* 74.9% recovered, *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* are Cu 99% recovered [83], *Sulfobacillus thermosulfidooxidans* are Cu 89%, Zn 83%, Ni 81% recovered [84], *Sulfobacillus thermosulfidooxidans*, *Thermo plasma acidophilus bacteria* are Cu 86%, Zn 80%, Ni 74% [85-86] separated from metal concentrates of waste PCBs.

As a result of the above research, it was determined that streaking bacteria were isolated species of bacterial colonies using Nutrient Broth and bacteria cultured on PCB waste. The suggested microbial strategy is the most powerful and capable of resolving the issues with chemical leaching approaches for PCB metal recovery. Bioleaching procedures are a great alternative to chemical leaching and developing technology that keeps the environment beautiful.

Conclusions

Every year, a large amount of PCB trash is rapidly increased across the world, causing significant human and environmental concerns. Inefficient, informal treatment and recycling methods such as soil filling, incineration, pyrolysis, and electrolysis have contributed to a wide range of environmental concerns in recent years, and may involve different methodologies, economic, and environmental factors for selecting successful techniques over others. Previous study, for example, identified a number of methods that were effective in terms of recovery rates, metal ions, and environmental advantages from the PCBs treatment process.However, based on the findings of leaching medium, this research suggests that some chemical reagents are given higher metal recovery rates, while some investigations have recorded a minimal recovery rate. In comparison to bioleaching, prior chemical leaching procedures required significant investments in leaching reagents, high temperature, pressure, and operations to operate. In this study, formal approaches such as leaching (two-stage chemical leaching and bioleaching) and adsorption were recommended for recovering heavy metals from PCBs.

Chemical leaching involves the recovery of heavy metals from PCBs by using aqua regia as a two-stage leaching agent (the first stage is HCl and HNO_3 and the second stage is HCl and H_2SO_4) and optimizing various operating parameters. Leached metals are extracted by electro-winning, electro-refining, and ion exchange processes, but these processes have disadvantages. It is therefore proposed to resolve environmental impacts and other disadvantages. Chemical leaching, however, has some drawbacks due to the existence of toxic reagents that could have toxic effects on human health (human brain, central nervous system, issues with the kidneys and bones, skin allergies, cancers, and headaches) and environmental effects.

The Bioleaching technique is an important tool for reducing the metal content of PCBs. It's eco-friendly and easy to treat. PCBs will be treated with *Acidithiobacillus ferrooxidans* and *Acidithiobacillus thiooxidans* for metal dissociation. Leaching would optimize the different parameters, such as contact time effects, pulp density, particle size, and temperature, to verify the optimal conditions and estimate the feasibility of bioleaching of PCB heavy metals. Hence, this review proposed technique has a big advantage in environmental protection as bioleaching does not result in the generation of any toxic wastes into the environment and leads to safer disposal of waste.

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Case Study

Forest fire prediction using IoT and deep learning

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Abstract

Forests are the most important part of the human life as it maintains an environmental balance to get proper rain and sufficient resources accordingly. The major threat raising in forest areas is a fire, in which the forest fire scenario is the most important cause to destroy many trees and animals within a few hours. The technologies such as deep learning, IoT and smart sensors provide a lead to design a smart forest fire prediction scheme to support nature to manage the ecosystem in the proper way. This paper is intended to design a forest fire prediction mechanism. Learning-based forest fire prediction scheme (LBFFPS) based on deep learning has been proposed for the prediction in the timely manner. This approach identifies the forest fire based on the sensor unit associated with the system with respect to the learning logics. A digital camera with 1020-megapixel has adapted for the surveillance. The sensor unit consists of two different and powerful sensors such as smoke identification sensor and the temperature and humidity monitoring sensor. Based on these two sensors the surrounding smoke presence, temperature and the humidity level have been identified and reported using the NodeMCU controller. In this application, internet of things (IoT) is associated, to provide a wireless communication alert ability. It collects and maintain the information regarding the forest provided by the sensor unit to the remote cloud server environment. The NodeMCU microcontroller has an inbuilt WiFi to acquire the internet signals and provides a constant bridge between the sensor unit and the server end for remote data maintenance. The proposed logic is helpful to identify the fire signals and inform the respective person to take appropriate action to prevent the forest fire.

Keywords

Deep learning, Forest fire prediction, Internet of Things (IoT), LBFFPS.

1.Introduction

Forests are valuable concerns for human existence as well as societal progress because they help maintain the universe's entire ecosystem stability [1–3]. Unfortunately, forest fire scenarios occur regularly as a result of certain unregulated human activity and erratic environmental circumstances [4, 5]. Such fires are by far the most destructive to environmental assets as well as the human ecology [6–9]. In this situation, forest fire scenarios have significantly increased in regularity as a result of global warming, mortal activity and certain other things [10, 11].

The identification and surveillance of such forest fire scenarios have become a worldwide problem for communities dedicated to forest fire scenario management. As a consequence of environmental temperature, the chance of igniting a fire rises exponentially. Forest fire scenarios are rising in frequency and it will continue to do so. To assist firefighters on the battlefield, a technique for early identification of forest fire scenarios is provided in this paper. This technique seems to be more exact than other means of communications, including such observation structures as well as surveillance systems. This paper is based on the collection of atmospheric wireless data communication from the

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Greedy Weight Matrix Topological Adaptive Ad Hoc On-demand Multipath Distance Vector Protocol for QOS Improvement in MANET

R. Praveenkumar[1,2] · S. Anbukaruppusamy[3]

Accepted: 7 February 2022

Abstract

The Mobile Ad Hoc Network (MANET) dominates the wireless network environment and the output of MANET is significantly affected by the flexibility and limitation of the resources. The mobility of the node will have a strong effect on two parameters: one is connectivity efficiency and another one is node resource limitations. These two will result in congestion and due to this, it will be very difficult to develop a routing MANET service quality (QoS) protocol. The QoS is needed to enhance the network behavior and for the guaranteed network performance. The high-speed mobility of node and regular disturbance in the connection, the QoS performance is affected, so a MANET routing protocol is very much essential to act in accordance with the changes in how the devices are arranged among the network to support QoS. Here we propose a protocol named as Greedy Weight Matrix Topological Adaptive Ad hoc On-demand multipath distance vector(GWMTA-AOMDV) that can be adapted to assist QoS with high-speed node travel. In this, by using an algorithm for selecting a consistent path, it is possible to have the stable relation between node and node resources (power, maximum amount of data transferred, and length of a queue) for the trajectory selection. In addition, the proposed protocol will monitor and respond to the quick topological changes by using updated routing technique concept which includes link interference forecasting feature, on the basis of periodic probabilistic forecasts of link stability. The results achieved by the proposed concepts indicate the significant improvement in QoS measurements for the channel proposed (packet transmission rate, delay in source to destination and packet received ratio). The user end satisfaction in terms of network aspects has a urge regarding MANET's high-speed demonstrates by our protocol designed for multipath reactive protocol.

Keywords Mobile Ad hoc network · Quality of service · Greedy weight matrix topological adaptive Ad hoc on-demand multipath distance vector

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RATE DIFF - Difference in rates on usage of card internationally
CLG - Cheque Clearing Transaction
EDC - Credit transaction through EDC Machine
SETU - Seamless electronic fund transfer through AXIS Bank
Int.pd - Interest paid to customer
Int.Coll - Interest collected from the customer

24

Faculty Incentives Detail Form EEC/IQAC/Research/Form 3.1.02-R00

EXCEL ENGINEERING COLLEGE

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Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A+" Grade (3.26) and Recognised by UGC (2f &12B)
Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 8/3/2022

FACULTY INCENTIVE FORM

Staff Name	Dr. N. VENKATACHALAM			
Designation/ Department	Associate professor / Mechanical Engineering			
Publication Category	SCI/SCIE/WoS ✓	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500) ✓
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	—
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	—
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	3.48	10.46488/NEPT 2022. V21 i01.033		—
Approved amount in Rs.	Rs. 1,500/-			

Investigator / Coordinator 08/3/22

Dept. IRRP Coordinator 08.03.22

N. Natarajan HOD 8/3/22

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator 18/3/22

Added in Google Scholar

IRRP Chief-Coordinator 22/3/2022

Director - IRRP 22/3/2022

Director (Admn.) / Principal 22/3/22

may be proceeded

Executive Director 24.03.22

Amount Received Already — NIL

24/3

AXIS BANK

N VENKATACHALAM
Joint Holder :- -
EXCEL ENGINEERING COLLEGE NH 47 NEW, SALEM
MAIN ROAD, PALLAKKAPALAYAM SANKARI VI
NAMAKKAL DISTRICT
NAMAKKAL
TAMIL NADU-INDIA

637303

Customer No :853282802
Scheme :EASY ACCESS SALARY ACCOUNT
Currency :INR

Statement of Axis Account No :914010028068229 for the period (From : 08-04-2022 To : 09-04-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			48266.44	
08-04-2022		SRI RENGASWAMY /Excel Payment		1500.00	49766.44	4893
09-04-2022		UPI/P2A/209995473660/KUMARAVEL/Federal B/D Kadir		100000.00	149766.44	4893
-04-2022		NEFT/MB/AXMB220994923036/Saradha/INDIA N /4th paym	50000.00		99766.44	4893
		TRANSACTION TOTAL	50000.00	101500.00		
		CLOSING BALANCE			99766.44	

Unless the constituent notifies the bank immediately of any discrepancy found by him/her in this statement of Account, it will be taken that he/she has found the account correct.

The closing balance as shown/displayed includes not only the credit balance and / or overdraft limit, but also funds which are under clearing. It excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective available balance. For any further clarifications, please contact the Branch.

We would like to reiterate that, as a policy, Axis Bank does not ask you to part with/disclose/revalidate of your iConnect passord,login id and debit card number through emails OR phone call Further,we would like to reiterate that Axis Bank shall not be liable for any losses arising from you sharing/disclosing of your login id, password and debit card number to anyone. Please co-operate by forwarding all such suspicious/spam emails, if received by you, to customer.service@axisbank.com

With effect from 1st August 2016, the replacement charges for Debit card and ATM card applicable on Current accounts have been revised. To know more about the applicable charges,please visit www.axisbank.com

Deposit Insurance and Credit Guarantee Corporation (DICGC) insurance cover is applicable in all Bank's deposits, such as savings, current, fixed, recurring etc.* up to maximum amount of Rs 5 Lakh including principal &interest both* (*for exceptions and details please refer http://www.dicgc.org.in/)

REGISTERED OFFICE - AXIS BANK LTD,TRISHUL,Opp. Samartheswar Temple, Near Law Garden, Ellisbridge, Ahmedabad . 380006.This is a system generated output and requires no signature.

Legends :

ICONN - Transaction trough Internet Banking
VMT-ICON - Visa Money Transfer through Internet Banking
AUTOSWEEP - Transfer to linked fixed deposit
REV SWEEP - Interest on Linked fixed Deposit
SWEEP TRF - Transfer from Linked Fixed Deposit / Account
VMT - Visa Money Transfer through ATM
CWDR - Cash Withdrawal through ATM
PUR - POS purchase
TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
RATE.DIFF - Difference in rates on usage of card internationally
CLG - Cheque Clearing Transaction
EDC - Credit transaction through EDC Machine
SETU - Seamless electronic fund transfer through AXIS Bank
Int.pd - Interest paid to customer
Int.Coll - Interest collected from the customer

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Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A" Grade (3.26) and Recognised by UGC (2f &12B)

Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 23/02/2022

(16)

FACULTY INCENTIVE FORM

Staff Name	V. ARUN ANTONY			
Designation/Department	Asst. Prof. / ECE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	—
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	—
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	—	202241006319		—
Approved amount in Rs.	5,000/-			

23/02/22
Investigator / Coordinator

23/2/22
Dept. IRRP Coordinator

23/2/22
HOD

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

Verified 23/2/22
R&D Coordinator

Added in google scholar 23/2/22

8/3/2022
IRRP Chief-Coordinator

8/3/2022
Director - IRRP

Director (Admin.) / Principal

May be approved

Executive Director

already Received Amount - NIL

8/3

5/3/22

119A

पेटेंट कार्यालय
शासकीय जर्नल

OFFICIAL JOURNAL
OF
THE PATENT OFFICE

निर्गमन सं. 06/2022	शुक्रवार	दिनांक: 11/02/2022
ISSUE NO. 06/2022	FRIDAY	DATE: 11/02/2022

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :07/02/2022

(21) Application No.202241006319 A

(43) Publication Date : 11/02/2022

(54) Title of the invention : NEW DIGITAL SOFTWARE TECHNOLOGY TO IDENTIFY THE VARIETY OF DANGEROUS VIRUS

(51) International classification	:H04L0029060000, G06F0021570000, C12N0007000000, G06F0021550000, G06F0021560000
(86) International Application No Filing Date	:PCT// :01/01/1900
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

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Address of Applicant :V.Arun Antony, Assistant Professor, Department of Electronics and Communication Engineering, Excel Engineering College, Komarapalayam, Namakkal – 637 303 ---------- ----------

Name of Applicant : NA

Address of Applicant : NA

(72)Name of Inventor :

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5)D.Gowthami | Assistant Professor | Department of Electronics and Communication Engineering | Nandha College of Technology | Erode

Address of Applicant :D.Gowthami, Assistant Professor, Department of Electronics and Communication Engineering, Nandha College of Technology, Erode-638 052 ---------- ----------

(57) Abstract :

ABSTRACT This invention represents the computer software manufacturing sector. Computer is a useful technology. Many things are done by this. A computer failure due to a virus attack is really a serious problem. Computer software stops working due to virus. To overcome this problem, we envision new software which protects us from such dangerous cyber attacks. With the solution given in the drawing and description of this technology, we can protect our computer. For the computer to work properly, all the software on the computer should be updated on time. This should work with 100% capacity. Studying the drawings and descriptions of this technology, it is clear that the solution we have presented is, in fact, appropriate for computer security. So far 10 big dangerous viruses have been identified. Our aim is to try to protect the computer from dangerous viruses. Our goal is to create new kind of software.

No. of Pages : 13 No. of Claims : 4

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इंडियन बैंक Indian Bank

इलाहाबाद ALLAHABAD

STATEMENT OF ACCOUNT

Customer Name	: Arun Antony Varghese VARGHESE	CIF	: 3264296109
Address	: 16-34 CHETTICHARVILAI Kalkulam KANNANOOR,Kanniyakumari Tamil	Account Type	: SB
		Account Status	: Active
State	: TAMILNADU	Account Number	: 6575218330
PIN	: 629158	Currency	: INR
Mobile No	: 919486644170	Home Branch	: VERKILAMBI
Email ID	: Not Available	Branch IFSC	: IDIB000V120
Branch Code	: 02510		

Statement Period : From 21/02/2022 To 24/03/2022 Statement Date: 25/03/22 10:19:24

TRANSACTION DATE	PARTICULARS	WITHDRAWALS	DEPOSIT	BALANCE
24/03/2022	SRI RENGASWAMY E/AXISP00274198459 NEFT/UTIB	-	5000.00	6411.81 CR
21/03/2022	UPI TRANSFER/208032821647/Srini	-	300.00	1411.81 CR
17/03/2022	UPI TRANSFER/207608111174/UPI	1050.00	-	1111.96 CR
16/03/2022	NEFT/UTIB	-	666.00	2161.96 CR
15/03/2022	UPI TRANSFER/207419491141/Det	-	60.00	1495.96 CR
15/03/2022	UPI TRANSFER/207416123976/UPI	-	100.00	1435.96 CR
13/03/2022	UPI TRANSFER/207218318103/UPI	140.00	-	1335.96 CR
12/03/2022	UPI TRANSFER/207119249716/UPI	80.00	-	1475.96 CR
11/03/2022	UPI TRANSFER/207013782138/UPI	-	100.00	1555.96 CR

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Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

Date : 28.02.2022

FACULTY INCENTIVE FORM

Staff Name	V. RAMYA			
Designation / Department	AP / CSE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	-
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	-
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	-
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	-
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	-	202241003757		-
Approved amount in Rs.				

Investigator / Coordinator

Verified 28/2/22
Dept. IRRP Coordinator

HOD 28/2/22

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator — Added in google Scholar.

3/3/2022
IRRP Chief-Coordinator

Director (Admin.) / Principal — Already Received Amount

Executive Director

Office of the Controller General of Patents, Designs & Trade Marks
Department of Industrial Policy & Promotion
Ministry of Commerce & Industry
Government of India

(http://ipindia.nic.in/index.htm)

INTELLECTUAL PROPERTY INDIA (http://ipindia.nic.in/index.htm)

Application Details

APPLICATION NUMBER	202241003757
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	23/01/2022
APPLICANT NAME	1 . DR.A.SASI KUMAR 2 . V.RAMYA 3 . DR RAVISHA N S 4 . DR.T.K.SHAIK SHAVALI 5 . LINCY N L 6 . NALINAKSHI M 7 . DR. K. SENTHIL KUMAR 8 . DR. R. RAMESH 9 . DR. J. SANTHOSH 10 . JITENDRANATH GORAI 11 . ACHUTHA JC 12 . RAJEEV RANJAN
TITLE OF INVENTION	ANALYSIS AND MONITORING OF NETWORK TRAFFIC USING DEEP LEARNING TECHNIQUES
FIELD OF INVENTION	COMMUNICATION
E-MAIL (As Per Record)	sgowthami12@gmail.com
ADDITIONAL-EMAIL (As Per Record)	sgowthami12@gmail.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	25/02/2022

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :23/01/2022

(21) Application No.202241003757 A

(43) Publication Date : 25/02/2022

(54) Title of the invention : ANALYSIS AND MONITORING OF NETWORK TRAFFIC USING DEEP LEARNING TECHNIQUES

(51) International classification	H04L0029060000, C06N0003040000, C06N0003080000, H04L0012240000, H04L0012260000
(86) International Application No Filing Date	PCT: 01/01/1900
(87) International Publication No	NA
(61) Patent of Addition to Application Number Filing Date	NA NA
(62) Divisional to Application Number Filing Date	NA NA

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4)DR.T.K.SHAIK SHAVALI
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6)NALINAKSHI M
7)DR. K. SENTHIL KUMAR
8)DR. R. RAMESH
9)DR. J. SANTHOSH
10)JITENDRANATH GORAI
11)ACHUTHA JC
12)RAJEEV RANJAN
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Address of Applicant : NA
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9)DR. J. SANTHOSH
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11)ACHUTHA JC
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Address of Applicant :RAJEEV RANJAN, ASSISTANT PROFESSOR, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, BAKHTIYARPUR COLLEGE OF ENGINEERING, BAKHTIYARPUR, DISTRICT- PATNA, BIHAR-803212

(57) Abstract :
Analysis and monitoring the real time network traffic using deep learning techniques is the proposed invention. The invention aims at analyzing big data with lesser time and also monitoring the data packets using deep packets inspection (DPI) techniques. To achieve the expected efficacy in analytics, deep neural networks are applied with decision tree algorithm. The network traffic is seen as data packets and they are keenly analyzed for the purpose of authentication and authorization.

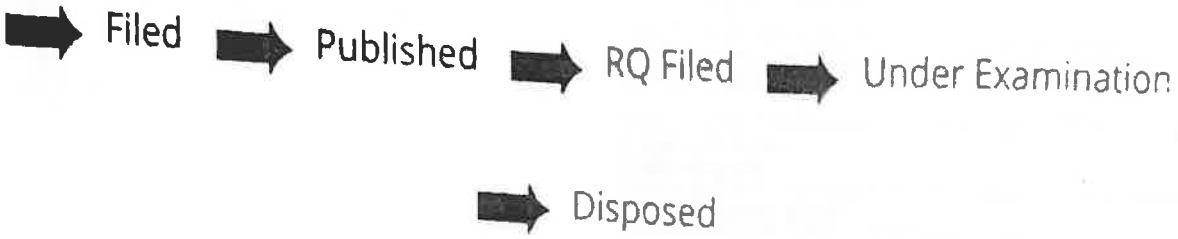
No of Pages : 11 No of Claims : 6

Application Status

APPLICATION STATUS

Awaiting Request for Examination

View Documents



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123

Gmail

ramya jagan <ramyaajaagan@gmail.com>

Notification from Axis Bank

1 message

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Reply-To: alerts@axisbank.com
To: ramyaajaagan@gmail.com

Thu, Mar 24, 2022 at 6:38 PM

INR 2500.00 credited to A/c no. XX3815 on 24-03-22 at 18:34:20 IST. Info- SRI RENGASWAMY /EXCEL MAGZINE PAYMENT. Avl Bal- INR 29920.64 - Axis Bank

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28 - 5 (124)

Faculty Incentives Detail Form | EEC/IQAC/Research/Form 3.1.02-R00

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NBA (Aero., CSE, ECE & Mech.), NAAC with "A+" Grade (3.26) and Recognised by UGC (2f &12B)

Komarapalayam - 637303

Centre for Industrial Relation and Research Projects (IRRP)

(19)

Date : 05.03.2022

FACULTY INCENTIVE FORM

Staff Name	R. PREETHI				
Designation / Department	ASSISTANT PROFESSOR / ECE				
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)	
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)	
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	Patent-Granted	Applicant (Rs.15,000)	Inventor (Rs.10,000)		
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Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	—	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	—	
Participation	IITs/NITs/up to NIRF Top 100 colleges	Registration Fee - Actual (Max.Rs.5,000)	—		
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme	NIRF Ranking		
	—	202241008813	—		
Approved amount in Rs.	Rs.5,000/=				

Investigator / Coordinator (signed 5/3) | for Dept. IRRP Coordinator (signed 05/03/2022) | HOD (signed 5/3/22)

SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

R&D Coordinator (signed) Added in Google Scholar | IRRP Chief-Coordinator (signed 8/3/2022)

Director - IRRP (signed 8/3/2022) | Director (Admin.) / Principal (signed 8/3/22) | Executive Director (signed 15/03/22) May be provided

Amount Received Already - Rs 1950/- for 4 week Induction (signed 8/3/2022)

Dr Geetha (signed 18/3) 20/3

(12) PATENT APPLICATION PUBLICATION

(19) INDIA

(22) Date of filing of Application :20/02/2022

(21) Application No.202241008813 A

(43) Publication Date : 04/03/2022

(54) Title of the invention : AN IMAGE PROCESSING BASED TECHNIQUE TO HELP HR PREDICT THE PULSE OF WORKING ENVIRONMENT

(51) International classification :C06K0009000000, C06T0007000000, C06Q0010100000, A61B0005160000, C06Q0010060000

(86) International Application No :PCT//
Filing Date :01/01/1900

(87) International Publication No : NA

(61) Patent of Addition to Application Number :NA
Filing Date :NA

(62) Divisional to Application Number :NA
Filing Date :NA

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4)RAJKUMAR.R
5)VEERRAJU SAMPENGA
6)GAURAV MORGHARE
7)BHAGWANDAS PATEL
8)DR BRIJ MOHAN SINGH
9)B.HEMALATHA
10)DR. J. EUGENE
11)GURU PRASAD PASUMARTHI
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Address of Applicant : NA
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12)REENA THAKUR
Address of Applicant :ASSISTANT PROFESSOR/MEDI-CAPS UNIVERSITY, A. B. ROAD, PIGDAMBER, INDORE ---------- ----------

(57) Abstract :
An image processing-based technique to help HR predict the pulse of working environment. The invention aims at studying and analyzing the stress and mood swings of employees using their body language and mutual communication with their colleagues. The invention is implemented using image processing algorithms and predict the work and mood of employees.

No. of Pages : 12 No. of Claims : 5

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Application Details

APPLICATION NUMBER	202241008813
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	20/02/2022
APPLICANT NAME	1 . R.PREETHI 2 . DR. FARHAT ALI SYED 3 . DR.S.SRIDEVI 4 . RAJKUMAR.R 5 . VEERRAJU SAMPENGA 6 . GAURAV MORGHARE 7 . BHAGWANDAS PATEL 8 . DR BRIJ MOHAN SINGH 9 . B.HEMALATHA 10 . DR. J. EUGENE 11 . GURU PRASAD PASUMARTHI 12 . REENA THAKUR
TITLE OF INVENTION	AN IMAGE PROCESSING BASED TECHNIQUE TO HELP HR PREDICT THE PULSE OF WORKING ENVIRONMENT
FIELD OF INVENTION	COMPUTER SCIENCE
E-MAIL (As Per Record)	sgowthami12@gmail.com
ADDITIONAL-EMAIL (As Per Record)	sgowthami12@gmail.com
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	04/03/2022

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Currency :INR

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Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			194.97	
24-03-2022		UPI/P2M/208328095142 EURONETGP/ICICI Ban/UPI	179.00		15.97	1449
24-03-2022		SRI RENGASWAMY EXCEL MAGZINE PAYMENT		5000.00	5015.97	1449
24-03-2022		ATM-CASH/SBI KAVUNDAPADI/BHAVANI/240322	5000.00		15.97	1449
25-03-2022		UPI/P2A/208456597490/KANNAN E/Bank of B/UPI		200.00	215.97	1449
		TRANSACTION TOTAL	5179.00	5200.00		
		CLOSING BALANCE			215.97	

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CWDR - Cash Withdrawal through ATM
PUR - POS purchase
TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
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Date : 08/03/2022

FACULTY INCENTIVE FORM

Staff Name	A. ANITHA RANI			
Designation/Department	Asst. professor / ECE			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000)	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	
Additional details (Attach supporting documents)	Impact Factor	~~DOI~~ / Patent No./ ~~Scheme~~		NIRF Ranking
		202241009176 A		
Approved amount in Rs.	FIVE THOUSAND ONLY / Rs. 5000/-			

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8/3/22
Dept. IRRP Coordinator

8/3/22
HOD

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R&D Coordinator Added in Google Scholar

IRRP Chief-Coordinator

Director - IRRP

Director (Admin.) / Principal

Executive Director

Amount Received already — Nil 8/3/22

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(19) INDIA
(22) Date of filing of Application :21/02/2022

(21) Application No.202241009176 A
(43) Publication Date : 04/03/2022

(54) Title of the invention : PRECISION ANALYSIS OF DIGITAL AGRICULTURE

(51) International classification :G06Q0050020000, H04L0029080000, A01G0009140000, A01G0025000000, G01W0001020000
(86) International Application No Filing Date :PCT// :01/01/1900
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

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3)Dr. D.USHA
4)Dr. B.SENTHIL KUMAR
5)Dr. THIPPESWAMY G R
6)Dr. ASHOK KUMAR P S
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Address of Applicant : NA
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(57) Abstract :
In this present scenario, the conventional information base worldview does not have sufficient capacity for the information delivered by Internet of Things (IoT) gadgets prompts the need of distributed storage. These information's are broke down with the assistance of Big Data mining procedures. Cloud based enormous information investigation and the IoT innovation performs a significant job in the attainability investigation of perceptive horticulture. Perceptive or accuracy horticultural frameworks are assessed to play a fundamental job in further developing farming exercises. Cell phone use is extremely normal by everybody, including the farmers. In that, in the everyday existence of farmers the Information and Communication Tools (ICT) assume a fundamental part to get the horticultural Data. The IoT has different applications in Digital Farming area like observing the yield development, determination of the compost, water system choice emotionally supportive network, and so on. Agriculture is one of the fundamental enhancements of our public. Soil is vital for related agriculture. The creation of soil varies from one soil to another. The Growth of Crops is disappeared with those substance capacities of soil. Picking the appropriate kind of vegetation for that particular kind of soil is moreover fundamental. AI methodologies might be utilized to arrange the soil assortment measurements this endeavor gives a dirt recovery device, which takes, enter photo as a Soil pictures taken from area Using Deep learning information on set of rules to arrange soil and moreover exhort the harvest data and deal the weather pattern. Numerous farmers need money and need to dispose of their items as quickly as time permits. In this research, IoT gadget is utilized to detect the horticultural information and it is put away into the Cloud information base.

No. of Pages : 13 No. of Claims : 6

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Application Details

APPLICATION NUMBER	202241009176
APPLICATION TYPE	ORDINARY APPLICATION
DATE OF FILING	21/02/2022
APPLICANT NAME	1 . Mrs. A. ANITHA RANI 2 . Dr. M.VIMALADEVI 3 . Dr. D.USHA 4 . Dr. B.SENTHIL KUMAR 5 . Dr. THIPPESWAMY G R 6 . Dr. ASHOK KUMAR P S
TITLE OF INVENTION	PRECISION ANALYSIS OF DIGITAL AGRICULTURE
FIELD OF INVENTION	COMPUTER SCIENCE
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ADDITIONAL-EMAIL (As Per Record)	
E-MAIL (UPDATED Online)	
PRIORITY DATE	
REQUEST FOR EXAMINATION DATE	--
PUBLICATION DATE (U/S 11A)	04/03/2022

Application Status

APPLICATION STATUS	**Awaiting Request for Examination**

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ANITHARANI J
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637303

Customer No :850008477
Scheme :EASY ACCESS SALARY ACCOUNT
Currency :INR

Statement of Account No :913010039174411 for the period (From : 23-03-2022 To : 25-03-2022)

Tran Date	Chq No	Particulars	Debit	Credit	Balance	Init. Br
		OPENING BALANCE			**13479.04**	
24-03-2022		SRI RENGASWAMY /EXCEL MAGZINE PAYMENT		5000.00	18479.04	170
24-03-2022		UPI/P2A/208303987812/Sankar N/State Ban/Payment	270.00		18209.04	170
		TRANSACTION TOTAL	**270.00**	**5000.00**		
		CLOSING BALANCE			**18209.04**	

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CWDR - Cash Withdrawal through ATM
PUR - POS purchase
TIP/ SCG - Surcharge on usage of debit card at pumps/railway ticket purchase or hotel tips
RATE.DIFF - Difference in rates on usage of card internationally
CLG - Cheque Clearing Transaction
EDC - Credit transaction through EDC Machine
SETU - Seamless electronic fund transfer through AXIS Bank
Int.pd - Interest paid to customer
Int.Coll - Interest collected from the customer

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++++ End of Statement ++++

30-S (131)

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Centre for Industrial Relation and Research Projects (IRRP)

Date: 11/11/21

FACULTY INCENTIVE FORM

Staff Name	V. Karthikeyan			
Designation / Department	Assistant Professor / Mechanical Engg			
Publication Category	SCI/SCIE/WoS	1st Author (Rs.5,000) ✓	2nd Author (Rs.3,500)	3rd Author (Rs.1,500)
	Scopus/AU-Annexure I	1st Author (Rs.2,500)	2nd Author (Rs.1,500)	3rd Author (Rs.1,000)
	Patent-Published	Applicant (First) (Rs.5,000)		Inventor (Rs.2,500)
	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
Research Grants	Upon Receiving Fund	PI / Co PI	10 %	
Program Fund	Greater than Rs.50,000/-	Coordinator	5 %	
Consultancy	Greater than 2 Lakhs	Coordinators	50% Faculty + 50% Management	
Participation	IITs/NITs/up to NIRF Top 100 colleges		Registration Fee - Actual (Max.Rs.5,000)	
Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
	7.134	IJRSET/218545 www.doi.org		
Approved amount in Rs.	Rs. 5,000/-			

V. Karthikeyan 11/11/21
Investigator / Coordinator

11/11/21
Dept. IRRP Coordinator

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SUBMITTED TO THE PRINCIPAL

The details were checked and updated. The above mentioned incentive amount is recommended for approval.

13/11/21
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16/11/21
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6/12/21

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Design and Performance Analysis of Air Pre heater for Water Tube Boiler to improve its Efficiency

V. Karthikeyan, M. Sambathkumar, K. Arulkumar

Department of Mechanical Engineering, Excel Engineering College, Komarapalayam, Namakkal. Tamilnadu, India

Article Info
Volume 8, Issue 6
Page Number : 01-06

Publication Issue :
November-December-2021

Article History
Accepted : 05 Nov 2021
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ABSTRACT

Air preheater is a heat transfer surface in which air temperature is raised by transferring heat from other media such as flue gas which is coming from boiler exhaust. The paper presents the design of regenerative –air preheater to designed to meet specific performance requirements, using the software application CFD (Computational Fluid Dynamics) / CADD. An analytical study was planned to find out the various heat transfer performance parameters like outlet and inlet air temperature of the air preheater and the boiler, Pressure drop inside the Air preheater and the boiler heat transfer coefficients, heat transfer rate, overall heat transfer coefficient and Velocity of the air and flue gas also Conduction and convection modes of heat transfer were found. These heat transfer parameters are critical in designing and functioning of the air Preheater and to calculate the efficiency of the boiler.

Keywords : CFD, Pre-heater, Regenerative, Boiler

I. INTRODUCTION

A high pressure water tube boiler is a type of boiler in which water circulates in tubes heated externally by the fire. Fuel is burned inside the furnace, creating hot gas which heats water in the steam-generating tubes. In smaller boilers, additional generating tubes are separate in the furnace, while larger utility boilers rely on the water-filled tubes that make up the walls of the furnace to generate steam. The heated water then rises into the steam drum. Here, saturated steam is drawn off the top of the drum. In some services, the steam will reenter the furnace through a super heater to become superheated. Superheated steam is defined as steam that is heated above the boiling point at a given pressure. Superheated steam is a dry gas and therefore used to drive turbines, since water droplets can severely damage turbine blades. Cool water at the bottom of the steam drum returns to the feed water drum via large-bore 'down comer tubes', where it pre-heats the feed water supply. To increase economy of the boiler, exhaust gases are also used to pre-heat the air blown into the furnace and warm the feed water supply. Such water tube boilers in thermal power stations are also called steam generating units. The older fire-tube boiler design, in which the water surrounds the heat source and a gas from combustion pass through tubes within the water space, is a much

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This is to certify that **V. Karthikeyan, M. Sambathkumar, K. Arulkumar** have published a research paper entitled ***'Design and Performance Analysis of Air Pre heater for Water Tube Boiler to improve its Efficiency'*** in the International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Volume 8, Issue 6, November-December-2021.

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R. Selvaraju, M. Bhuvaneswari

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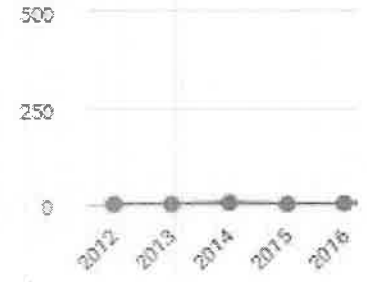

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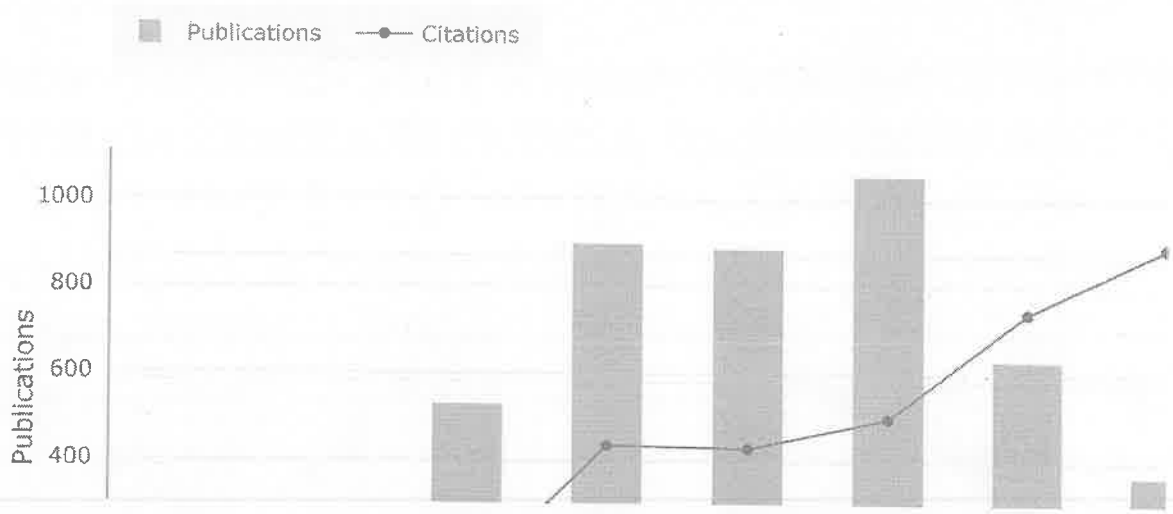

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Additional details (Attach supporting documents)	Impact Factor	DOI / Patent No./ Scheme		NIRF Ranking
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(57) Abstract :
An apparatus for generating electrical power. The apparatus comprises of a sustainable energy generator from the natural resources: sun and wind. The apparatus comprises a plurality of solar energy collectors for generating electricity from solar energy; a plurality of wind turbines for generating electricity from wind energy; a support structure having arms extending radially from a vertical shaft; wind turbines surrounded with solar panels are affixed to the arms; and the support structure comprising solar and wind power generators resembles a tree structure not affecting the beauty of nature and vegetation. The power generator is eco-friendly and produce noise-free and carbon-free power for the beneficial of the residential and commercial areas that are not suitable for the construction of traditional wind turbines.

No. of Pages : 21 No. of Claims : 10

Dr. V.S. Arulmurugan (146)

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A Group Teaching Optimization Algorithm for Priority-Based Resource Allocation in Wireless Networks

S. Sreethar[1] · N. Nandhagopal[2] · S. Anbu Karuppusamy[2] · M. Dharmalingam[3]

Accepted: 19 October 2021

Abstract
In wireless networks, resource allocation (RA) is considered as a very important and it is used to enhance the wireless and communication networks performances. D2D (Device-to-device) communication based RA is expressed as a MINLP (mixed integer nonlinear programming) issue. Existing strategies based on RA cannot offer integrative consideration to spectrum efficiency, QoS (Quality of Service) for networks with mixed traffic. When multiple users with various priorities utilize the similar network resource, then it is necessary to utilize the resource on priority basis. In this work, priority based RA is introduced using the GTOA (group teaching optimization algorithm) by combining spectrum resources from unlicensed and licensed spectrum bands to the D2D users in the mixed traffic scenarios. The GTOA optimization framework maximizes all the D2D pair's utility functions by reducing the whole energy utilization. The network contains the two types of users such as QoS services and BE (best effort) services. Along with several traffics, the function of utility is described for users. The priorities are assigned to the QoS services by the developed GTOA based RA mechanism for performing the resource allotment. As related to other current approaches, the GTOA procedure devours lessor complexity. For the real-time traffic, the developed GTOA can spontaneously assurance the QoS constraint and also owing to the utility function the developed GTOA system create the balance among fairness and throughput for BE traffic users. As a result, by executing RA, the resources and a user can be deliberated. The priority based RA is performed using MATLAB. Simulation outcomes show that the developed GTOA is most appropriate for the priority based RA to the D2D users in the mixed traffic scenarios.

Keywords Priority · Optimization algorithm · Mixed traffic · D2D communication · Resource allocation

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Published online: 30 October 2021

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IOT SMART SENSING DEVICE FOR SENSITIVE NANOCLUSTERS MODIFICATIONS IN SENSING PROPERTIES

NAIM SHAIKH[1*], A.VASANTHARAJ[2], K. S. RAGHURAM[3], MOHAMMAD HAIDER SYED[4], ASHOK KUMAR KOSHARIYA[5] AND RAVICHANDRAN.S[6]

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ABSTRACT

Biotechnologies increasingly gaining traction potentially effective as well as cost-effective critical diagnosis instruments enabling premature illness identification, which includes essential enabling individualized healthcare yet welfare monitoring. Moderate identification for particular specific health biomarkers (pM concentration) has shown might be highly effective in assessing diseases development during treatment. Comprehensive algorithms including non - linear along with non-insights are needed that investigate overall efficacy for a particular given medication, improve medication, including connecting indicator levels that underlying ethology. Because of bioengineering advances made

throughout detecting component falsification, smartphone incorporation, interoperability, packaged foods, but rather detection effectiveness at this same moment of people caring (People enjoy going color), genetic tests can now be tailored to this same needs of disorder administration but rather physician malady profiles, resulting through customized diagnoses. Initiatives that develop state-of-the-art biosensor equipment potential next quasi diagnoses approach remain ongoing. Having these throughout mind, our contemporary commentary piece discusses tailored medical treatment planning and control analyzing techniques that may offer people having improved wellness, overall the overarching goal of managing future healthier destiny inside the suitable way.

Keywords: Biotechnologies, nanostructures, and pathophysiology are some of the terms used in this paper

INTRODUCTION

This biomarker industry was expected to grow due to technical developments with a continual requirement made among specialists. Only some attributes of nan electronics but instead nan devices had already been incorporated into this same falsification of succeeding mechanisms for improving a detector based with configurable important functionalities, including bifunctional nanomaterials, slender cinema, biomimetic polymeric components, microelectronic amplifiers, this same emergence of microchannel configurations, smartphone containers, but instead sure forth **[1-2]**.

Laser reactive dye-labeled sensor Bt hairpin was coupled with carbon Aunanoarray during a recent study, with helps significantly improve sensitivity chemistry mixed electromechanical mechanisms (Emr) enabling Spectral analysis dependent bioimaging **[3]**. These photonic Metal particles contribute towards the acoustic intensification of overall Spectroscopic information, whilst diamond concurrently amplifies overall notification using another molecular process that aligns this same energetic content and graphite matching that for an overall designated molecule.

Highly well composite SERS potential benefits and harms technology might prove beneficial in studying biological processes. Network with Spore Phenomena **[4]** is another proposal enabling researching microscopic electronics enabling cross-functional including cross monitoring, atmospheric management including hazardous chemicals, including contamination. This same IoBNT provides this same ability could send healthcare statistics information

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23-01-2022		GST @18% on Charge	1.12		121949.56	170
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https://doi.org/10.1007/s12046-021-01644-x

RE-PUPIL: resource efficient pupil detection system using the technique of average black pixel density

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MS received 3 October 2020; revised 13 January 2021; accepted 8 May 2021

Abstract. The pupil detection algorithm plays a key role in the non-contact tono-meter, auto ref-keratometry and optical coherence tomography in medical ophthalmology diagnostic equipment. A major challenge associated with pupil detection techniques is the use of conventional neural networks based on algorithms, integro-differential operator and circular hough transform, which leads to inefficient use of hardware resources in FPGA. To overcome this, using an average black pixel density technique, the proposed human eye pupil detection system is used to easily recognize and diagnose the human eye pupil area. Double threshold, logical OR, morphological closing and average black pixel density modules are involved in the proposed solution. To test the proposed method, the near infrared (NIR) iris databases are being used, namely: CASIA-IrisV4 and IIT Delhi and have achieved 98% percent accuracy, specificity, sensitivity. The proposed work was synthesized via Zynq XC7Z020 FPGA and the results are compared with previous approaches.

Keywords. Digital logic OR; double threshold; morphology; average black pixel density; pupil detection.

1. Introduction

This research work is concerned with the real-time detection of human eye pupil by the application of pupil monitoring for ophthalmology diagnostic equipment. Eyes are a rich human resource capable of interacting with the external world. Abnormal eye movement is well known to provide an indicator of ophthalmology conditions such as diabetic retinopathy, glaucoma, etc. Also, when it is focused on a target, the eye is never fully at rest. Detecting the location of the pupil will help bring the eye to the correct place to analyze the diseases. An eye tracking system typically employs electrical and computing equipment to track eye movement. Evaluation of eye movement is a critical component of a diagnostic or screening system. To meet real-time constraints, it is possible to use FPGAs for the implementation phase of image processing tasks for pupil detection. Due to the strong computational complexity of pupil monitoring, it is difficult to achieve the real-time operation of the general purpose sequential processor, so hardware acceleration is unavoidable. The Circular Hough Transform (CHT) [1] algorithm, which is an established older algorithm, was used to decide the radius of the pupil on the eye image, which has more computational and hardware complexity in-terms of FPGA resources. However, integrating the CNN for Iris detection and diagnosis systems using FPGA still faces serious challenges in terms of computational complexity and memory requirements. The drawback of the edge map generation technique [1] is the second implementation of the sobel filter, which increases the sophistication of hardware and the constant threshold for the database (CASIA Iris). To address these disadvantages, the average black pixel density algorithm is proposed instead of the CHT, Edge map generation, CNN techniques. The approach of this research work is organized into six sections. In section 2, various literature works are discussed. Section 3 gives inside information about the proposed technique and dataset descriptions. Section 4 explains the performance evaluations of the different iris datasets with the proposed method. Section 5 describes the FPGA synthesis result, experimentation of the proposed technique and its hardware utilization. The conclusion is presented in section 6.

2. Relevant researches

Several improvements and effective hardware architectures for the pupil detection system have been suggested by several researchers and scientists. Pupil detection by threshold, morphology operations [2, 3]

*For correspondence
Published online: 08 June 2021

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Article

Tech Science Press

Trust Management-Based Service Recovery and Attack Prevention in MANET

V. Nivedita[1,*] and N. Nandhagopal[2]

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Abstract: The mobile ad-hoc network (MANET) output is critically impaired by the versatility and resource constraint of nodes. Node mobility affects connection reliability, and node resource constraints can lead to congestion, which makes the design of a routing MANET protocol with quality of service (QoS) very difficult. An adaptive clustering reputation model (ACRM) method is proposed to improve energy efficiency with a cluster-based framework. The proposed framework is employed to overcome the problems of data protection, privacy, and policy. The proposed ACRM-MRT approach that includes direct and indirect node trust computation is introduced along with the master recovery timer (MRT) for achieving an efficient service recovery process, and its service recovery time is calculated through the service execution process. During data transmission in MANET, various types of attacks can occur, of which the Sybil attack is the most dangerous. To address this problem, this paper proposed a method for the detection and prevention of Sybil attacks using a resilient scheme. The proposed method can improve system energy efficiency and address security, safety, and privacy issues of wireless network applications. Finally, the performance of the proposed method is evaluated regarding the time delay, throughput, energy efficiency, control overhead, and detection rate. The simulation results show that the proposed ACRM-MRT method can effectively improve the time delay, throughput, energy efficiency, control overhead, and detection rate compared to the existing methods. Topological change adaptive ad-hoc on-demand multi-path distance vector (TA-AOMDV)and ad-hoc on-demand multi-path distance vector (AOMDV) are simulated on the NS2 platform for the data rate in the range of 4–40 kbps and the number of nodes in the range of 10-100. The proposed method can reduce the service recovery time in the case of faults during service execution and can be used in real-time applications traffics since it is mostly affected by failure through the occurrence of delay and loss of packets.

Keywords: MANET; routing algorithm; adaptive clustering reputation model; master recovery timer; sybil attack; data protection; privacy and policy

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ORIGINAL PAPER

SARC: Search and rescue optimization-based coding scheme for channel fault tolerance in wireless networks

S. Sreethar[1] · N. Nandhagopal[2] · S. Anbu Karuppusamy[2] · M. Dharmalingam[3]

Accepted: 28 June 2021

Abstract
Energy efficiency in wireless network has received significant attention in the field of academia and industry. In additions, error correction and detection have become important aspects and it have been receiving considerable attention in wireless network application. In this paper, we have proposed Search and Rescue (SAR) optimization algorithm based faulty tolerant coding technique. Actually, SAR imitates the explorations behaviour of humans during search and rescue operations. The performance of SAR is better in terms of complexity, fast convergence and accurate optimal solution finding, thus we have selected SAR in our work for the optimization of fault tolerant coding process in wireless networks. Search and Rescue optimized Coding (SARC) scheme mainly works by means of codeword length and the data (sample) length for detection and correction purpose of consecutive and non-consecutive bit errors. The simulation is carried out and validated using MATLAB platform and the complexity of proposed SARC is analysed with some other existing coding techniques.

Keywords Encoding · Decoding · Search and rescue · Wireless network · Error correction · Error detection · Fault-tolerant coding scheme

1 Introduction

In the wireless network filed, the technology of telecommunication has become essential in recent years [1]. The power usage is an important issues because of increasing usage of wireless communication network. The wireless network designing aims to save energy and reduce power consumption, which presents in the network [2]. The Internet of Things (IoT) and energy efficiency in the wireless network has gotten important attention from the industry. In additions, error correction and detection have become important aspects in IoT and wireless network application [3]. The best network with complete reliability and accuracy must have the option to transfer the data from one node to another node or from the source to destination. Therefore, at the destination, the errors must be corrected and detected for the reliable network [4].

The packet dropping occurs if the data is retransmitted, which leads to network degradation. In real-time applications, the problem of packet dropping is very critical [5]. However, providing highly reliable service, high packet delivery, high throughput and high data rate service is very challenging due to different qualities of wireless channels, frequent topology changes, interference, broadcast nature of wireless transmission and unreliable wireless links [6]. In order to overcome these issues, many error correction and detection schemes like Low-density parity-check codes (LDPC) [7], Bose, Chaudhuri, and Hocquenghem (BCH) [8], Reed Solomon (RS) [9] and Turbo codes [10] were investigated during the past years to enhance the wireless network system reliability. In a communication system, designed codes to be utilized as a channel coding method, each of one has own advantages.

Hamming codes are the earliest error correction and error detection codes that can correct the single-bit error

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4	201104058	20CS059	KUNDAN KUMAR	9523776569	Will come on this week
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6	201104091	20CS092	RAJNISH KUMAR SAH	7546050977	Coming in nov last week
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Automated Brain Imaging Diagnosis and Classification Model using Rat Swarm Optimization with Deep Learning based Capsule Network

A. Vasantharaj[*,**], Pacha Shoba Rani[†,††], Sirajul Huque[‡], K. S. Raghuram[§,‡‡], R. Ganeshkumar[¶,§§] and Sebahadin Nasir Shafi[‖,¶¶]

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Earlier identification of brain tumor (BT) is essential to increase the survival rate of the patients. The commonly used imaging technique for BT diagnosis is magnetic resonance imaging (MRI). Automated BT classification model is required for assisting the radiologists to save time and enhance efficiency. The classification of BT is difficult owing to the non-uniform shapes of tumors and location of tumors in the brain. Therefore, deep learning (DL) models can be employed for the effective identification, prediction, and diagnosis of diseases. In this view, this paper presents an automated BT diagnosis using rat swarm optimization (RSO) with deep learning based capsule network (DLCN) model, named RSO-DLCN model. The presented RSO-DLCN model involves bilateral filtering (BF) based preprocessing to enhance the quality of the MRI. Besides, non-iterative grabcut based segmentation (NIGCS) technique is applied to detect the affected tumor regions. In addition, DLCN model based feature extractor with RSO algorithm based parameter optimization processes takes place. Finally, extreme learning machine with stacked autoencoder (ELM-SA) based classifier is employed for the effective classification

** Corresponding author.

of BT. For validating the BT diagnostic performance of the presented RSO-DLCN model, an extensive set of simulations were carried out and the results are inspected under diverse dimensions. The simulation outcome demonstrated the promising results of the RSO-DLCN model on BT diagnosis with the sensitivity of 98.4%, specificity of 99%, and accuracy of 98.7%.

Keywords: Deep learning; Brain tumor; medical imaging; image segmentation; capsule network; Rat swarm optimizer.

1. Introduction

Medical imaging provides accurate diagnostics which strongly relies in today's healthcare industry and it has gained more attention owing to the significant role in healthcare applications. Computer vision has great success in many medical scenarios, such as surgical planning, medical imaging, and many more. And for tumors identification, computer vision provides enhanced results more accurately and supports for many medical tasks efficiently. Further, computer vision in healthcare system helps to reduce the needless diagnostic procedures and provides treatment more effectively. The development in medicinal techniques assist medical professionals in facilitating an effective e-healthcare system to the patient. There are several medical fields in which e-health care system is one of the most valuable ones.[1] Computer vision-based applications of biomedical imaging receive maximum attention as they offer recognizable data to the radiotherapist for better treatment relevant challenges. Various medical imaging methods involve Magnetic Resonance Imaging (MRI), X-ray, Computed Tomography (CT), and Ultrasound, have a major impact on diagnoses and treatment procedure of persons. The creation of abnormal set of cells within the brain/nearby regions can result in the initiation of brain tumors (BT).[2] The abnormal cells can quickly process in the brain and influence the person's health. Brain imaging analyses, diagnoses, and treatment with accepted medical imaging methods are the major purpose of study for the scientist, radiotherapist, and medical professionals.[3] The analyses of brain image are an essential factor due to diagnosing diseases in brain named BT that are fatal and is the reason for a huge amount of mortality in developing countries.[4] The BT is widely categorized into two kinds: tumorous cancers, so-called malignant tumors, and non-tumorous cancers, so-called benign tumors. Tumors that are malignant are cancerous and they form as cells expand out of control. In a metastasis process, the malignant tumors may develop rapidly and feast to other body parts. However, the non-tumorous cancers are noncancerous soft tissue tumor, it grows slowly and does not spread to the other body parts. Several image processing approaches were utilized for diagnoses and treatments. Segmentation is an essential stage in image processing method and is utilized for extracting the affected area of brain tissue from MRI.[5] Segmenting the affected area is one of the significant processes for diagnosing tumors, treatment, and calculation of treatment results. A huge amount of automatic and semi-automatic segmentation approaches is utilized for segmenting cancer. The automatic and semi-automatic segmentation is significant for surgical treatment and disease diagnosis.

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(57) Abstract :

This invention discloses a novel architecture of asynchronous system on chip (A SoC). The major steps involved in designing an A-SoC comprises defining a system architecture, designing a front-end logic design and physical design. Each step further comprises various operations to accomplish the A-SoC design. The system architecture is defined by providing a functional specification which comprises various features required, development scenario, hardware requirements and design parameters. After defining the functional specification, the system is studied for implementation feasibility, timing criticality, and application flexibility to arrive at the hardware partitioning. At the system architecture definition stage functional specification is translated into a document which details different sub blocks, interfaces, handshake signals, verification strategies, and timing across blocks, the sub blocks used are reduced instruction set computing (RISC) processor, digital signal processor (DSP) processor, and Fast Fourier Transform (2D-FFT) engine. Machine details are designed at block level which defines exact procedure to realize function/feature that are compliant to design guidelines, verification strategies, synthesizability and testability.

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	Patent-Granted	Applicant (Rs.15,000)		Inventor (Rs.10,000)
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Development of a new improved structural integrity assessment correlation for throughwall axially cracked 90° shape imperfect pipe bends under in-plane opening bending moment

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ABSTRACT

In the present work, a systematic and detailed investigation on the plastic collapse load of 90° structurally defected pipe bends under in-plane opening bending was performed using three-dimensional finite element (FE) analyses. The analysis considers the material behavior as elastic-perfectly plastic (EPP) with a large strain formulation option. The structural defects in the pipe bend models included were ovality at mid-portion and throughwall axial crack (TAC) at the crown portion. Ovality varied from 0 to 20 % with 5 % increment at each step while the normalized throughwall axial crack (TAC) parameter length a/D from 0 to 1 with an increment of 0.2 in each step. As per the recommendation of clause NB-3213.25 in Section III of ASME B&PV code, Twice-elastic slope (TES) technique was extensively used to determine the plastic collapse moment (PCM) for all simulated pipe bend models from their corresponding reaction moment versus angular rotation curve. The analysis illustrated that both ovality and throughwall axial crack (TAC) significantly affected PCM load of pipe bends and when combined, the effect was almost double. In pipe bend models with thin walls and short bend radius, both ovality and TAC were found to be more vulnerable and the effect decreased with an increase in bend radius and thickness. The experimental results for pipe bend's plastic collapse moment available in open literature were used to validate the present finite element (FE) procedure and a new improved structural assessment correlation proposed for pipe bends with ovality and TAC defects.

1. Introduction

Right-angled (90°) pipe bends or elbows are commonly employed in a variety of technical applications such as petroleum refineries, chemical processing plants, pharmaceuticals, food processing plants, conventional and nuclear power plants [1]. Elbows are most vulnerable to failure among other piping components due to the complexities of loading and geometric structure. Mourad and Younan [2] proved that elbows and pipe bends have nearly 5-20 times more flexibility than straight pipes with identical geometry and material properties. Hence pipe bends offer necessary flexibility (cushion-like effects) to the piping system and protect the pipeline by reducing reaction forces and moments caused within the pipeline by local deformation [3]. Plastic collapse occurs in the structure when the pipe bend deformation exceeds the elastic limit and should be avoided. To establish the allowable limit of plastic loads on structures, the concepts of plastic limit load analysis are used [4]. Maximum load carrying capacities are estimated for structures with respect to failure and therefore knowledge on plastic limit loads is essential. Crack like defects occur not only during the manufacturing and installation stages but also as a result of prolonged normal continuous operation with cyclic loading and material degradation. These are the major causes for crack or flaw initiation and propagation that greatly reduce the pipe bend's failure load [5]. Hence in a pressurized piping system, assessment of structural integrity of pipe bends with crack is a primary safeguard task and the measurement of plastic loads for cracked pipe bends plays an important role in integrity assessment technology. Further, accidents in power plants can occur due to complex loads and weak parts in pipe bends resulting in significant losses. The leak-before-break (LBB) concept employs the analysis of throughwall cracks on the principal heat transport piping systems of pressurized reactors in nuclear industries [6]. The presence of large

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Available online 5 August 2021

ujjivan SMALL FINANCE BANK

(173)

Name	: BALAKRISHNAN SUNDARAM	Customer Id	: 1181701977
Address	: NH 544 SALEM MAIN ROA D,PALLAKKAPALAYAM,SAN KARI WEST POST	Mobile Number	: 9894094049
		Account Number	: 1181110080052017
City	: SALEM	Currency	: INR
State	: TAMIL NADU	Account Scheme	: SAVINGS BANK - SALARY
Pincode	: 637303	Branch Name	: KOMARAPALAYAM
Country	: INDIA	Branch Id	: 1181
Nomination	: M.REVATHI	MICR Code	: 638761005
Mode of Operation	: SELF	IFSC Code	: UJVN0001181

Statement of Account from September 20,2021 to September 21,2021

Date	Particular	Chq./Ref.no.	Withdrawal	Deposit	Balance Amount
2[illegible]9-21	NEFT Cr SRI RENGASWAMY EDUCATIONAL TRUST AXISP0022	UJ792126		5000.00	5075.23
20-09-21	Limit Exceed ATM Charges in other Banks	UJ80367	23.60		5051.63
21-09-21	UPI/DR/126417910338/PYTM/paydth5848@paytm/UPI	UJ1462746	270.00		4781.63
21-09-21	UPI/DR/126473575243/PYTM/paydth5848@paytm/Oid152	UJ1518735	242.00		4539.63

Summary of Accounts as on September 21,2021

Account Type	Account no	Balance Summary
SAVINGS BANK - SALARY	1181110080052017	4539.63

Generated on : 10-03-2022
Generated by : 1181701977

This is a computer generated statement and does not require any signature

DO NOT SHARE your Personal Net Banking User ID, password, OTP and card details like card number, PIN and CVV. The Bank will never ask these details. Sharing such details could lead to unauthorized access to your account.

Ujjivan Small Finance Bank Limited

Balance Amount displayed in this statement includes funds earmarked for hold and/or under clearance (if applicable).Thisstatement excludes the amount marked as lien, if any. Hence the closing balance displayed may not be the effective availablebalance. Contents of this statement will be held true and valid unless the Bank is notified immediately.

SMS code BAL to 9243232121 for balance enquiry
Give a missed call on 9243012121 for balance enquiry or 9243032121 for mini statement

For help, contact our toll free number : 1800-208-2121
www.ujjivansfb.in

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KOMARAPALAYAM - 637303

6.3.2. Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year

Academic Year 2021 - 22

Name of Teacher	Name of Conference / Workshop attended for which financial support was provided	Name of the professional body for which Membership fee was provided	Amount of support
Mr.S.Sandhiyapriya	Thermal Engineering		750
Ms.V.Kowsalya	Thermal Engineering		750
Mr.N.Sreenivasaraja	NATURE AND PROPERTIES OF MATERIALS	NPTEL	1100
Mr.K.Vijaybabu	SMART MATERIALS FOR PRODUCT DEVELOPMENT		750
Mr.J.Senthil Kumar	SMART MATERIALS FOR PRODUCT DEVELOPMENT		750
Mr.S.Prabhu	SMART MATERIALS FOR PRODUCT DEVELOPMENT		750
Mr.J.Balakannan	Advaned Manufacturing Technology		900
Mr.S.Prashanth	Decentralizing Trust with Blockchain Technology		750
Mrs.T.Muthumari	Decentralizing Trust with Blockchain Technology		750
Mr.K.Arul Kumar	Decentralizing Trust with Blockchain Technology		750
Mr.S.Balasundaram	FUTURISTIC RESEARCH IN MECHANICAL ENGINEERING		1000
Mr.M.Sanjay	FUTURISTIC RESEARCH IN MECHANICAL ENGINEERING		1000

EXCEL ENGINEERING COLLEGE NAAC

EXCEL ENGINEERING COLLEGE AERONAUTICAL ENGINEERING KOMARAPALAYAM-638 183

HOD / AERONAUTICAL ENGINEERING
EXCEL ENGINEERING COLLEGE
KOMARAPALAYAM - 637 303

S. No.	Name of the Faculty	Name of the program	Date	Amount (in Rs.)	Faculty Sign	HOD Sign
1.	Ms. S. Sandhiya priya	Thermal Engineering	07.06.2021 to 11.06.2021	750	S.Sp	
2.	Ms. V. Kousalya	Thermal Engineering	07.06.2021 to 11.06.2021	750		
3.	N. Sreenivasaraja	Nature and Properties of Materials	18.08.2021	1100	N.Sreeni	

S. No.	Name of the Faculty	Name of the program	Date	Amount (in Rs.)	Faculty sign	HOD Sign
4.	K. VIJAY BABU	Smart Materials for Product development	13.09.21 to 17.09.21	750		
5.	J. SENTHIL KUMAR	Smart Materials for Product development	13.09.21 to 17.09.21	750		
6.	S. Prabhu	Smart Mateeials for product development	13.09.21 to 17.09.21	750		
7.	J. Balakannan	Advanced manufacturing technology	13.9.2021 to 18.9.2021	900		
8.	S. prashanth	Decentralizing with block chain Technology	21.02.2022 to 23.02.2022	750		

9.	T. Muthumari	Decontralizing with block Chain Technology	21.02.2022 to 23.02.2022	750		
10.	K. Arul kumar	Decentralizing with block chain technology	21.02.2022 to 23.02.2022	750		
11.	S. Balasundaram. S	Futuristic Research in Mechanical Engineering	8/8/2022 to 13/08/2022	1000		
12	N. Sanjay	Futuristic Research in Mechanical Engineering	8/8/2022 to 13/08/2022	1000		

EXCEL ENGINEERING COLLEGE AO/C

Sno.	Date	Name of the Faculty	Funding event	Organizer	Date (from / To)	Funded Amount	Mode of Payment	Staff sign	Approval	
									HOD	Principal
1.	17.11.21	Mr. Vellingiri VR	Alternative Fuel	AICTE Training and learning academy	22.11.2021 - 26.11.2021	₹1800	Cash	17.11.21	17/11/21	
2.	14.12.21	Mr. Bharath V	Biomass to Fuels, chemicals and value added products for sustainable and Environmental Future	AICTE Training and learning academy	20.12.2021 - 24.12.2021	₹2200	Cash	14/12/21	14/12/21	

S.no.	Date	Name of the faculty	Funding Event	Organizer	Date (From/To)	Funded Amount	Mode of Payment	Staff sign	Approval	
									HOD	Principal
3.	18.10.21	Mr. Manojprabhu C	Challenges and Innovative Technique in Concrete Structures	Jyothi Engineering College	28.10.2021 - 24.10.2021	₹2300	Cash	18/10/21		
4.	13.4.22	Ms. R. Saranya	Best practices	Centre for faculty development Anna University	18.04.2022 - 24.04.2022	₹1450	Cash	13/4/22		

5.	18.4.22	Mr. Rameshkumar S	Best Practices	IQAC Thirumalai Nayakar college	18.04.2022 - 21.04.2022	₹1900	Cash		

FACULTY DEVELOPMENT PROGRAMME

S.NO	FACULTY NAME	TITLE	From date	TO date	Amount	Signature
1.	M. Geetha	Artificial Intelligence and its applications	25 Jan 2022	29 Jan 2022	500	
2	Mosesk	Artificial Intelligence and its application	25 Jan 2022	29 Jan 2022	500	
						HOD / AP

S.NO	NAME OF THE FACULTY	TITLE OF THE EVENT	DATE	AMOUNT IN RS	FACULTY SIGN	HOD SIGN
1.	Ms. M. K. Prabavathi	Bio-Medical Engineering and Computing Technologies (ICBECT 22)	From: 21-3-2022 To: 22-03-2022	800 ₹	M.K.P.V	
2.	Ms. T. Susikala	International Workshop on Nanofibre Based Bio-Medical Healthcare Materials for Infection Control	From: 20-4-2022 To: 22-4-2022	1500 ₹	T.S.K	
3.	Ms. Jini Thomas	6th International Conference on trends in electronics and Information (ICOEI 2022)	From: 28-4-2022 To: 30-4-2022	1200 ₹		
4.	MR. Suraj Kumar Sah	4th National Conference on Emerging Trends and Challenges in BioMedical Engineering	From: 24-5-2022 To: 25-5-2022	1000 ₹		

5.	Mr. V. Boobalan	Fourth International Conference on Electrical Computer and communication Technologies (ICECCT)	From: 15.9.2021 To: 17.9.2021	1500 ₹	V Boobalan	
6.	Mrs. K.P. Aarthy	2nd International Conference on Smart Data Intelligence (ICSMDI-2022)	From: 11.4.2022 To: 12.4.2022	1000 ₹	K.P. Aarthy	
7.	Mrs. S. Dhiviya	International conference on Electric, Electronic and communication Technology	From: 26.8.2022 To: 27.8.2022	1200 ₹	S. Dhiviya	
8.	Dr. Balasubramanian Balavibathan	Advances in Medical Informatics	From: 16.8.2021 To: 20.8.2021	1500 ₹		

6.3.2 Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year

Name of teacher	Name of conference/ workshop attended for which financial support was provided	Name of the professional body for which membership fee was provided	Amount of support
Mrs P.Narmatha	Digital Image Processing	NPTEL	1000
Ms.Theivanayaki	Digital Electronics and Microprocessor	NPTEL	1000
A.Anitha rani	Machine Learning in production	Coursea	1000
Dr G.Prakash	Introduction to Machine Learning	NPTEL	1000
Ms.K.Tamilarasi	Fundamentals of Wireless Communication	NPTEL	1000

HEAD OF THE DEPARTMENT
Electronics And Communication Engineering
Excel Engineering College
Komarapalayam - 637 303.

S.No	Name of Faculty	Course details	Amount	Sign.
1.	P. Narmatha	Digital Image processing NPTEL - OCT	RS 1000	
2.	A. Anitha Rani	Machine Learning in production - Coursea - OCT	RS 1000.	
3.	Dr. G. Prakash	Introduction to m/c Learning NPTEL - Jan	RS 1000.	
4.	MS. S. Theivana - kayi	Digital Electronics and Microprocessor NPTEL - Jan	RS. 1000	
5.	MS. K. Tamilaras	fundamentals of wireless communication NPTEL - Jan	RS. 1000.	

HEAD OF THE DEPARTMENT
Electronics And Communication Engineering
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6.3.2 Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year			
Name of teacher	**Name of conference/ workshop attended for which financial support was provided**	**Name of the professional body for which membership fee was provided**	**Amount of support**
C.RAJESWARI	MODEL QUALITY EVALUATION OF ADVANCED DISTRIBUTION MANAGEMENT SYSTEM BASED ON SMART GRID ARCHITECTURE MODEL ON IOT	–	500
M.R.MOHAN RAJ	VOLTAGE SAG ENHANCEMENT THROUGH GRID CONNECTION ALONG WITH HYBRID PV-WIND POWER SYSTEM USING BATTERY AND AI BASED DYNAMIC VOLTAGE RESTORER	—	500
M.R.MOHAN RAJ	REDUCED HARMONIC USING MULTILEVEL INVERTER TECH BASED SOFT COMPUTING METHOD	——	500

Dr.V.S.ARULMURUGAN, B.E.,ME.,Ph.D.,
Professor & Head
Department of Electrical & Electronics Engineering,
Excel College of Engineering and Technology,
Komarapalayam, Namakkal-Dt.

S.NO	FACULTY NAME	Paper Name	Fund Received	Faculty Sign	HOD Sign.
1.	C. Rajeswari	Model Quality Evaluation of Advanced distribution management System based on Smart Grid Architecture Model on IoT (BIT)	500		
2.	M.R. MohanRaj	Reduced Haumonic Using multilevel Inverter tech Based Soft computing method.	500		
3.	M.R. MohanRaj	Voltage Sag Enhancement through Grid connection Analog with hybrid PV-wind Power system Using battery and AI Based Dynamic voltage Restorer.	500.		

S.NO	Name of the faculty	Title of the event	Type of Event	Date & Location	Amount (in Rs)	Faculty signature	HOD signature
1.	E. NIVETHA	Advancements in Bio-technology & Chemical Engineering	Faculty Development Programe	25/08/2021 Excel Engineering college	Rs, 1000/-		
2.	E.NIVETHA	Recent opportunities, breakthrough and challenges in food Processing Industries	Webinar	13/10/2021 Excel Engg College	Rs. 500/-		
3.	M. Raja	Hybrid Learning for education 5-0	Faculty Development Program	16/12/2021 to 22/12/2021 Excel Engg college (Autonomous)	Rs 500/-	M. Raja	

S.NO	Name of the Faculty	Title of the Event	Type of Event	Date & Location	Amount (in Rs)	Faculty Sign	HOD Sign
4	Dr. M.P. Murugesan	Toxic metal Recovery from waste Printed circuit boards A Review of Advanced approaches for sustainable treatment methodologies Vol No: 22 No: 1 PP 1-9, Feb 2022	journal publication	01.02.22 – 28.02.22	₹ 5000/-		
5.	Dr. M.P. Murugesan	A comparative review on recovery of Heavy metals from PCB's by chemical & Bioleaching Vol-23 No: 1 PP 90-98 Feb 2022.	journal Publication	01-02-22 – 28-02-22	₹ 5000/-		
6.	Dr. M. Indumathi	Advances in Quality assurance and hygienic production of animal origin food	e-Training	17-01-2022 to 28-01-2022	Rs 1000/-		

workshop	15.02.2022	Rs 1000/-	M. Raja	
webinar	12/04/2022	Rs 800/-		
7.	M. Raja	Application of Artificial intelligence in food Processing		
8.	Dr. M. Indumathi	citrus not enough. A webinar call on post harvest handling value chain management		

S. No	Faculty Name	Title of The Event / Seminar / FDP / Workshop	Attended Date	Institute / Organization	Fund received	Faculty Sign
1.	Mr. M. Vadivel	STTP - IOT and its Application in industry	19/7/2021 - 24/7/2021	SIKKIM MANIPAL INSTITUTE OF TECHNOLOGY	500	
2.	Ms. S. Kiruthika	FDP - Next generations applications of AL and ML for Smart IOT Application	18/10/2021 - 22/10/2021	AICTE	500	
3.	Mrs. S. Mouna	FDP Blockchain and Application	7/3/2022 - 11/3/2022	Presidency University.	500	
4.	Mr. N. Naveen	FDP - cyber Security	14.03.2022 - 18.03.2022	Presidency University.	500	
5.	Mr. P. Dinesh kumar	FDP - Advanced Security Mechanism in networks	14/3/2022 - 19/3/2022	Periyar Maniammai Institute of Science and technology	500	

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DEPARTMENT OF MANAGEMENT STUDIES

6.3.2 Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year

Name of teacher	Name of conference/ workshop attended for which financial support was provided	Name of the professional body for which membership fee was provided	Amount of support
MR. V.K. MAHES KUMAR	HOW TO BECOME EMOTIONALLY FIT THIRD WAVE OF COVID 19	—	1500
MR. MAHENDARA BOOPATHY P	HOW TO BECOME EMOTIONALLY FIT THIRD WAVE OF COVID 19	—	1500
MR. MOHANASUNDARAM R	HOW TO BECOME EMOTIONALLY FIT THIRD WAVE OF COVID 19	—	1500
. V.K. MAHES KUMAR	Research quality Teaching learning and evaluation	—	250
MR. MAHENDARA BOOPATHY P	Research quality Teaching learning and evaluation	—	250
MR. MOHANASUNDARAM R	Research quality Teaching learning and evaluation	—	250
MR. RAJASEKAR P	Nurturing digital marketing skills	—	500
MR. SATHEESHKUMAR S	Nurturing digital marketing skills	—	500
DR. BALASUBRAMANIAN M	Nurturing digital marketing skills	—	500

6.3.2 No of teachers provided with Financial Support To attend Conferences and workshops 2021 - 2022

SNo	Date	Name of the Faculty	Name of the conference workshop attended	Funding TO- organis	Amount supporte	Sign
1	21.1.2022	Mr. Maheshkumar.v.k AP/MBA Mr. Mahindraboopathy.p AP/MBA Mr. Mohanasundaram AP/MBA	How to become emotional fit in third wave of covid 19	Randhirsingh Bhadoriya mahavidyalaya unned.	4500/- (1500 each)	
2	10.03.22	Mr. Maheshkumar.V.K AP/MBA Mr. Mahindraboopathy AP/MBA Mr Mohanasundaram AP MBA	Research Quality in Teaching learning Education	Vasavitha College Rajghat	750/- (250 each)	
3	17.03.22	Dr. Balasubramani Prof MBA Mr. Rajasekar AP/MBA Mr Sakthi Sankumar AP/MBA	Nurturing Digital Marketing Skills	Ramakrishna college of engineering Coimbatore	1500 (500 each)	

EEC / MECH / 6.3.2

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Department of Mechanical Engineering

FACULTY PROVIDED WITH FINANCIAL SUPPORT

ACADEMIC YEAR 2021-22

S.NO	FACULTY NAME	TITLE	FROM DATE	TO DATE	AMOUNT
1.	Dr.R.VInoth	International Conferance on Advanced Materials and Modern Manufacturing	25.3.22	27.3.22	2000
2.	Mr.Karthi Keyan V	Second International Conference on Emerging Trends in Materials, Computing and Communication Technologies	09.12.22	10.12.22	1500
3.	Mr.Nandha Kumar	First International Conference on Advances in Automobile Manufacturing and Mechanical Engineeering	11.3.22	11.3.22	2000
4.	Dr.R.VInoth	Innovations in THERMAL, Manufacturing, Structural and Environmental Engineering (ICITMSEE'22)	22.04.22	23.04.22	1000
5.	Dr.N.Tamilselvan	International Conferance on Recent inovation in robotics construction and mechanical sciences	10.06.22	11.06.22	2000
6.	N.SELVAKUMAR	Faculty Development Program on "Recent Trends in Thermal Engineering"	06.09.21	10.09.21	500
7.	Mr. Alagesan	Faculty Development Program on "Recent Trends in Thermal Engineering"	06.09.21	10.09.21	500
8.	Mr. S Ganapathy	FDP On Emerging Trends in Research Paper Writing	18.04.22	22.04.22	500
9.	Dr. N Venkatachalam	National Level Workshop on Research Methodology	02.06.21	04.06.21	500
				Total Amount	**10,500**

COORDINATOR

EXCEL ENGINEERING COLLEGE IQAC

HOD/MECH

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Department of Safety and Fire Engineering

6.3.2 Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year

Name of teacher	Name of conference/ workshop attended for which financial support was provided	Name of the professional body for which membership fee was provided	Amount of support
Mr.S.Saravanakumar	Faculty Development Program on "Additive Manufacturing 3D-Printing"	-	500
Mr.M.Saravanakumar	Faculty Development Program on "Additive Manufacturing 3D-Printing"	-	500
Mr.B.Surender	Faculty Development Program on "Futuristic Research in Mechanical Engineering"	-	500

HoD/SF

S.NO	NAME OF THE STAFF	NAME OF THE PROGRAMME	FROM DATE	TO DATE	ORGANISATION INSTITUTION	REQUESTED AMOUNT	STAFF SIGNATURE	HOD SIGNATURE
1	S. Saravana Kumar & R. Suresh Kumar	"FDP on "Additive manufacturing 3D-Printing"	29.12.21	04.01.22	Thakur Polytechnic	Rs.500 + Rs.500	S. Saravana Kumar R. Suresh Kumar	K.My
2	B. Surender	FDP on "Thermal Science and materials Engineering"	07-11-22	11-11-22	Srinivasa Ramanujan Institute of Technology	Rs.500	Surender	K.My

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KOMARAPALAYAM – 637303

6.3.2 Number of teachers provided with financial support to attend conferences / workshops and towards payment of membership fee of professional bodies during the year

Name of teacher	Name of conference/ workshop attended for which financial support was provided	Name of the professional body for which membership fee was provided	Amount of support
Mr. D Mani	National Level Webinar on "Awareness of Covid and Importance of Vaccination"		Rs 500
Mr. D Gurubatham	FDP on Strategies and Outcomes to Enhance sustainable Green Environment		Rs 1000
Ms P Suseela	Five day national level FDP on advancing towards sustainable teaching and learning pedagogy		Rs 500
Dr R Kamalam	FDP on "Recent Advances in Water Treatment and Desalination"		Rs 500
Ms P Sudha	International Webinar on Fundamental Mathematics		Rs 500
Dr S Kavitha	Webinar on Applications of mathematics in Real life		Rs 300
Dr. S. Ponnusamy	International FDP on Scope and Developments in teaching and Research and Research Stratergies		Rs 700
Ms. M. Sindhu	FDP on Math Modeling and Computational Modeling		Rs 500
Dr S Mohan Kumar	International Workshop On Research Methodology An Engineering Approach		Rs 500
Ms G Sugapriya	Webinar on modeling Lithography : from classroom to the recent developments		Rs 300
Ms M Revathi	National webinar on Battery Materials		Rs 500
R M Samukthaa	International webinar on Applied Mathematics		Rs 500
Ms. S. Maragathamani	International Conference on emerging biometrials for advanced applications		Rs 500
Ms. C. Suganthi	Two Week International FDP on "Research Perspectives in Mathematics and its Applications"		Rs 1000
Dr. N. Prabhu	Workshop on Sustainable Materials Advances and Applications		Rs 500

IQAC

Department of Scienc and Humanities.

S.NO	Year	NAME OF THE TEACHER	NAME OF THE CONFERENCE/ WORKSHOP ATTENDED FOR WHICH FINANTIAL SUPPORT PROVIDED	DATE	AMOUNT OF SUPPORT	STAFF SIGNATURE	HOD SIGNATURE.
1.	2021-22	Mr. D. Mani	National Level webinar on "Awareness of covid and Importance of Vaccination"	07.06.2021	Rs. 500		
2.	2021-22.	Mr. D. Gurubhaham	"FDP on strategies and outcomes to enhance sustainable green environment"	19.07.2021 to 23.07.2021	Rs. 1000		
3.	2021-22	Ms P Suseela	Five Day National level FDP on advancing towards sustainable teaching and learning pedagogy	2.8.2021 to 6.8.2021	Rs. 500		
4.	2021-22	DR. R. Kamalam	FDP on "Recent Advances in water treatment and Desalination"	23.8.21 to 27.8.21	Rs. 500		

S.NO	YEAR	NAME OF THE TEACHER	NAME OF THE CONFERENCE/ WORKSHOP ATTENDED FOR WHICH FINANCIAL SUPPORT PROVIDED	DATE	AMOUNT OF SUPPORT	STAFF SIGNATURE	HOD SIGNATURE
5.	2021-2022	Ms P. Sudha	International Webinar on Fundamental Mathematics	30.8.21 to 01.09.21	Rs.500	P. Sudha	
6.	2021-2022	Dr S Kavitha	Webinar on Applications of mathematics in Real life	31.08.21	Rs. 300	S.	
7.	2021-22	Dr. S. PonnuSamy	International FDP on Scope and developments in teaching and research and research Stratergies	22.11.21 to 26.11.21	RS.700		
8.	2021 -22	Ms. M. Sindhu	FDP on Math modelling and Computational modelling	24.01.22 to 28.01.22	Rs.500		
9.	2021-22	Dr. S. Mohan kumar	International workshop on Research methodology An Engineering Approach.	21.02.22 to 25.02.22.	RS. ~~500~~ 700		

S.NO	YEAR	NAME OF THE TEACHER	NAME OF THE CONFERANCE/WORK SHOP ATTENDED FOR WHICH FINANCIAL SUPPORT PROVIDED.	DATE	AMOUNT OF SUPPORT	STAFF SIGNATURE	HOD SIGNATURE.
10	2021-22	MS.G.Sagapriya	Webinar on Modeling Lithography: from classroom to the recent developments	08.03.22	Rs.300	G.Sagapriya	
11.	2021-22	Ms.M.Revathi	National Webinar on Battery Materials	10.03.22	Rs.500		
12.	2021-22	R.M.Samukthaa	International webinar on Applied Mathematics	19.04.22 to 20.4.2022	Rs 500	R.M.Samukthaa	
13.	2021-22.	Mrs.S.Mangatha Mani	International Conference on emerging biomaterials for advanced applications	21-04-2022 - 22.04.2022.	Rs. 500.	S.Mangatha	
14.	2021-22	Ms. C. Suganthi	Two week International FDP on Research Perspectives in Mathematics and its Applications	4.7.22 16.7.22	Rs. 1000	C. Suganthi	
15.	2021-22	Dr. N. Prabhu	Workshop on Sustainable Materials advances and Applications	22.07.22	Rs. 500		