

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

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COGNITION

Quarterly Research Newsletter of NIT Raipur
VOLUME 1 , ISSUE 2, AUGUST 2021



NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

GE ROAD, RAIPUR - 492 010



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Editorial Note: **COGNITION**

Volume 1, Issue 2



Respected Sir/Madam,
Warm Greetings to everyone!

It is indeed a matter of great pleasure that the research newsletter COGNITION volume1, issue 2 focuses on ongoing research and innovation activities with the prime objective to bring out the up-to-date considerable research work carried out by the faculty members, research scholars, startup enthusiasts, and to motivate conducive environment of interdisciplinary research and learning in the institute.

The current issue of the research newsletter covers all the noteworthy events of academic research and innovation activities reported in the second quarter (April - June 2021) and showcases the curtailed versions of the research papers, book chapters, details of books published, patents published/awarded, research projects undertaken, etc. contributed by the faculty

members and students from various departments as per the available source information during the respective quarter time period. It is strongly believed that the recognition of any academic excellence is the highest value of teaching, research and innovation. The team, COGNITION articulates profuse thanks and deep sense of gratitude to honorable Director, Dr. A.M. Rawani, NIT Raipur, for perpetual support and inspiration.

The team COGNITION expresses heartfelt thanks to all respected Deans, Heads of all Departments, Faculty members, Researchers, Students, Administrative and Non-teaching staff for in time responses and undeniable support.

The editorial team, COGNITION appeals all stakeholders for valuable advice and suggestion which will help to reinforce ideas and circulation at optimum level in impending times.

Kindly mail us at : cognition@nitrr.ac.in

Thank you all for bestowing wonderful opportunity and team COGNITION wishes you all a happy reading!

Best regards
Editorial Team



Dr. Ayush Khare
Associate Professor
Department of Physics



Dr. Sanjeev Das
Assistant Professor
Department of MME



Dr. Y Vijaya Babu
Assistant Professor
Department of HSS



Dr. A. K. Dash
Assistant Professor
Department of ME

Graphic Support by :

Rajan Kumar Sharma | Neha D. Naralkar | Sourabh B. Chavan



PATENT GRANTED TO NIT RAIPUR

BOOKS PUBLISHED

TITLE : SMART BATHROOM SYSTEM AND METHOD

NAMES OF INVENTORS : Dr. REKH RAM JANGHEL, ALOK KUMAR SINGH KUSHWAHA, BHAVNA JHARIA, G. ARUNAKRANTHI, CHANDRA PRAKASH GUPTA, MAYANK SOHANI, RAJKUMARBANOTH AND PRATHAP REDDY A.

PATENT GRANTING AUTHORITY : AUSTRALIAN GOVERNMENT/ IP AUSTRALIA

STATUS (PUBLISHED/AWARDED) : PUBLISHED

PATENT NO : 2021100780

MONTH AND YEAR OF AWARD : APRIL 2021

Summary of Invention :

A system and a method of smart bathroom : The system comprising a motion sensor 102 detects position of a person standing below the shower and sends signal to the system, a controller unit 106 to swirl the shower head 104 according to the position of the person using a motor 108, a temperature sensor 110 for measuring the temperature of the room, and sends signal when the temperature of the room exceeds a pre-defined threshold value, and a water heating unit 112 for supplying hot water, by heating the water for a predefined interval of time and simultaneously notifies the user when the water is heated via an alert unit 120.

Title of Book : Data Science and its Applications
Publisher : Taylor and Francis, Chapman and Hall/CRC
ISBN : 9780367608866
Month & year of publication : June 2021
Authors : Dr. Aakanksha Sharaff and G.R. Sinha



Dr. Aakanksha Sharaff
Department of Computer Science & Engg.

About the book

The term "data" being mostly used, experimented, analyzed, and researched, "Data Science and its Applications" finds relevance in all domains of research studies including science, engineering, technology, management, mathematics, and many more in wide range of applications such as sentiment analysis, social medial analytics, signal processing, gene analysis, market analysis, healthcare, bioinformatics etc. The book on Data Science and its applications discusses about data science overview, scientific methods, data processing, extraction of meaningful information from data, and insight for developing the concept from different domains, highlighting mathematical and statistical models, operations research, computer programming, machine learning, data visualization, pattern recognition and others.

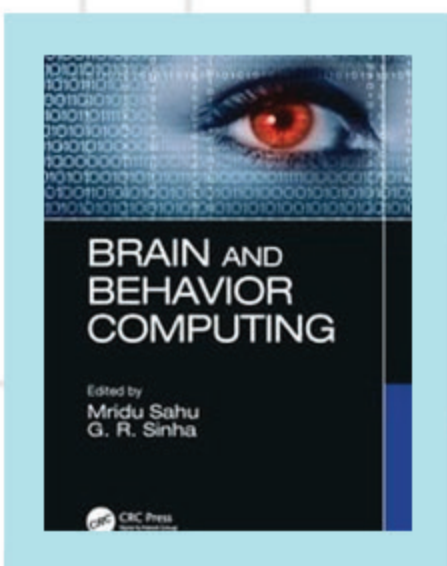
The book also highlights data science implementation and evaluation of performance in several emerging applications such as information retrieval, cognitive science, healthcare, and computer vision.

The salient features of the book are:

- Overview, Challenges and Opportunities in Data Science and Real Time Applications
- Addressing Big Data Issues
- Useful Machine Learning Methods
- Disease Detection and Healthcare Applications utilizing Data Science Concepts and Deep Learning
- Applications in Stock Market, Education, Behavior Analysis, Image Captioning, Gene Analysis and Scene Text Analysis
- Data Optimization



Title of Book : Brain and Behavior Computing
Publisher : CRC Press
ISBN : 9780367552978
Month & year of publication : June 2021
Author : Dr. Mridu Sahu



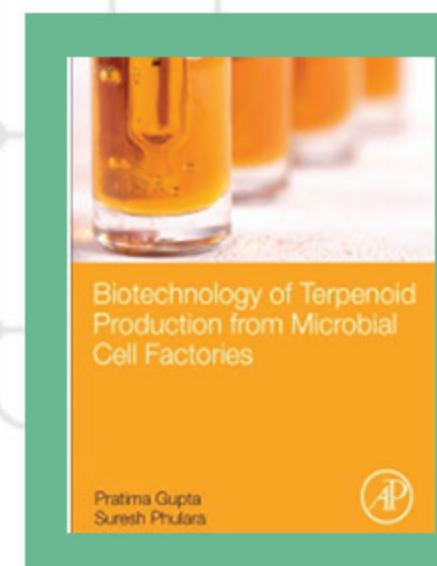
Dr. Mridu Sahu
Department of Information Technology

About the book

Brain and Behavior Computing offers insights into the functions of the human brain. This book provides an emphasis on brain and behavior computing with different modalities available such as signal processing, image processing, data sciences, statistics further it includes fundamental, mathematical model, algorithms, case studies, and future research scopes. It further illustrates brain signal sources and how the brain signal can process, manipulate, and transform in different domains allowing researchers and professionals to extract information about the physiological condition of the brain. Emphasizes real challenges in brain signal processing for a variety of applications for analysis, classification, and clustering. Discusses data sciences and its applications in brain computing visualization. Covers all the most recent tools for analysing the brain and it's working. Describes brain modeling and all possible machine learning methods and their uses. Augments the use of data mining and machine learning to brain computer interface (BCI) devices. Includes case studies and actual simulation examples.

This book is aimed at researchers, professionals, and graduate students in image processing and computer vision, biomedical engineering, signal processing, and brain and behavior computing.

Title of Book : Biotechnology of Terpenoid Production from Microbial Cell Factories
Publisher : Elsevier
ISBN of book : 978-0-12-819917-6
Month & year of publication : April 2021
Authors : Pratima Gupta and Suresh Phulara



Pratima Gupta



Suresh Phulara

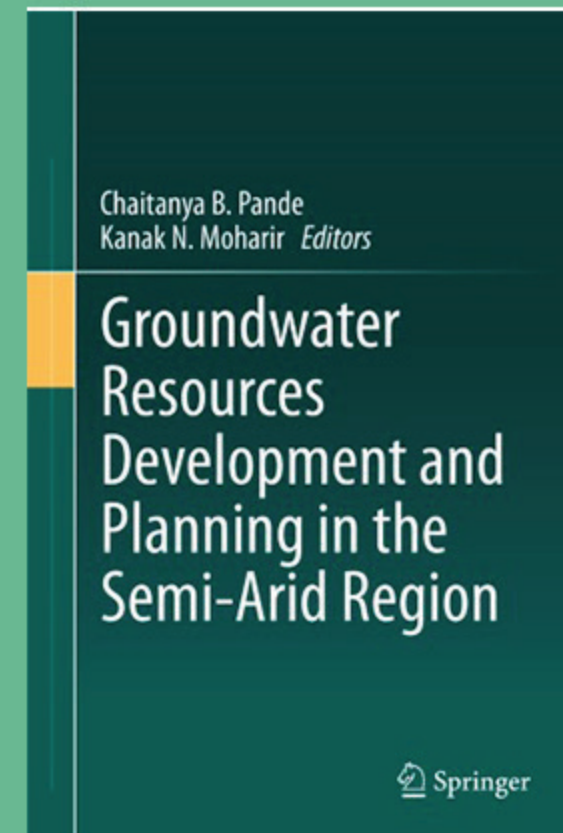
About the book

Biotechnology of Terpenoid Production from Microbial Cell Factories is a unique reference to help researchers, scientists and scholars explore available strategies involved in the production of terpenoid-based, value-added compounds from GRAS status (Generally Recognized as Safe by FDA) microbes to address the associated challenges for the industry. The book covers the most up-to-date information about microbial terpenoid production, including culture condition modulation for the improved and high-specificity production of terpenoid and their in-situ extraction. Each class of terpenoid is explained in detail, including their nutritional and pharmaceutical information and their molecular aspects.



BOOK CHAPTERS PUBLISHED

TITLE : A Coupled Hydrological and Hydrodynamic Model for Flood Mitigation
PUBLISHER : Springer Nature Switzerland
ISBN : 9789388991001
MONTH & YEAR OF PUBLICATION : June 2021
AUTHORS : Triambak Baghel, Manish Kumar Sinha, Ishtiyag Ahmad, and M. K. Verma



About the book chapter

The objective of this study was to develop hydrologic and hydraulic models for the Champa pooling station, Taga village, Janjgir Champa District, Chhattisgarh. Due to heavy rainfall on 1st Aug, 2014 to 10th Aug, 2014, the Power Grid Corporation of India Limited—Champa pooling Station was flooded along with few parts of nearby villages. The flood problem is due to alteration in natural drainage pattern and provision of improper artificial drainage. The station is installed with heavy electrical appliances such as capacitor banks and transformers. If water level rises about 50–100 cm it will cause damage to electrical appliances. This research work is based on the physical observations of the flood condition in and around the site and detailed watershed modelling and analysis of flood plan area to plan feasible remedial measures for flooding at Champa pooling station and its surrounding area.



TITLE : Application of Particle Swarm Optimization for Threshold Setting in Fault Detection Unit
PUBLISHER : Springer Singapore
ISBN : 978-981-15-8220-2
MONTH & YEAR OF PUBLICATION : April 2021
AUTHORS: Chinta Durga Prasad and Monalisa Biswal

About the book chapter

A simple and fast fault detection technique is proposed in this paper which considers the difference between the successive samples of three phase real power. Apart from regular current and voltage signals, 3-phase instantaneous real power signal is chosen for implementation of fault detection logic. This fault detection unit (FDU) is assisted with particle swarm optimization (PSO) based intelligent threshold setting to enhance its overall performance by generating large indices. The results are carried out in MATLAB-SIMULINK software environment.



TITLE : Study on the Role of Absorption Defect Density, Layer Thickness and Transport Layer Doping Concentration on the Performance of Lead Free Perovskite Solar Cell

PUBLISHER : B P International, West Bengal, India

ISBN : 978-93-91473-55-6

MONTH & YEAR OF PUBLICATION : June 2021

AUTHORS : Priyanka Roy and Ayush Khare



About the book chapter

This book covers key areas of engineering research. The contributions by the authors include DIY safety kit, making COVID-19 safety kit at home, Biodegradable bag for making safety kit, horizontal irregularity, earthquake load, storey shear, maximum storey displacement, storey drift, Lab VIEW platform, mathematical model, defect density, absorber layer thickness, carrier concentration, tin based perovskite solar cell, parallel sigma delta converters, resolution, sampling, interleaving techniques, D-S modulators, quantizing errors, green building practices, energy efficiency, sustainable construction, electron beam welding, equipment for EBW, numerical control, layered Double Hydroxide, intercalation, UV-visible spectroscopy, drug release kinetics, phosphate buffer solution, compliant mechanism, topology optimisation, clutch fork, optimal design, reverse engineering, discharge efficiency, sampling interval, sensor node, wireless sensor networks, aerobic brickbat grit sand, NMR-relaxation, structure-dynamical parameters, nuclear magnetic resonance relaxometry, signal and transmits, RF transmission, wifi environment, wireless charging, radio frequency, ransomware and spyware. This book contains various materials suitable for students, researchers and academicians in the field of engineering research.



TITLE : Maize Leaf Disease Detection and Classification Using Deep Learning, part of Artificial Intelligence in Mechanical and Industrial Engineering

PUBLISHER: CRC Press, Taylor & Francis Group

ISBN : 9781003011248

MONTH & YEAR OF PUBLICATION: June 2021

AUTHORS : Phani Kumar Singamsetty, G. V. N. D. Sai Prasad, N. V. Swamy Naidu and R. Suresh Kumar

About the book chapter

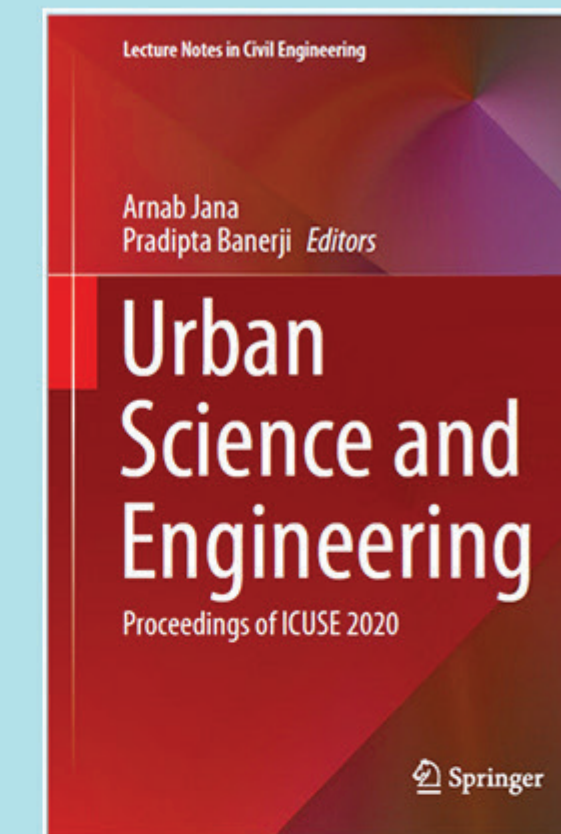
Plant diseases are the major cause of low agricultural productivity. Mostly the farmers encounter difficulties in controlling and detecting the plant diseases. Thus, early detection of these diseases will be beneficial for farmers to avoid further losses. This book chapter focuses on supervised machine learning techniques such as Naive Bayes (NB), Decision Tree (DT), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), and Random Forest (RF) for maize plant disease detection with the help of the images of the plant. The RF algorithm results with the highest accuracy of 79.23% as compared to the rest of the classification techniques.

TITLE : Using Remote Sensing Data and Geospatial Techniques for Watershed Delineation and Morphometric Analysis of Beas Upper Catchment, India. Geogr. Inf. Sci. L. Resour. Manag.,
PUBLISHER : Wiley Online Books
ISBN : 9781119786375
MONTH & YEAR OF PUBLICATION : April, 2021
AUTHORS : Monika, K. Yogender, S.S Salunkhe, M. Singh and H. Govil



About the book chapter

The remote sensing data and Geographical Information system (GIS) has emanated as a competent tool for delineating and analyzing the watershed and its morphometric parameters for proper planning and prediction of the topography, hydrological behavior, drainage pattern, engineering, site suitability aspect, and water potential of the catchment area. This chapter emphasizes the morphometric characteristics by addressing linear, aerial, and relief aspects of Beas Upper Catchment. Data inputs in the study included ASTER & Cartosat DEM (30m) and IRS LISS-IV Imagery. A total of ten watersheds were delineated. Watershed delineation and boundaries comparison were made using both the DEMs. The morphometric analyses were delineated by measuring linear, aerial and relief aspects of the catchment with 22 morphometric parameters such as stream order, basin relief, drainage density bifurcation ration, and form factor using both the ASTER & Cartosat DEM. The study has proven that morphometric analysis is sustainable for illustrating the hydrological response behavior of the watershed. It is also well understood that satellite remote sensing is emerging as the most effective, time-saving, and accurate technique or tool for morphometric analysis of a basin watershed to date.



TITLE : Assessment of Social Cost for Limited Stop Bus Transit Operations in Durg-Raipur
PUBLISHER: Springer
ISBN : 9789813341142
MONTH & YEAR OF PUBLICATION: APRIL 2021
AUTHORS : Sachin Kumar Sahu and Vivek Agnihotri

About the book chapter

The existing intercity public bus transit system can be improved by accelerated transit operation and reduce the travel time. The introduction of accelerated operations for bus transit will not only reduce the travel time of the passengers but also help in increasing the comfort factor of passengers, this will lead to the increase in ridership of the bus transit and will make the bus services more efficient.

The research aims to identify suitable accelerated operations for the public transit corridor and evaluate these operations based on travel time and travel cost. A methodology is demonstrated for determining the suitable accelerated operations, i.e., skip-stop, zonal, and express operations and to compare the social cost involved with the operations to the existing normal operations. The study assumes the travel demand of the corridor to be constant. A social cost function is created to calculate the social cost of the operations. Based on the analysis, possible scenarios are assumed, and new travel times are discussed along with savings in travel time.

TITLE: Road Detection Using Semantic Segmentation-Based Convolutional Neural Network for Intelligent Vehicle System
PUBLISHER : Data Engineering and Communication Technology, LNDECT, Springer, Singapore
ISBN : 978-981-16-0081-4
MONTH & YEAR OF PUBLICATION : MAY 2021
AUTHORS : Deepak Kumar Dewangan and Satya Prakash Sahu



About the book chapter

Road scene perception of driving environment is an important yet stimulating task for an intelligent vehicle system (IVS). Advancement of deep learning techniques has enabled the image sensors to understand the scene more accurately for the intended object, especially in segmentation domain. In context of computer vision approach, segmentation of road scene from colour images is challenging, due to the varying illumination circumstances, the non-uniform road shapes and the fuzzy boundaries between the road and other objects. However, existing studies have limited performance in context of standard measures, therefore fails to incorporate the mentioned issues. With this aim and to clearly distinguish road and non-road portion, we have utilized U-Net, Seg-Net and fully convolutional network (FCN) models. From the conducted experiments, U-Net has achieved 94% score for mIoU and dice coefficient which is better than the scores achieved by other models Seg-Net and FCN-32. In our experiment, images from Camvid dataset have been used to train and validate the performance.

SPONSORED PROJECTS

DETAILS OF SPONSORED RESEARCH PROJECTS

01

TITLE OF RESEARCH PROJECT SANCTIONED

In situ application of a Microbial Peroxide producing cell for oxidative depolymerisation of lignin and its subsequent valorization

SPONSORING AGENCY

SERB-DST, New Delhi

DURATION (FROM-TO)

2021-2024

AMOUNT SANCTIONED (Rs.)

39.05 Lacs

PI

Pratima Gupta

CO-PI (IF ANY)

Nil

SUMMARY

A microbial peroxide producing cell (MPPC) is an electro chemical device to convert the electron equivalents of organic compounds into electrical current and hydrogen peroxide. When introduced as catholyte, the lignin goes through H_2O_2 -mediated oxidative depolymerization. The present study will unfold a novel aspect of the microbial electrochemical cell to depolymerize lignin using the H_2O_2 produced. Exoelectrogenic microbes in Microbial peroxide producing cell (MPPC) are used for the production of H_2O_2 and subsequent conversion of lignin into valuable chemicals via advanced oxidation. An in situ MPPC-mediated oxidative depolymerization of lignin would lead to formation of bio based platform chemicals and simultaneous production of bio electricity.



DETAILS OF WORTHY PROJECT WORK/PhD THESIS

DEPARTMENT OF APPLIED GEOLOGY

01 TITLE OF WORK (PhD THESIS): Implication of Thermal Infrared Remote Sensing and Spectral Indices for Geological, Environmental and Urban

NAME OF SCHOLAR : Subhanil Guha

NAME OF SUPERVISOR : Dr. Himanshu Govil

SUMMARY

This thesis emphasized the thermal infrared (TIR) bands of different satellite sensors (Landsat, ASTER, and MODIS) to analyze the geological, environmental, and urban studies. Several lithological indices (quartz, feldspar, and mafic indices) and normalized difference spectral indices (NDVI, NDWI, MNDWI, NDBI, NDBaI, and NMDI) effectively evaluated the results. Land surface temperature (LST) plays significant role in this scenario. The relationship between LST and these spectral indices can change spatially, temporally, or seasonally. It can influence the land use/land cover (LULC) categories significantly. The geological investigation was evaluated in the Malanjkhanda Copper Mines area of Madhya Pradesh and the Amarkantak region of Madhya Pradesh. The environmental and urban studies were assessed in the Raipur city of Chhattisgarh.

During his PhD tenure, Mr. Subhanil Guha has published a total of 30 research articles out of which 22 are in SCI journals, 04 in SCOPUS indexed journals and 04 as book chapters.

RESEARCH PAPERS PUBLISHED

Title: Identification of malachite and alteration minerals using airborne AVIRIS-NG hyperspectral data

Authors: Gaurav Mishra, Himanshu Govil and Prashant Kumar Srivastava

Journal: Quaternary Science Advances, Elsevier, Vol. 4 (2021), 100036

Web: <https://doi.org/10.1016/j.qsa.2021.100036>

Title: Mapping Hydrothermally Altered Minerals and Gossans using Hyperspectral data in Eastern Kumaon Himalaya, India.

Authors: Govil, H., Mishra, G., Gill, N., Taloor, A., Diwan, P,

Journal: Applied Computing and Geoscience, Elsevier, Vol. 9 (2021), 100054

Web: <https://doi.org/10.1016/j.acags.2021.100054>

Title: COVID-19 lockdown effect on land surface temperature and normalized difference vegetation index

Authors: Guha, S., Govil, H

Journal: Geomatics, Nat. Hazards Risk, Vol. 12 (1) (2021)

Web: <https://doi.org/10.1080/19475705.2021.1914197>

Title : The quest for reusability: The facile and stable immobilization of papain on cysteine functionalized iron oxide nanoparticles activated glass surface

Authors: Shraddha Chauhan and Lata SheoBachan Upadhyay

Journal: Indian journal of biochemistry and biophysics, NISCAIR-CSIR, India Vol 58, April 2021, pp 141-147.

Web Link: <http://nopr.niscairres.in/handle/123456789/56486>

Title : Estimation of River Discharge from Satellite Observations.

Authors: DhanendraBahekar, Ishtiyaq Ahmad, A.D.Prasad

Journal: Turkish Journal of Computer and Mathematics Education, Vol. 12 No. 4 (2021)

Web Link: <https://turcomat.org/index.php/turkbilmat/article/view/603>

Title : Prospecting the effect of topic modeling in information retrieval

Authors: AakankshaSharaff, J. Dewangan & D. S. Sisodia

Journal: International Journal on Semantic Web and Information Systems (IJSWIS), Vol. 17 (3) (2021)



Title: : Rice Crop Disease Prediction by Using Machine Learning Technique
Authors: B. Patel, & Aakanksha Sharaff
Journal: International Journal of Agricultural and Environmental Information Systems (IJAIS) Vol 12 (4)(2021) Systems (IJSWIS), Vol. 17 (3)(2021)
WebLink: <https://www.igi-global.com/article/rice-crop-disease-prediction-using-machine-learning-technique/280312>

Title: : Statistical Growth Analysis of Rice Plants in Chhattisgarh Region Using Automated Pixel-based Mapping Technique
Authors: B. Patel, & Aakanksha Sharaff
Journal: International Journal of System Dynamics Applications

Title: Defect count prediction via metric-based convolutional neural network Using Automated Pixel-based Mapping Technique
Authors: Meetesh Nevendra & Pradeep Singh
Journal: Neural Comput & Applic (2021)
Web: <https://doi.org/10.1007/s00521-021-06158-5>

Title: Data Sampling Strategies for Click Fraud Detection Using Imbalanced User Click Data of Online Advertising: An Empirical Review
Authors: Deepti Sisodia & Dilip Singh Sisodia
Journal: IETE Technical Review (2021)
Web: <https://doi.org/10.1080/02564602.2021.1915892>

Title: : Multi-function Prediction of Unknown Protein Sequences Using Multilabel Classifiers and Augmented Sequence Features
Authors: Saurabh Agrawal, Dilip Singh Sisodia & Naresh Kumar Nagwani
Journal: Iranian Journal of Science and Technology, Transactions A: Science, Vol. 45, pages 1177–1189 (2021)
Web: <https://doi.org/10.1007/s40995-021-01134-z>

Title: : Multi-label software bug categorisation based on fuzzy similarity
Authors: Rama Ranjan Panda, Naresh Kumar Nagwani
Journal: International Journal of Computational Science and Engineering, Vol. 24, No. 3, (2021)
Web: <https://doi.org/10.1504/IJCSE.2021.115645>

Title: : Gas sorption and luminescence properties of activated forms of a Cd(II)-coordination polymer
Authors: Somnath, Lovely Tyagi, Ravindra Singh, Prem Lama and Kafeel Ahmad Siddiquia

Journal: Journal of Coordination Chemistry
Web: <https://doi.org/10.1080/00958972.2021.1950699>

Title: Slow flow past a weakly permeable spheroidal particle in a hypothetical cell
Authors: Tina Bucha, Madasu Krishna Prasad
Journal: Archive of Mechanical Engineering
Web Link: DOI: 10.24425/ame.2021.137044

Title: : Effect of Eu³⁺ ions on electrical and dielectric properties of barium hexaferrites prepared by solution combustion method
Authors: Jayashree Mahapatro, Sadhana Agrawal
Journal: Ceramics International, Vol. 47 (14), (2021)
Web Link: <https://doi.org/10.1016/j.ceramint.2021.04.062>

Title: : Reduction of thermal conductivity due to interfacial polarization mechanism of GaN/In_xGa_{1-x}N superlattice
Authors: Subhranshu Sekhar Sahu, Bijay Kumar Sahoo
Journal: Physica E: Low-dimensional Systems and Nanostructures, Vol. 134, 2021, 114849
Web: <https://doi.org/10.1016/j.physe.2021.114849>

Title: : Role of interfacial electric field in thermal conductivity of indium-rich GaN/In_xGa_{1-x}N/GaN superlattices
Authors: Subhranshu Sekhar Sahu, Bijay Kumar Sahoo
Journal: Indian Journal of Physics (2021)
WebLink: <https://doi.org/10.1007/s12648-021-02141-x>

Title: : Chemical Bath Deposited (Cd_{0.85}-Zn_{0.15})S Nanocrystalline Film: Influence of Capping Agent on Various Characterizations
Authors: Devjyoti Lilhare and Ayush Khare
Journal: Materials Chemistry and Physics, 270 (2021) 124835
Web: <https://www.sciencedirect.com/science/article/abs/pii/S0254058421006180>



Title: : Investigation of structural and conduction mechanism of Europium modified BaZr_{0.05}Ti_{0.95}O₃ ceramic prepared by solid state reaction method
Authors: Nag Bhargavi, TanmayaBadapanda, AyushKhare, M. Shahid Anwar and NameetaBrahme

Journal: Applied Physics A, 127: 528 (2021)

Web: <https://link.springer.com/article/10.1007/s00339-021-04628-0>

Title: An investigation of structural, electrical and optical properties of Lead-free Barium Zirconium Titanate (BZT) based ceramic compounds

Authors: G. Nag Bhargavi, TanmayaBadapanda and AyushKhare

Journal: Phase Transitions, Vol. 94 (6-8), (2021)

Web: <https://www.tandfonline.com/doi/abs/10.1080/01411594.2021.1940181?journalCode=gpht20>

Title: : An investigation on the influence of temperature variation on the performance of tin (Sn) based perovskite solar cells using various transport layers and absorber layers

Authors: Priyanka Roy, Sanjay Tiwari and Ayush Khare

Journal: Results in Optics, Vol. 4 (2021).

Web: www.sciencedirect.com/science/article/pii/S2666950121000316

Title: : A sociological analysis of religion and caste among the Nat Muslims in India

Authors: Md MoshabbirAlam and Moksha Singh

Journal: International Journal of Psychosocial Rehabilitation, Vol. 25 (2), (2021)

Web: <https://www.psychosocial.com/article/PR320065/37998/>

Title: : The Emergence of Nation and Nationalism: an Ontic Study

Authors: Saikat, Majumdar & Sandip Sarkar

Journal: The Turkish Online Journal of Qualitative Inquiry (TOJQI), Vol.12 (3), (2021)

Web: <https://www.tojqi.net/index.php/journal/article/view/2243/1351>

Title: Development of Time-Frequency Based Approach to Detect High Impedance Fault in an Inverter Interfaced Distribution System

Authors: Monalisa Biswal; Shubham Ghore, Om P. Malik, Ramesh C. Bansal

Journal: IEEE Transactions on Power Delivery

Web Link: <https://ieeexplore.ieee.org/document/9318518>

Title: Adaptive Third-Zone Distance Protection Scheme for Power System Critical Conditions

Authors: Kasimala Venkatanagaraju, Monalisa Biswal, Om P. Malik

Journal: IEEE Transactions on Power Delivery, Vol. 36 (3), (2021)

Web Link: <https://doi.org/10.1016/j.ceramint.2021.04.062>

Title: : A Novel Swarm Intelligence Assisted Euclidean Distance based Single Detection Index Approach in Transmission Line Relaying for Fast Decision Making

Authors: Chinta Durga Prasad, Monalisa Biswal

Journal: International Journal of Emerging Electric Power Systems, (2021)

Web: <https://doi.org/10.1515/ijeeps-2021-0035>

Title: Automated psoriasis lesion segmentation from unconstrained environment using residual U-Net with transfer learning

Authors: Ritesh Raj, Narendra D. Londhe, Rajendra Sonawane

Journal: Computer Methods and Programs in Biomedicine, Vol. 206(2021)

WebLink: <https://doi.org/10.1016/j.cmpb.2021.106123>

Title: : : MVFNet: A multi-view fusion network for pain intensity assessment in unconstrained environment

Authors: Ashish Semwal, Narendra D. Londhe

Journal: Biomedical Signal Processing and Control, Vol. 67 (2021)

WebLink: <https://doi.org/10.1016/j.bspc.2021.102537>

Title: : VLDNet: Vision-based Lane region detection network for intelligent vehicle system using semantic segmentation

Authors: Deepak Kumar Dewangan, Satya Prakash Sahu, Bandi Sairam, Aditi Agrawal

Journal: Computing

Web: <https://doi.org/10.1007/s00607-021-00974-2>

Title: SLICACO: An automated novel hybrid approach for dermatoscopic melanocytic skin lesion segmentation

Authors: Lokesh Singh, Rekh Ram Janghel, Satya Prakash Sahu

Journal: International Journal of Imaging Systems and Technology

Web: <https://doi.org/10.1002/ima.22591>



Title: : RCNet: road classification convolutional neural networks for intelligent vehicle system

Authors: Deepak Kumar Dewangan, Satya Prakash Sahu

Journal: Intelligent Service Robotics, 14, 199-214 (2021).

Web: <https://doi.org/10.1007/s11370-020-00343-6>

Title: Binary Jaya algorithm based on binary similarity measure for feature selection

Authors: Abhilasha Chaudhuri and Tirath Prasad Sahu

Journal: Journal of Ambient Intelligence and Humanized Computing

Web: <https://link.springer.com/article/10.1007/s12652-021-03226-5>

Title: : Feature weighting for naïve Bayes using multi objective artificial bee colony algorithm

Authors: Abhilasha Chaudhuri and Tirath Prasad Sahu

Journal: International Journal of Computational Science and Engineering, 24(1), (2021)

Web: <https://www.inderscienceonline.com/doi/abs/10.1504/IJCSE.2021.113655>

Title: Elliptic Curve Cryptography based authentication scheme for Internet of Medical Things

Authors: K. Sowjanya, Mou Dasgupta and Sangram Ray

Journal: Journal of Information Security and Applications, Vol. 58, (2021)

Web Link:

<https://www.sciencedirect.com/science/article/abs/pii/S2214212621000120>

Title: Effect of graphite particulate on mechanical characterization of hybrid polymer composites

Authors: BN Dhanunjayarao, Usha Kiran Sanivada, NV Swamy Naidu, Raul Fanguero

Journal: Journal of Industrial Textiles

Web Link: DOI: 10.1177/15280837211010670

Title: Analysis of flow characteristics of two circular cylinders in cross-flow with varying Reynolds number: a review

Authors: Hishikar P, Dhiman, S. K., Tiwari, A. K., Gaba, V. K.

Journal: Journal of Thermal Analysis and Calorimetry (2021)

WebLink: <https://doi.org/10.1007/s10973-021-10933-w>

Title: Analysis of flow characteristics of two circular cylinders in cross-flow with varying Reynolds number: a review

Authors: Hishikar P, Dhiman, S. K., Tiwari, A. K., Gaba, V. K.

Journal: Journal of Thermal Analysis and Calorimetry (2021)

WebLink: <https://doi.org/10.1007/s10973-021-10933-w>

Title: : Thermal modelling of single and double slope passive solar stills for different climatic zones in India

Authors: Chetpelly A., Soni P, Dhiman, S. K., Bhowmick S., Gaba, V. K.

Journal: International Journal of Ambient Energy (2021)

Web: <https://doi.org/10.1080/01430750.2021.1946147>

Title: : Review on improvement of adsorption refrigeration systems performance using composite adsorbent: current state of art

Authors: Soni P, Sur A, Gaba V. K., Sah R. P

Journal: Energy Sources, Part A: Recovery, Utilization, and Environmental Effects

WebLink: <https://doi.org/10.1080/15567036.2021.1927252>

Title: : Study of microbial contribution in alkalinity generation during treatment of acid mine drainage by laboratory successive alkalinity producing system

Authors: M. D. Patel

Journal: Indian Journal of Biochemistry & Biophysics Vol. 58 (2021)

Web: <http://op.niscairres.in/index.php/IJBB/article/view/35103>

Title: Material Flow Behavior and Mechanical Properties of Dissimilar Friction Stir Welded Al 7075 and Mg AZ31 Alloys Using Cd Interlayer

Authors: Satya Kumar Dewangan, M. K. Tripathi & M. K. Manoj

Journal: Metals and Materials International (2021)

Web: <https://doi.org/10.1007/s12540-021-00980-1>



CONFERENCE/SEMINAR/ STTP ORGANIZED

Title : ATAL Sponsored Faculty Development Program on Cyber Security in Smart Cities

Duration(from-to) : 14th – 18th June 2021

Organizing Department : Department of Computer Applications

Co-ordinator : Dr. Mou Dasgupta

Convener: Dr. Mithilesh Atulkar

The Department of Computer Applications , National Institute of Technology Raipur has organized a Faculty Development Program on Cyber Security in Smart Cities virtually during 14th- 18th June 2021 with the financial assistantship from AICTE Training and Learning (ATAL) Academy, Ministry of Education, Govt. of India. A total of 86 participants representing different states of the country registered for the program having 14 sessions covering all aspects of Cyber Security in Smart Cities. In the Inaugural session, Padma Shri Prof. Bimal Kumar Roy, Former Director, Indian Statistical Institute Kolkata and Chairman of National Statistical Commission, Ministry of Statistics & Program Implementation, Govt. of India, was present online as the Chief Guest. The welcome address was given by Dr. S. Sanyal, Dean, Faculty Welfare. The program coordinator Dr. M. Dasgupta elaborated the need of Cyber Security in Smart Cities in present virtual world. Dr. M. Atulkar thanked all the distinguished speakers and participants for making the inauguration a resounding success.



ARTICLES OF PRIME RELEVANCE

IDENTIFICATION OF MALACHITE AND ALTERATION MINERALS USING AIRBORNE AVIRIS-NG HYPERSPECTRAL DATA

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INTRODUCTION

The present work includes identification, delineation and mapping of altered zones by AVIRIS-NG airborne hyperspectral data and its validation through field survey and laboratory spectra. Potential mineral deposit is usually associated with the zones of hydrothermal alteration zones. Recent advancement in the remote sensing enables us to identify, delineate and map the hydrothermal alteration zones using airborne hyperspectral remote sensing. Airborne Visible Infrared Imaging Spectrometer-Next Generation (AVIRIS-NG) is a NASA-ISRO joint venture to acquire hyperspectral data in the wavelength range of 380-2510 nm with the spectral resolution of 5nm. AVIRIS-NG facilitates to identify and map the minerals such as clay minerals, hydroxyl-bearing minerals, carbonates etc. Process of hydrothermal alteration produces mineralogical and chemical changes in the country rocks and causes formation of secondary minerals(Pirajno, 2009). The natures and type of hydrothermal alteration depends on the pressure, temperature and chemistry of circulating fluid circulates(Evans, 1992). Common minerals formed due to hydrothermal alteration and weathering includes talc, kaolinite, and kaolinite. Possible indication of base metal mineralization in the area is found in the form of malachite stains on the carbonaceous phyllite. Malachite is formed by surface weathering processes of copper ore bodies in the area and found in the carbonaceous phyllite lithology of the area.

Present study focuses on the mapping and delineation of hydrothermally altered zones in Mesoproterozoic rocks of Jahazpur in the south-eastern Rajasthan, India. The weathered, hydrothermally altered and clay minerals favours the implementation of hyperspectral remote sensing for the identification and mapping of this terrane. Supervised classification technique such as spectral angle mapper has been applied and it produces promising result for the mapping of clay minerals and hydrothermally altered zones. Field survey for ground truthing have been conducted in the delineated zones for the collection of representative rock samples. Further, the spectra of collected rock samples generated and it confirms the presence of talc and clay minerals such as kaolinite, kaolinite.



PRE-PROCESSING OF AVIRIS-NG HYPERSPECTRAL DATA

Pre-processing of hyperspectral data includes application of FLAASH (Fast line-of-sight Atmospheric analysis of spectral hypercubes) atmospheric which is a MODTRAN-based atmospheric correction model developed by the Force Phillips Laboratory, Hanscom AFB and Spectral Sciences, Inc. to remove atmospheric attenuation caused by certain factors such as water vapour column, aerosol, haze and gases present in the atmosphere (Perkins, 2012). FLAASH atmospheric correction was followed by the application of Minimum Noise Fraction (MNF) (to segregate the information from noise), Pixel Purity Index (PPI) (applied to identify and extract purest pixels), n-dimensional visualisation (for selection of endmember in n-dimensional feature space) and supervised classification technique such as spectral angle mapper (SAM).

Methodology for the research work includes pre-processing and classification of hyperspectral data, field investigation, generation of laboratory spectra and comparative analysis of spectra with established USGS mineral library. ASD spectroradiometer and generation of spectra of collected rock samples.

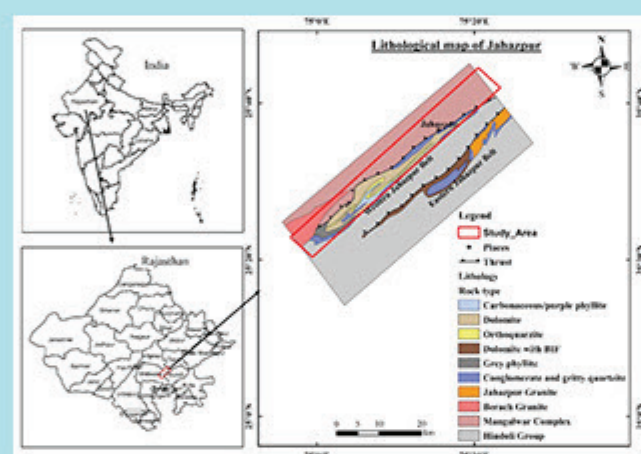


Fig. 1. Location and lithological map of the study area

ASD SPECTRORADIOMETER AND GENERATION OF SPECTRA OF COLLECTED ROCK SAMPLES

ASD Fieldspec 4 spectroradiometer collect the reflectance data with 1 nm spectral resolution in the wavelength range of 0.35–2.5 μm . This wavelength region (0.35–2.5 μm) includes visible/near-infrared to shortwave infrared region of electromagnetic spectrum. Due to narrow spectral resolution of the instrument, it is possible to identify and discriminate mineralogy. ASD field spectroradiometer instrument coupled with contact probe having halogen light as a source is utilized to collect the reflectance spectra of rock samples. Spectra are acquired on planar surface of rock samples to filter out all the unnecessary light from around. The ASD instrument is calibrated against the white reference plate initially and periodically throughout the collection of reflectance spectra from rock sample. Therefore, the reflectance spectra generated from ASD instrument can be directly compared with the established mineral spectral library.

Most of the altered minerals are phyllosilicate (e.g. talc, chlorite, mica, serpentine etc.) and clay group of minerals (e.g. kaolinite, montmorillonite, kaosmec, smectite etc.) which are sensitive to SWIR-wavelength region (1.3–2.5 μm) (Clark et al., 1990; Grove et al., 1992). The collected rock samples from the study area includes clay minerals such as kaolinite, kaosmec and montmorillonite and talc. These minerals shows characteristic absorption feature in the SWIR region of electromagnetic spectrum. The spectra of representative rock samples have been taken and analysed for the identification of minerals. The major altered minerals identified in the present study include iron hydroxides, clay minerals (kaolinite, kaosmec) and talc.

SPECTRAL ANGLE MAPPER CLASSIFICATION

Spectral angle mapper classified the study area based on the angle between reference and image spectra. The working and abandoned mining area of talc with surface exposure have been well delineated using spectral angle mapper. Further, several mining areas of china clay and kaolinite are also demarcated using spectral angle mapper. Fig. 2a shows the Gheoriya talc mine and adjacent kaolinite occurrences in green and red colour respectively. Fig. 2b shows the talc mining area near Ummedpura in green colours. Fig. 2c shows clay mining are near Ampura and marked by red pixels in SAM classified image. Fig. 2d shows abandoned kaolinite mining area at the contact between Carbonaceous phyllite and orthoquartzite in red colour pixels in SAM classified image. Working talc mining area near Madhopur and Abhaipur have been well delineated by spectral angle mapper and showed in Fig. 2e and 2f respectively by green pixels.

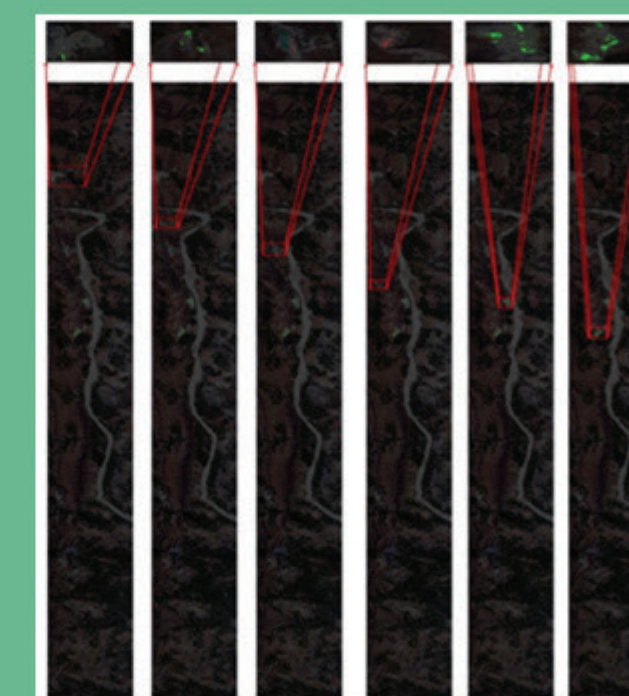


Fig. 2. Spectral angle mapper classified image (a) Gheoriya talc deposit; (b) Ummedpura talc deposit; (c) Ampura clay deposit (Kaolinite); (d) Bahadapura clay deposit (Kaolinite); (e) Madhopur talc deposit; (f) Abhaipur talc deposit.

COMPARATIVE STUDY OF LAB, USGS AND IMAGE SPECTRA OF MINERALS

The lab spectra of representative rock samples have been generated by study under ASD Fieldspec4 spectroradiometer. The image spectra, ASD spectra and USGS library spectra compared and it shows relevance with the mineral collected during field survey in and around Jahazpur. Fig. 3a–3c represents the spectra of rock samples collected from Ummedpura talc mine, Abhaipur talc mine and Madhopur talc mine respectively.



Image spectra and lab spectra compared with the USGS library spectra of mineral and it shows characteristic spectral absorption feature at 2315 nm due to presence of talc mineral ($3\text{MgO} \cdot 4\text{SiO}_2 \cdot 2\text{H}_2\text{O}$).

Fig. 3d and 3e shows the spectra of rock samples collected from abandoned kaolinite mines near Bahadarpura china clay mine (downhill side of Chavleshwar Jain Temple) and Ampura china clay mine, Jahapur respectively. Spectral characteristic of both the samples compared with the spectra of kaolinite mineral from USGS spectral library file and it shows characteristic absorption feature at 2155 and 2205 nm. Fig. 3f shows the spectra of mineral collected from clay mine adjacent to Gheoriya talc mine and compared with the USGS spectra of kaosmec (mixture of kaolinite and smectite). The ASD spectra, image spectra and USGS library spectra well matched and shows doublet of absorption feature at 2205 nm.

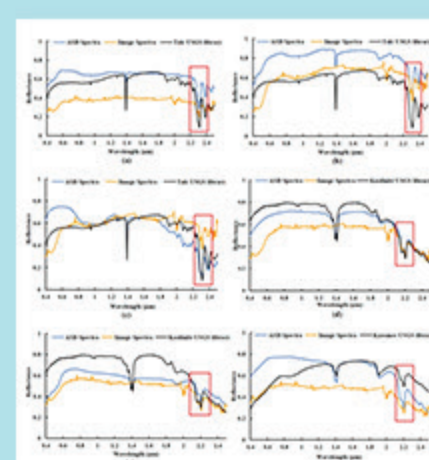


Fig. 3. Comparative analysis of image derived spectra, ASD Fieldspec4 spectroradiometer generated lab spectra and USGS spectral library spectra of representative minerals. a). talc from Ummedpura talc deposit; b) talc from Abhaipur talc mine; c). talc from Madhapur talc deposit; d). kaolinite deposit from china clay mine of Bahadarpura; e). kaolinite from Ampura china clay mine; f). kaosmec mineral collected from adjacent to Gheoriya talc mine.

Conclusion

Present study focuses on the identification and mapping of hydrothermally altered and weathered minerals in Jahazpur area, Rajasthan using AVIRIS-NG hyperspectral data. The delineated zones by spectral angle mapper studied through field survey and collection of rock samples. Spectroscopic study of representative rock samples found appropriate for the identification and mapping of weathered and hydrothermally altered rocks. Supervised classification technique spectral angle mapper performed well in the delineation of altered and weathered minerals in the study area. Malachite stains in the carbonaceous phyllite shows surface signature of the base metal mineralisation and it is associated with the hydrothermally altered zones. This study validates the AVIRIS-NG hyperspectral data in the identification and mapping of hydrothermally altered and weathered zones.



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IMPORTANCE OF DOSIMETRY IN RADIATION THERAPY

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INTRODUCTION

The radiations are everywhere. They arrive on the earth from outer space as cosmic rays. These radiations exist in air as emissions from radioactive radon and its progeny. Naturally occurring radioactive isotopes enter and remain in all the living things, and are inescapable. Indeed, all species on this planet are evolved in the presence of ionizing radiation. Radiation is defined as emission or transmission of energy in the form of waves or particles through space or through a material medium. It is mainly categorized as either ionizing or non-ionizing depending on the energy of the radiated particles. Ionizing radiation is a type of energy released by atoms that travel in the form of electromagnetic waves (gamma or X-rays) or particles (neutrons, beta or alpha). Ionizing radiation has numerous applications in medicine. It is used for diagnosis, treatment and sterilisation of medical products. Apart from medical applications, ionizing radiation (hereafter radiation) is also being used for industrial, research, power generation and space applications.

RADIATION THERAPY

Radiation Therapy also abbreviated as Radiotherapy (RT), is a treatment modality used for treatment of cancer using radiation sources or radiation generating equipment. Mostly, high energy X-rays or Gamma rays are used for treatment in radiotherapy. Now a days, proton therapy is also being used for treatment of cancer. Radiotherapy is administered for curative as well as palliative therapy. It is also common to combine radiotherapy with surgery and chemotherapy. RT, used alone or in association with different treatments has been an effective tool for treating cancer for more than 100 years. Radiotherapy may be delivered as external beam radiotherapy or brachytherapy. In the first modality, the beam of radiations is delivered by a source of radiations, which is external to the body. In the second one, a radioactive source is placed inside the body cavity/lesion. In brachytherapy radiation sources could be used temporarily or permanently inside the body.

AIM OF RADIATION THERAPY

Radiation therapy is administered to the patient with an aim to deliver high dose to the cancerous cell and minimal dose to the surrounding normal tissues.

BIOLOGICAL BASIS OF RADIATION THERAPY

The radiation therapy works by damaging the Deoxyribonucleic acid (DNA) of cancerous cells. The radiation can directly damage the DNA by causing breaks along the strands of genetic material, and it can also trigger the formation of very reactive molecules that themselves can be damaging. Unable to cope with this assault to their lifeline, ultimately the cancer cells die. However, due to fractionated treatment normal cells have their ability to fix their own damage to DNA, which is not possible for cancerous cells.

DIAGNOSIS OF CANCER

Cancer diagnosis is mainly performed by using the following imaging modalities:

(i) Diagnostic Radiology

Cancer diagnosis is carried out by using X-rays, ultrasound and magnetic resonance imaging (MRI) which provide anatomical information and extent of disease. The equipments employed for this purpose are Radiography, Mammography, CT-Scan, CT Angiography, Dental CBCT, etc. In addition, MRI and ultrasound are also used for diagnosis.

(ii) Nuclear Medicine

In addition to X-rays, imaging is also performed by administering (intravenously or by mouth) a substance that is radioactive inside the patient body. This type of imaging modality is known as Nuclear Medicine Imaging (NMI). NMI is a method of producing images by detecting radiation from different parts of the body after a radioactive tracer is given to the patient. The radiotracer/radiopharmaceutical is generally absorbed by the cancer cells and diagnosed with the help of imaging devices. The images are digitally generated on a computer and transferred to a nuclear medicine physician, who interprets the images and diagnose the disease. Apart from diagnosis of cancer, NMI is also used to understand the status of coronary artery disease, pulmonary embolism, thyroid carcinoma, brain disorders, acute cholecystitis (an inflammation of the gall bladder), gastrointestinal bleeding, renal artery stenosis (a frequent cause of elevated blood pressure), and even acute fevers of unknown origin. NMI is performed by using Gamma camera, SPECT and Positron-emission tomography (PET) equipments. PET-scan is very popular technology for the detection of cancer. It is a specialized type of imaging that is being used for the detection of cancer, memory disorders and even for measuring how well certain drugs are doing to get rid of cancer. The main advantage of NMI over X-ray based imaging is that it could provide functional imaging. The radionuclide used for NMI are Technetium-99m, Iodine-123, Fluorine-18, Thallium-201, Gallium-67, Lu-177, P-32, etc. Apart from diagnostic application of radiation, it is being used for treatment of cancer. Cancer treatment is carried out by administering radiation to the cancerous part of the body especially for thyroid cancers and bone palliation. It is being treated by using I-131 and beta emitters under the therapeutic application of Nuclear Medicines (NM).

RADIATION THERAPY TREATMENT DOSE

The amount of radiation dose used in radiotherapy varies depending upon type and stage of cancer. For curative treatment, typically 60 to 80 Gy dose is administered to the patient. Preventative (adjuvant) doses are typically around 45 - 60 Gy in 1.8 - 2Gy fractions (for Breast, Head, and Neck cancers).

TREATMENT PLANNING

Treatment planning system (TPS) is the process in which image datasets are loaded and the tumours are identified in a specialized computer. TPS develops a plan for each beam line route for how the therapy system will deliver radiation. TPS plays a pivotal role in radiation therapy and is the key to improved patient outcomes.

DETAILS OF RADIATION GENERATING EQUIPMENT AND SOURCES USED IN RADIATION THERAPY

Radiation therapy is administered with the help of radiation generating equipment, such as medical electron accelerator, proton accelerator and radiation sources (Co-60, Ir-192, I-125, Sr-90, Ru-106, and Cs-137). Medical electron accelerators can deliver multiple photon and electron energies. Proton therapy is gaining popularity due to its unique feature (Bragg's Peak) of no exit dose after the treatment. For brachytherapy treatment, Ir-192 and Co-60 sources are mostly used for intracavitary application. Sr-90 and Ru-106 are used for eye tumours while I-125 is used preferred for the treatment of prostate cancer.

RADIATION DOSIMETRY

Radiation dosimetry in a radiobiological system is a method for a qualitative determination of energy deposited in a given medium by directly or indirectly ionizing radiations. It is conducted for different purposes using variety of dosimeters, such as ionization chamber, Film, MOSFET and TL/OSL dosimeters for confirming the accurate radiation dose delivery at a point of interest in the medium.

IMPORTANCE OF DOSIMETRY

Radiation dose received by the non-target area of patient during diagnosis and therapy is unwanted. It is important to quantify this dose. The advancement in the technology and day to day use of radiation in various therapeutic and diagnostic procedures necessitates the periodic verification especially prior to treatment through radiotherapy.

NEED TO DEVELOP INDIGENOUS DOSIMETRY SYSTEM

Developed countries have already developed their dosimetry system and performing dosimetry as per their intendant tasks. Since, commercially available systems are costly; hence, there is a need to develop and establish indigenous dosimetry systems which can be locally available, cheap and exhibit optimum performance. Bhabha Atomic Research Centre (BARC),



Mumbai has indigenously developed three OSL phosphors namely Aluminium Oxide doped with Carbon (Al₂O₃:C), Lithium Magnesium Phosphate doped with Boron (LiMgPO₄: B) and Lithium Calcium Aluminium Fluoride doped with Europium and Yttrium (LiCaAlF₆: Eu,Y). Dosimetric characterization of these phosphors for medical dosimetry is yet to be done. Therefore, in our study, we have prepared disc dosimeters using these phosphors and characterized it for medical dosimetric applications (diagnostic and therapeutic energy). Further, Al₂O₃: C has been used for multi-institutional dose audit along with ionization chamber and GaFchromic film in therapeutic photon beam. To the best of our knowledge, this is the first time when this work is being carried out in India.

Conclusion

All three types of OSL disc dosimeters have been characterized for medical dosimetric applications in diagnostic as well as therapeutic energies, patient specific dosimetry, audit of point dose measurement in 6 MV photon beam and multi-institutional audit for QA of conformal therapies. In diagnostic energies, its dose response was studied for multiple energies and patient dose measurements were performed in dental equipment. It is concluded that these disc dosimeters are having enough potential to replace age old TLDs for medical dosimetric applications [1-3].



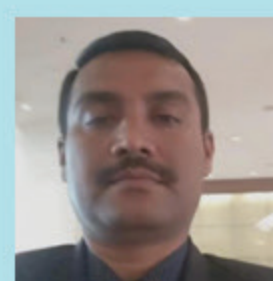
Fig. 1 Images of a patient using CT-Scan/PET-CT unit



Fig. 2 Therapy of a patient using medical electron accelerator

References

- [1] Kumar P, Sharma SD, Chandola RM, Agrawal S, et al. Relative energy response of indigenously developed optically stimulated luminescence dosimeters Al₂O₃: C, LiMgPO₄: B and LiCaAlF₆: Eu, Y in therapeutic photon and electron beams. *Luminescence* 2020; 35(8):1217-1222.
- [2] Kumar P, Sharma SD, Chandola RM, Agrawal S. et al. Patient specific dosimetry using in-house developed OSL disc dosimeters. *Radiat. Prot. Dosim.* 2020; 189(1): 127 – 135.
- [3] Kumar P, Sharma SD, Chandola RM, Agrawal S et al. Radiation dose measurements in dental orthopantogram unit using indigenously developed optically stimulated luminescence dosimeters. *Luminescence* 2019; 34:444-449.



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ARTIFICIAL CONSCIOUSNESS BEYOND THE CODE AND EMPIRICAL LEARNING

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Introduction

We as humans got utmost favorable and phenomenal circumstances to evolve in such a way so that we can think of all the other events and objects including us, and we are one of our kind of species as of now in the entire known universe. It's our mind and brain that makes us distinguishable from all the other species. Human brain is a highly astonishing system that contains billions of neurons and their interconnected networks in order to process huge amounts of information. A completely unique and exclusive structure of the brain allows it to hold intelligence and consciousness that enable humans to think and perform differently. In this article we are going to discuss intelligence, consciousness and how they can be constructed artificially. Intelligence is the capacity that can be held by someone or something, in order to gain experimental insights, learnings, and knowledge that may be further utilized to render results and outcomes accordingly. Furthermore, Intelligence is closely related to consciousness, although, the actual definition of consciousness has a deeper meaning, it is indeed, the ability of being just aware about something, it's the awareness, contained by something or someone about the inner and outer realm. Intelligence can be created artificially as of now; its examples are evidently present in the modern era in the form of Artificial intelligence. The technologies that show human-like behaviour, try to make decisions according to past learnings, and perform their task accordingly can be considered as artificially intelligent. An automatic temperature controlled air conditioner or autonomous vehicles are few examples among others, although mobile phones and computers are the widely used devices that carry intelligence.

Concepts of consciousness, on the other hand, are still debatable, as it is the extensively and frequently discussed topic in philosophy since the 17th century when it was addressed by a famous western philosopher "John Locke". Some other philosophers argued that consciousness is not only limited to humans but it is also possessed by everything, everyone and by the entire universe. This particular concept comes under the theory of panpsychism, which is traced back to 600-500 BCE, and was supported by philosophers such as Aristotle, Plato, Thales of Miletus and Franciscus Patricus in the 15th century. Until the 19th century it was acceptable but with the concepts of "Qualia" and the "hard problem of consciousness", it is now disagreed due to many philosophical consequences. Philosopher, "David Chalmers", proposed the "hard problem of consciousness" or "Qualia", that is the experience possessed by someone by observing something, that cannot be described or explained and only can be perceived.

To comprehend the Qualia, the philosopher Frank Jackson proposed, “Mary’s room Experiment” in 1982. That involves a girl named Mary, who actually never experienced the colour red but knows and read everything about it as a neuroscientist. When, one day, Mary accidentally sees the colour, then the question arises, what different knowledge she learned and how she will explain it. This is the biggest and hard problem of consciousness which is still not properly answered. These philosophical consequences create the limitation in the way to develop the artificial consciousness, as it does not necessarily require the past knowledge and experience in order to make new decisions and perform certain tasks.

Although, the ultimate question is more profound, that is, is it possible to code and program the machine for the future, to make certain decisions, perform tasks, even if the knowledge of previous incidents and learnings are not available. This situation can be addressed properly by assuming the theory of panpsychism is true, that means, consciousness is everywhere, and it is contained by everything. For example, we can take a thought experiment, where, if we think that the air is conscious, which means it’s aware of its surroundings. So, it can be true if the air would adjust itself if the surroundings change. To prove this concept, if we take some air from the earth surface, and bring it away from the surface then we will find that, as the height increases, the density of air is decreased. It is just because of the fact that air molecules are constantly aware about their inner and outer realm, which allows them to change their density with change in gravity and atmospheric pressure. In this situation, even though the air molecules are completely not aware of microgravity, they show the exact same behaviour for any number of experiments performed with similar conditions.

This concept supports the fact that the tools and programs made by humans would also carry consciousness, however, the level and intensity of consciousness is not as similar to as human’s consciousness. It is certainly possible that the computer programs are still conscious but they do not have sufficient reasons and necessity to behave in such a way for which they are not programmed. Conscious behaviour, although, can be the resultant of many different and certain combinations of points in a dimension, is perceptible individually that is perhaps a derivative emerged due to various algorithmic changes in several other dimensions. The existing way of computing is required to have knowledge about all the other dimensions to comprehend consciousness, however, another approach where formulas are enough in order to comprehend and respond to everything that occurs around, would be more suitable in the near future.

Conclusion

As we are gradually unfolding formulas, algorithms and constants behind everything, it seems like there is a unified mathematical function for all natural and artificial events. With increasing computation, iteratively a situation will come when we reach closer to the underlying function that almost governs everything, including consciousness. This formula can then be coded into computer programs, not to provide the outcomes as per the previous experience, not to learn insights and knowledge, but to act, respond and perform their task by leveraging the higher level of consciousness. Humans would limit their capability if they only act and evolve on the basis of accumulated knowledge, likewise, if they made a program that is based on knowledge accumulation, then it would be limited to a certain extent. The next approach towards artificial consciousness may be fundamentally based on iterative and self corrective formulas that are continuous in nature and evolving with time. The existing computing is entirely digital and thus discrete in nature, but a new radical approach can be adopted in the form of continuous computing, that will further help to hold the very basic formula of consciousness in order to solve the hardest problem of mankind and the world.



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OUR COGNITIVE BEHAVIOUR: A TOOL USED BY SOCIAL MEDIA

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“ Did you know if our cognitive behaviour is analysed, a mechanism can be made to change our behaviour which can even change our personality? ”

Introduction

Cognitive theorists, Piaget and Vygotsky whose work in the 1950s and 1960s brought about the popularity of this new field of psychology called cognitive psychology. The ability to think and how thinking happens, to process the thinking in young people’s mind. Our brain tries to process a huge amount of information at the same time it has to adapt to an enormously changing environment so as to process current thoughts and feelings into human behaviour, which is very complex.

Cognition refers to the mental process of acquiring knowledge and understanding through thoughts , experiences , senses. Cognitive processes include attention, thinking, formation of knowledge, problem solving, language, imagination, perception and planning.

Uses of cognitive processes include learning, forming memories, decision making, etc. which influence how we perceive the world, form impressions and how we interact. Hence we need to nurture our cognitive abilities or it will be influenced by technological mechanisms developed using Artificial Intelligence(AI) and Machine Learning (ML) so as to alter our behaviour .

ONE SUCH EXAMPLE IN OUR DAILY LIFE - THE SOCIAL MEDIA APPLICATIONS

Social media is now a days is so widespread that every individual has some sort of social media account which helps us to maintain Interpersonal relationships and entertain ourselves but nothing comes free of cost.They utilise our personal, political, and consumer aspects in order to influence our attitudes and behaviours into meeting their online demands such as influencing us to advertise, promote and buy a product.

They collect data through our posted contents, frequent searches and contents that we appreciate (like, comment and share). One of the most popular social networking sites, Facebook currently has around 2.85 billion active users (those who logged into facebook during the past 30 days) thus generating 4 petabyte of data(millions of GB) daily. How do you think they benefit from this enormous amount of collected data ? By utilising technologies such as AI, ML, dynamic eye tracking etc. they process the users’ data to analyse cognitive behaviour and they can manipulate us. Processing of data includes using technologies like:

ARTIFICIAL INTELLIGENCE

It is a technology which is a mimic of human intelligence that is capable of finding solutions to different challenges and problems. The requirement is to understand the environment in which this technology operates. Later by placing this into operation, the collected data will be used to detect normal environmental parameters and recognise the functionality of the challenges. It can develop methods and conduct inductive reasoning to derive general principles learning from experience. The aim is to use artificial intelligence to analyse cognition and develop marketing strategies.

One of the fields is computer vision. Computer vision is a technology that not only recognises patterns but also understands them. Both Science and engineering collaborate in computer vision.

COMPUTER VISION/GOOGLE CLOUD VISION

It is a field of computer science that focuses on creating special software algorithms which help in processing, analyzing, and making sense of visual data i.e images or videos ,as humans do. The concept is actually based on teaching computers to process an image at a pixel level and also to understand it.

BLOCKCHAIN

Decentralized social media is one of the most upcoming genres of the social media sector. There are a number of cases of social media and blockchain convergence which helps in developing marketing strategies.

IoT (INTERNET OF THINGS)

IoT can help to create solutions around real-time monitoring of data and insights coming in from social media. They are now making a collaboration with other organisations to monitor users' data via their IoT devices to help companies make better business decisions.

All the above mentioned technologies can be combined together to process our data in such a manner that it will predict and recognise our cognitive behaviour. This particular data can be used in various aspects like advertising and also by having such amount of processed data they analyse our cognitive biases (systematic error in thinking which occurs in people while processing and interpreting information from their surroundings which finally affects the decisions and judgments they make) such as :

- Anchoring bias (people rely on pre-existing or first piece of information for decision making)
- Availability heuristic bias (using mental shortcuts that rely on immediate examples)
- Bandwagon effect (people tend to believe what the world believes regardless of their own)
- Choice supportive bias (people tend to defend their choices)
- Confirmation bias (people tend to listen to information that confirms what they already know)
- Ostrich bias (people often avoid negative information or feedback that monitor their goals)
- Outcome bias (people make decisions based on the outcomes of previous events)
- Placebo bias (if people believe that something will create effect on them, it will end up creating one)
- Survivorship bias (people judge on the information provided by the surviving group regardless of others)
- Selective perception (people perceive what they want in a message while ignoring opposing viewpoint)

ANALYSIS OF COGNITIVE BEHAVIOUR USING TECHNOLOGIES IS REWIRING OUR NERVOUS SYSTEM

Extensive Neuroimaging research in social cognition has revealed that several brain networks may be involved in social media use. Parts of the brain that are related to orgasms, motivation and love are stimulated to trigger the release of dopamine (happy hormones or feel good chemicals) which makes us engage in social media. The neurological excitements we receive by our desired rewards create a drug dependent effect on us. Only thirty to forty percent of face to face communication is self-centered but in case of social media communication eighty percent are self involved; another factor which drives us to social media usage.

While designing the Social media site they ensure that their design, layout, sound effect and other trigger factors satisfy our social drives such as convenience, expectations, operant conditioning etc., ensuring our engagement on the site.



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SOFT FILLER ELASTOMER COMPOSITE FOR MICRO-ELECTRO-MECHANICAL SYSTEM

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Introduction

Smart or intelligent materials are a class of materials which changes its size, shape, etc. in response to the external stimuli. Electro-active polymer (EAP) is one of the smart materials that generates mechanical deformation in response to the external electric field and vice-versa[1]. In an EAP, when deformation is caused by field-induced reorientation of a crystal-line or semi crystalline structure, such polymer is classified as 'electro-strictive' (in this case, the permittivity is dependent on the electric field). Dielectric elastomers (DE) are another type of EAP in which deformation is generated by the electrostatic forces. In modern day to day work, DE based micro-electro-mechanical systems (MEMS) are growing to be an essential part in the form of adaptive display, wearable devices, sensors, actuators, etc. Escalated load possesses the higher performance of the MEMS and also generates an opportunity for the detrimental events or sudden failure, which reduces the working life span and subsequently the reduces its reliability. Whereas, improving the performance with lower loads and increase in reliability have always been a huge challenge with the application of DE material. Researchers have assessed two major methods to improve the performance pre-straining and chemical modification (Fig.1).

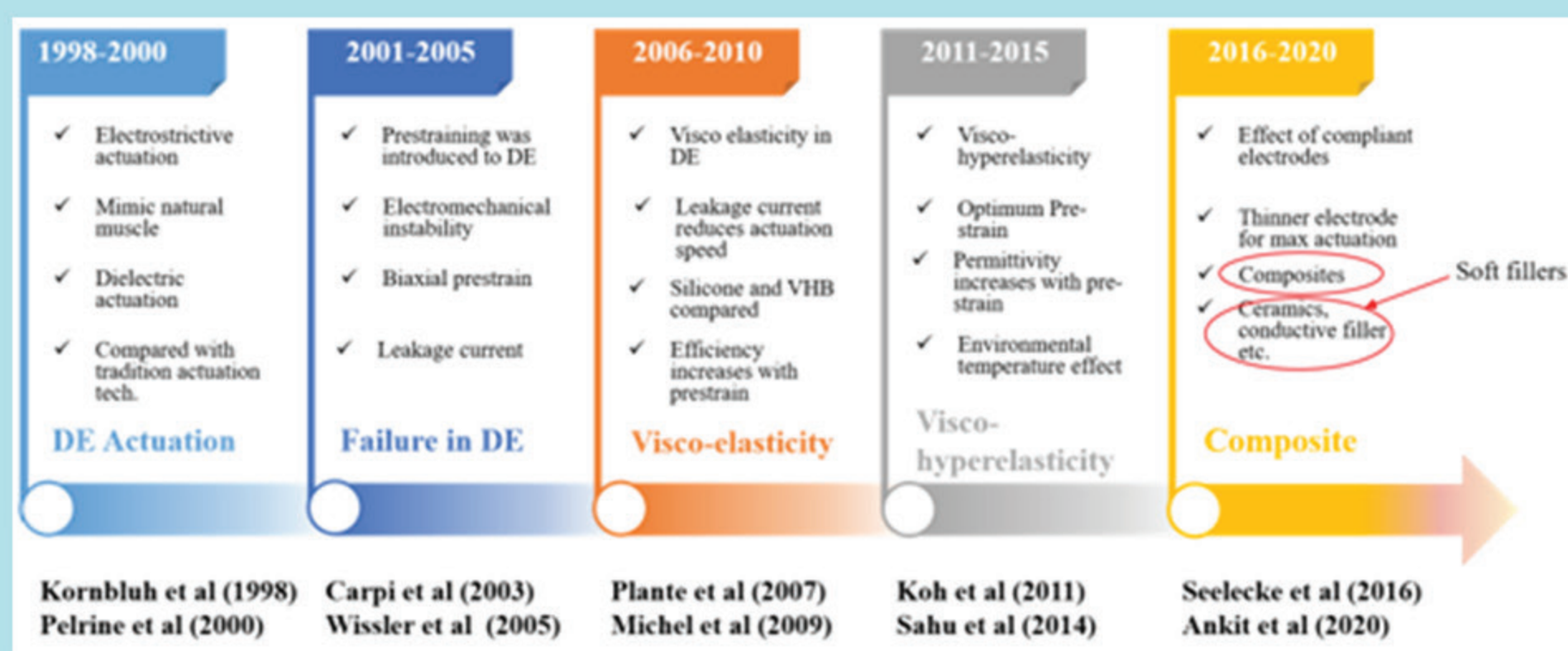


Fig.1 Time trend of investigation for dielectric elastomer and expected upcoming area of research.

PRE-STRAINING

Pre-straining of DE increases the material efficiency by suppression of the failure in which small amount of strain is introduced to the system before applying the external stimuli. Small pre-strain can be uniaxial, biaxial, pure shear or radial in some cases. Pre-strain generally increases the electrical breakdown strength and thus increases the efficiency with some limitations. Pre-strain is limited to the acrylic dielectric elastomers, and any reduction in the film thickness prior to load application leads to the increased leakage current and often reduction in dielectric property.

CHEMICAL MODIFICATION

To overcome some of the limitations of the pre-straining, chemical modification was adopted by many researchers. Chemical modification refers to improving the material property by incorporating foreign particle into the DE. It can be achieved by means of blending or compositing fillers. Compositing fillers have shown prominence due to the easiness and flexibility of the method. Researchers have assessed the composite of traditionally available fillers, such as ceramics, conductive fillers and carbon derivatives [2][3], and reported that dielectric property of the material improved significantly at the cost of mechanical compliance. As low mechanical compliance is an essential parameter for soft actuation, it has to be lower or intact. New emerging trend of soft filler-based elastomer composite may be appropriate replacement to enhance the material properties and keep the mechanical compliance low/intact[4][5]. It is expected that the lower mechanical compliance may help researchers and manufacturers to improve the soft actuation.

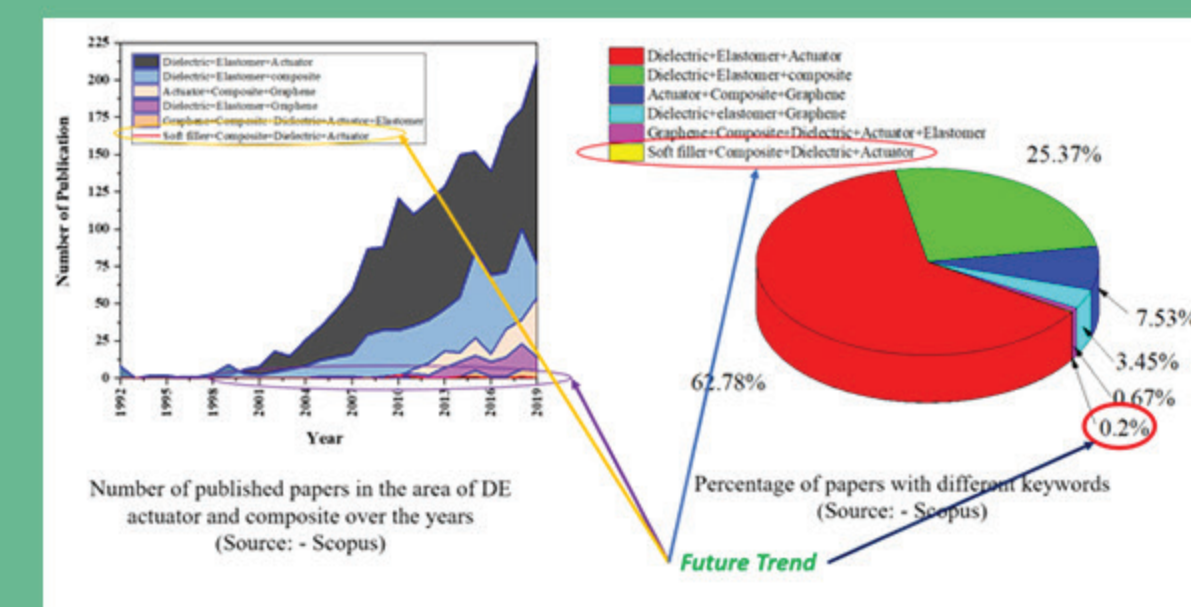


Fig.2 Research trend of DE with different filler and without fillers and scope of soft fillers to improve the elastomer performance.

References

[1] R. E. Pelrine, R. D. Kornbluh, and J. P. Joseph, "Electrostriction of polymer dielectrics with compliant electrodes as a means of actuation," *Sensors Actuators, A Phys.*, vol. 64, no. 1, pp. 77-85, 1998, doi: 10.1016/S0924-4247(97)01657-9.

[2] C. Pan et al., "A Liquid-Metal-Elastomer Nanocomposite for Stretchable Dielectric Materials," *Adv. Mater.*, vol. 31, no. 23, pp. 1–10, 2019, doi: 10.1002/adma.201900663.

[3] F. Zhang, T. Li, and Y. Luo, "A new low moduli dielectric elastomer nano-structured composite with high permittivity exhibiting large actuation strain induced by low electric field," *Compos. Sci. Technol.*, vol. 156, pp. 151–157, 2018, doi: 10.1016/j.compscitech.2017.12.016.

[4] V. Chiaula, P. Mazurek, J. Eiler, A. C. Nielsen, and A. L. Skov, "Glycerol-silicone adhesives with excellent fluid handling and mechanical properties for advanced wound care applications," *Int. J. Adhes. Adhes.*, vol. 102, no. December 2019, p. 102667, 2020, doi: 10.1016/j.ijadhadh.2020.102667.

[5] H. Aguilar Bolados et al., "Electro-mechanical actuation performance of SEBS/PU blends," *Polymer (Guildf.)*, vol. 171, no. February, pp. 25–33, 2019, doi: 10.1016/j.polymer.2019.03.035.

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COVID-19 LOCKDOWN EFFECT ON LAND SURFACE TEMPERATURE AND NORMALIZED DIFFERENCE VEGETATION INDEX

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INTRODUCTION

COVID-19 has been spread by severe acute respiratory syndrome coronavirus-2 which has affected more than 219 countries and territories. The most affected countries are the United States of America, India, Brazil, Russia, the United Kingdom, France, Spain, Italy, Turkey, Germany, Colombia, Argentina, Mexico, Poland, Iran, South Africa, Ukraine, Indonesia, Peru, Czechia, and the Netherlands. In each of these countries, at least 1 million people have been affected by the virus. The whole world is looking for its vaccine or suitable medicine for a long time which is still not available in the market. The World Health Organization (WHO) and the government of individual countries have repeatedly presented several preventive methods to restrict the spreading of this disease. Lockdown is the most popular and effective method among them. As the common people of different countries did not maintain the basic steps to protect themselves from the severe effect of COVID-19, the lockdown was very necessary to stop the contamination process. In the lockdown process, people are compelled to stay at home without any emergency or medical purpose. Academic institutions, public and private offices, restaurants, banks, public and private transports, factories, shops, etc. are entirely closed at the time of proper lockdown.

The lockdown process slows down the environmental pollution and develops a less polluted ecologically rich society. The restricted transportation system and industrial activities reduce the air pollution level and enhance air quality. The vegetation grows at a fast rate without any kind of interruption. The immediate positive effect of this lockdown on the environment was noticed in the reduction of air temperature and land surface temperature (LST). LST primarily depends on the land surface composition and solar radiation. The vegetation surface generates a low amount of LST, whereas the man-made concrete land surface reflects a high amount of LST. Normalized difference vegetation index (NDVI) is widely considered as the most significant remote sensing index that regulates the variation of LST. In humid tropical climate, LST and NDVI normally generate an inverse correlation. The improvement of air pollution and the increase of moisture in air predominantly increase the strength of the LST-NDVI correlation.

The key objective of the case study is to examine the immediate effect during the lockdown period (25 March to 31 May, 2020) in Raipur city of India on the LST, NDVI, and LST-NDVI relationship. Another objective is to evaluate the effect of lockdown on the thermal comfort level of the city. The study can be appraised for future urban planners to develop better environmental planning and management system.

Landsat 8 data sets for April and May from 2013 to 2020 was used in the present study. The minimum LST values in the earlier images of April month were quite higher compared to the minimum LST values in the lockdown images (2 April and 18 April, 2020) of April month. The maximum LST values also show similar result. The mean LST values during the lockdown period of April month were quite lower compared to the mean LST values in the lockdown images of April month. The average value of the mean LST of April during the lockdown period is 5.32oC lower than the earlier years. Like April, a similar type of result regarding LST is found in May also. The average value of the mean LST of May during the lockdown period (4 May, 2020) is 2.30oC lower than the earlier years. The result indicates a positive change during the lockdown phase. It is mainly because of the low concentration of the population and various types of vehicles on the road.

The reduction of transport and industrial pollutants performs a crucial role in the reduction of mean LST during the lockdown period in Raipur City.

The lockdown phase had a great impact on NDVI. The three multi-date satellite image of the lockdown phase show a higher value of mean NDVI than the images of earlier years. The low level of pollution and the health status of vegetation not impacted by anthropic disturbance (emission, traffic, industrial activities, etc.) reflect an increase in NDVI. It is a positive sign of the lockdown period.

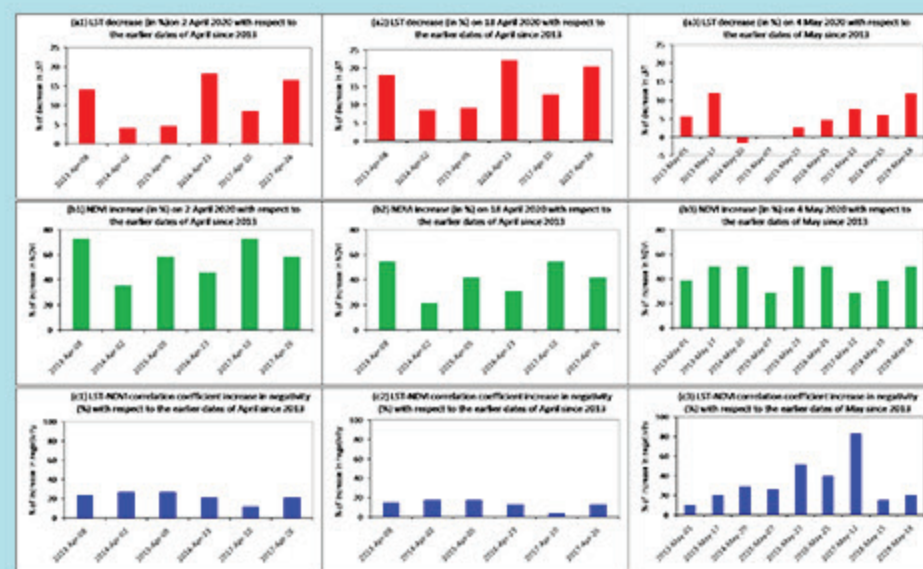


Figure 1. Comparison of LST and NDVI between lockdown period and the earlier dates: (a1-a3) Decrease of LST (in %); (b1-b3) Increase of NDVI (in %); (c1-c3) Increase of negativity in LST-NDVI correlation (in %)

Figure 1 shows the comparison between the LST and NDVI values and their correlation between the lockdown period of 2020 and the earlier years since 2013. In the lockdown period, LST decreases at a high percentage than the previous years (up to 22% in April and up to 12% in May) (Figure 1 (a1-a3)). It is clear that the value of NDVI increases up to 73% in April and up to 50% in May in the lockdown period compared to the previous years due to the interrupted growth of green vegetation (Figure 1 (b1-b3)). Thus, a negative LST-NDVI correlation was observed throughout the entire period. But, the negativity of the correlation was increased at a high percentage, e.g., up to 27% in April and up to 83% in May (Figure 1 (c1-c3)). It was a great achievement of the lockdown period in the natural environment.

Some thermal comfort indices are available for evaluating the ecological quality of urban life. In this study, the urban thermal field variance index (UTFVI) was used for the evaluation of the thermal comfort level of Raipur city during the lockdown period. The city has two extreme categories for ecological evaluation: the excellent category and the worst category. Most of the areas of Raipur (> 45% during the entire period) having an excellent thermal condition where vegetation and water bodies are present in a high ratio. The central and southwest portions experience excellent thermal conditions. However, the worst category of the ecological evaluation index also exists in a large portion (> 31% during the entire period) in the northwest, north, east, and southeast parts. Here, most of the lands are impervious (either bare land with exposed rock surface or under built-up areas). The normal thermal condition is found in some small patches surrounding the vegetation and water areas while the worse condition exists around the areas of the built-up class. During the lockdown period, the area under the worst ecological condition (< 33% of the total area) has been decreased at a significant rate than the previous years. However, all the satellite images of the previous periods include areas belonging to the worst ecological condition and exceeding > 35%.

Conclusion

The study examines the value of LST, NDVI, and LST-NDVI correlation coefficient to compare the environmental condition of Raipur city in the lockdown period and the earlier times. A total of eighteen Landsat 8 satellite data of April (eight) and May (ten) months from 2013 to 2020 were used for this investigation. The results show that the value of LST reduced and the value of NDVI increased in the lockdown period due to the sudden stop of industrial and transport activities in Raipur. The negativity of the LST-NDVI correlation was also increased significantly during the lockdown period. It shows that the natural environment becomes less polluted and ecologically more comfortable compared to the previous years and before the lockdown period.

The study is very much useful for urban planners as the results depict the positive impact of the lockdown period on the land surface of Raipur city and surrounding areas. As green areas and water bodies are the main responsible land covers for the generation of low LST zones, city planners should focus more on the land conversion process. The urban planners should convert the existing bare lands into vegetation and water surface. To conserve the ecological condition, tree plantation is quite necessary along the roads, commercial buildings, and residential apartments.



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START-UP BY STUDENT

CONCEPT: PROMOTING ENTIRELY BY NEW MEANS

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The idea basically revolves around the new era of the advertising industry which includes techy touch at its top, which involves the intersection of data science and aeronautics, where the researcher made an Air Ship and find the following image.

The researcher attached a thin film of sheet with a small projector to its end and the researcher will display the specific company / Local shops ads on that sheet and make that airship fly at a specific range of height considering a wide range of limitations and obstacles in that area/locality. The airship is entirely made up in RC (Remote Control), where it was Controlled by a person on the road, who will take care of the airship throughout its journey and walk along with Airship exactly beneath it and ensure to travel from a specific point to a specific destination which is desired by the client considering difficulties and hurdles. As it moves through the dedicated route, the ads will be displayed throughout the journey, which will be an eyecatcher of audience within its journey and beauty in this startup is the researcher uses data science for this project, which brings quite useful insights and decisions like which location will be best to get the audience attention, the idea to get the targeted audience along its way, etc. This enables to bring some useful insights and useful decisions to be made for the analysis on the reach, locations, and targeted audience.



The idea deals with entirely new practices as advertising through airship is the State of Art for the advertising industry and bringing Data Science, Aeronautical knowledge, Advertising under one roof makes the idea to stand out from the crowd. If the execution of the idea is properly done then the researcher could say it's definitely an upto the mark startup. The entire sketch of this startup is new at every corner and the researcher is modifying it in every area in an innovative way. At every corner, the researcher is making modifications and innovative decisions to keep this idea at the top and out of the box. The advertisement industry is one of the top Industries for businesses and startup and inclusion of technology will be a boon as this will help in taking decisions on time and accurately with efficiency. Another takeaway from this startup is It can also be used for philanthropist activities like propagating many social responsibilities and many neglected problems for example considering the recent crisis for Covid the researcher can use this Airship to propagate the importance of masks and washing hands regularly , the importance of nature and trees.

