Innovation is not about tools, Its about people, processes and pedagogy

Research & Development Cell

Raajdhani Engineering College

सा विद्या या विमुक्तये

RE Chronicle

Half-yearly Research Bulletin

Raajdhani Engineering College, Bhubaneswar

Promoting Creativity

Boosting Research

Exploring Innovation

RAAJDHANI ENGINEERING COLLEGE:

Raajdhani Engineering College (REC), Bhubaneswar, was founded in 2006 by the Samriddhi Educational Trust of Odisha, helmed by a distinguished cadre of professionals with deep expertise in education, industry, engineering, and technology. Situated on a sprawling 15-acre campus near Mancheswar Railway Station, the college benefits from its prime location, just 5 kilometres from the renowned Nandankanan Zoological Park. The campus is strategically positioned with excellent connectivity, being 5 kilometres from National Highway-5, 1 kilometre from Mancheswar Railway Station, and 8 kilometers from Biju Patnaik International Airport.

REC is recognized and approved by the All India Council for Technical Education (AICTE), New Delhi, and is affiliated with both Biju Patnaik University of Technology (BPUT) and the State Council for Technical Education and Vocational Training (SCTEVT), Government of Odisha. The institution holds accreditation from the National Assessment and Accreditation Council (NAAC) and is designated as a Scientific and Industrial Research Organization (SIRO) by the Department of Scientific & Industrial Research (DSIR), Government of India. Additionally, REC is an institutional member of the Indian Society for Technical Education (ISTE) and the Institution of Engineers (IE), and is an active participant in the Vigyan Prasar Network of Science Clubs. The college is also recognized by the Institute of Electrical and Electronics Engineers (IEEE), further highlighting its commitment to academic and professional excellence.

RE Chronicle

Welcome to the latest edition of REC Chronicle, where the intersection of pioneering discoveries and visionary thinking comes to life. This issue is your gateway to the cutting-edge advancements shaping the engineering landscape, showcasing transformative research and the latest industry trends that are redefining the future.

In this edition, we delve into an array of in-depth articles that illuminate the forefront of technological innovation. Our coverage spans breakthrough projects, revolutionary engineering methodologies, and the impactful research being conducted by our brightest minds. Each feature is designed to provide you with a comprehensive understanding of the dynamic changes occurring within the field of engineering.

Experience firsthand the remarkable student projects that push the boundaries of traditional engineering practices, offering fresh perspectives and novel solutions to contemporary challenges. Through expert analyses and thought-provoking insights, we celebrate the ingenuity and dedication of individuals who are driving progress and making significant contributions to the industry.

REC Chronicle stands as your premier resource for navigating the rapidly evolving world of engineering. We aim to inspire and inform, highlighting the creative endeavors and technical expertise that are shaping tomorrow's engineering marvels. Join us in exploring the new frontiers of technological excellence, and immerse yourself in the vibrant and ever-expanding realm of engineering innovation.

As we chart the course for the future, let REC Chronicle be your guide to understanding and appreciating the remarkable achievements and transformative ideas that define the cutting edge of engineering today.

Vision:

To focus on academic excellence in alignment with NEP-2020, aiming to provide quality and innovative research while contributing to societal development by addressing various challenges in a rapidly changing global and technologically driven environment.

Mission:

To create a conducive environment for better access to research and development through various programs such as expert talks, FDPs, and SDPs.
To encourage multidisciplinary research through a collaborative approach with industry, academia, government, and community-based organizations at local, national, and international levels.
To encourage faculty members to produce high-quality publications, participate in conferences, file patents, and publish books.

Quality Policy

Raajdhani Engineering College, Bhubaneswar is commited for creating, sustaining and improving the learning process through established quality management system, compliance to statutory & regulatory requirements and makes it a center of scientific & technological learning. Continual improvement and team work shall be our strength for achieving the set objective with its core value" Creativity & Innovation"

STALWARTS OF REC

CA. B. Ramprasad Rao
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Raajdhani Engineering College, BBSR

Dr. M. K. Palo
Vice Chairman
Raajdhani Engineering College, BBSR

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G. S. Mishra
Director (T & P)
Raajdhani Engineering College, BBSR

Dr. Alok Kumar Mohapatra
Principal
Raajdhani Engineering College, BBSR

Welcome to the inaugural edition of Rechronicle! As Chairman, I am thrilled to introduce this new platform dedicated to exploring and sharing transformative ideas. Our mission is to ignite curiosity, spark dialogue, and foster innovation across diverse fields. With a blend of insightful articles and compelling stories, we aim to inspire and engage our readers. I invite you to embark on this journey with us, contributing your thoughts and feedback as we build a vibrant community together. Here's to new beginnings and a future filled with discovery!

Warm Regards,
Chairman

Welcome to the first edition of Rechronicle in Research! I am thrilled to introduce a platform where pioneering research intersects with in-depth analysis. Our mission is to highlight breakthrough studies, encourage scholarly dialogue, and offer a venue for researchers to showcase their work and insights. In this issue, you'll find a diverse array of topics, from the latest advancements to emerging trends across various disciplines. We aim to spark curiosity, promote collaboration, and drive excellence in the research community. Join us as we embark on this exciting journey of exploration and learning.

Warm Regards,
Vice-Chairman

SECRETARY'S DESK:

Dear Valued Readers,

It is with immense pleasure and excitement that I welcome you to the latest edition of "REChronicle" Research Magazine.As the Secretary, I am continually inspired by the remarkable dedication and creativity within our research community. Our collective pursuit of knowledge and commitment to excellence are the driving forces behind our achievements. In this issue, you will encounter a rich tapestry of articles, each providing fresh insights and advancing our understanding across various disciplines. From pioneering research to compelling analyses, our contributors are at the forefront of innovation, pushing boundaries, and making significant impacts on both academia and society.

Thank you for joining us on this journey of discovery and exploration. Here's to celebrating the extraordinary contributions of our researchers and the ongoing pursuit of excellence.

DIRECTOR'S DESK (T&P):

It is with great pride and excitement that I present the inaugural edition of REChronicle-2024, marking a significant milestone in our institution's journey.

This magazine serves as a reflection of the collective effort and dedication of both our students and staff. It showcases how our community at REC has come together to share and expand knowledge, embodying the essence of a dynamic learning environment.As REC rises to prominence among esteemed technical institutions, it is a testament to our commitment to delivering exceptional education. Our institution, now 15 years young, boasts cutting-edge infrastructure and a dedicated faculty focused on fostering creativity and innovation. The environment at REC is meticulously designed to facilitate knowledge acquisition, generation, and dissemination while instilling a deep sense of social responsibility, human values, and environmental consciousness.

May this magazine inspire and inform, celebrating the remarkable achievements of our community and paving the way for future successes.

DIRECTOR'S DESK (admin & finance)

I am thrilled to announce the launch of our college magazine, REChronicle-2024. This momentous occasion is a testament to the creativity and ingenuity of both our students and staff. With this magazine, we have a remarkable platform to showcase exceptional articles and innovative ideas, truly highlighting the extraordinary talent within our college community.

REChronicle-2024 provides a unique opportunity for students and staff to exhibit their talents and share their pioneering ideas. This magazine is a reflection of the dynamic and diverse skills that our community possesses, and it serves as a vital tool for unlocking and celebrating the potential of everyone involved. I would like to extend my warmest congratulations to the chief editor, executive editors, and all members of the editorial board. Your dedication and hard work have made REChronicle-2024 a reality. Your efforts in curating and presenting the outstanding work from our college community are truly appreciated.

I believe in intuition and inspiration. Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution. It is, strictly speaking, a real factor in scientific research" Says Alber Einstein

Research is not a systematic occupation but an intuitive artistic vocation. I am happy that our institute REC is coming up with the maiden issue of our research magazine "REChronicle" where we are thrilled to explore the power of imagination and its outcome in particular. This magazine is expected to showcase the research outcomes of our students and faculties while simultaneously giving them an opportunity to discover their innovation and creativity.

My heartfelt thanks to the entire team of Editorial for bringing up this issue and I expect that it will surely boost the stakeholders to gradually orient their work into research and innovation and help the society and the world as a whole for a transformation with imagination and investigation as the real building blocks.

Warm Regards,
Principal

Dean Message

As the Dean of Research at REC, Bhubaneswar, I am honoured to present to you the first edition of our Research Magazine, "REChronicle" a testament to the innovative spirit and relentless pursuit of knowledge that defines our institution. Research is the cornerstone of academic excellence, driving the evolution of ideas, technologies, and solutions to the complex challenges facing our world today. At REC, we are committed to fostering a research environment that not only encourages curiosity and creativity but also emphasizes the importance of collaboration across disciplines. This magazine highlights the remarkable research endeavours undertaken by our faculty, students, and collaborators. From cutting-edge advancements in engineering and technology to ground-breaking studies in the sciences and humanities, the diversity and impact of our research activities are truly inspiring. Each article within these pages is a reflection of the dedication and hard work of our research community, striving to push the boundaries of knowledge and contribute meaningfully to society.

Looking ahead, REC is poised to further strengthen its research capabilities, with a focus on interdisciplinary research, industry partnerships, and global collaborations. We are committed to supporting our researchers through state-of-the-art facilities, funding opportunities, and a culture that values innovation and excellence.

I extend my heartfelt congratulations to all contributors whose work is featured in this magazine. Your achievements underscore the vibrant intellectual environment at REC and set a high standard for future research. I encourage all readers to engage with the content of this magazine, to explore the diverse array of ideas and findings presented, and to be inspired by the collective achievements of our research community.

Let us continue to strive for excellence in our quest for knowledge, with the conviction that our research will elevate our institute to new heights and make a lasting impact on the world.

Dr. Dattatreya Tripathy
Dean of Research
REC, Bhubaneswar

Welcome to the inaugural edition of "REChronicle" in Research! It is with profound enthusiasm that I present this publication, devoted to the forefront of academic inquiry and intellectual advancement. Within these pages, you will find a meticulously curated selection of pioneering studies and emergent trends, epitomizing the apex of contemporary research. Our objective is to forge a dynamic platform that not only facilitates the exchange of avant-garde ideas but also serves as a forum for researchers to disseminate their most consequential findings. We invite you to immerse yourself in these scholarly contributions, engage actively with the presented research, and partake in a robust dialogue that drives the evolution of knowledge across a myriad of disciplines. As we embark on this journey of intellectual exploration and enrichment, we eagerly anticipate your active engagement and reflective feedback. This magazine represents a confluence of innovative thought and academic rigor, poised to contribute significantly to the broader scholarly community. Here's to an era marked by transformative research, collaborative inquiry, and shared intellectual growth. May this publication inspire continued excellence and foster an environment where groundbreaking discoveries thrive.

Warm regards,
Binita Das
Chief Editor

STAKE HOLDERS

It is with great enthusiasm and anticipation that we present to you the first edition of REChronicle, our pioneering research magazine. This publication marks a significant milestone in our journey to foster a vibrant community of researchers, scholars, and thought leaders. I am excited to share our vision and the initial fruits of our collaborative efforts.

I am thrilled to unveil the debut edition of REChronicle, our groundbreaking research magazine. This launch represents a major milestone in our mission to cultivate a dynamic community of researchers, scholars, and innovators. I am eager to share our vision and the first of our collective work.

I am beyond thrilled to see the launch of the first ever edition of REChronicle! This is a monumental milestone, and I am honored to be a part of it.

The birth of Rechrolicle is the result of a collective effort by dedicated researchers, industry experts, and academic institutions. Each stakeholder has contributed invaluable insights and resources to ensure that this publication not only showcases high-quality research but also reflects a broad spectrum of disciplines and perspectives.

In this inaugural edition, we delve into a range of topics, from the latest advancements in artificial intelligence to groundbreaking studies in environmental science. Our feature articles, research highlights, and expert commentaries aim to offer a comprehensive overview of current trends and emerging fields.

RECronicle

CONTENTS

Faculty Voice : A Showcase of Scholarly Article

Graphene Oxide Reinforced Sustainable Geopolymer Concrete

Utilization of waste materials such as WFS and RCA in GPC will lessen the burden on environment and will solve the problem of waste disposal. Limited research has been done on the use of WFS in concrete. Moreover, negligible research has been found on the use of WFS in GPC. Addition of Graphene oxide (GO) in concrete is expected to enhance fracture toughness of GPC and may also help in recovering the loss in strength of concrete due to incorporation of WFS and RCA. The main objectives of this research project to develop Geopolymer concrete with foundry sand and RCA. To develop Geopolymer concrete with foundry sand and RCA by incorporating Graphene Oxide. To study strength and durability properties of concrete in fresh and hardened state. To check the efficacy of geopolymer concrete developed in retrofitting of columns. On the economic front, while graphene concrete currently costs 5–10 times more than its conventional counterpart, its superior attributes suggest promising long-term cost benefits. Conclusively, this review findings spotlight graphene-augmented concrete as pivotal for a sustainable, economically sound, and high-caliber construction future. The present research demonstrates very promising features of GO-modified concrete that exhibit improved strength development and durability compared to traditional concrete, thus further advocating for the wider utilization of geopolymer concrete manufactured from industrial by products.

Keywords: Geopolymer, foundry, waste materials, graphene oxide

Dr. Sanjay Kumar Behera
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Department of Civil Engg.

Hydrogen Fuel Cells: A Sustainable Solution for Decarbonizing Heavy-Duty Transportation

Hydrogen fuel cells are a clean, effective cause of energy, offering a favorable substitute to conventional fossil fuels. By converting chemical energy into electricity, hydrogen fuel cells yield simply water and heat as byproducts, producing those an attractive resolution for dropping greenhouse gas discharges and diminishing environmental deterioration. This technology has the potential to power an extensive sort of submissions, from conveyance and static energy production to portable electronics and industrial processes. With their high energy density, long lifespan, and zero-emission operation, hydrogen fuel cells are composed to execute a critical part in the conversion to a sustainable energy future. The transportation sector is an important provider towards greenhouse gas releases, with heavy transport vehicles being a major polluter. Decarbonizing heavy transport vehicles is crucial to mitigate climate change. This paper explores the strategies and technologies for decarbonizing heavy transport vehicles, including electrification, alternative fuels, efficiency improvements, sustainable fuels, hybridization, and green logistics. We analyze the benefits, challenges, and limitations of each approach and discuss policy and regulatory frameworks to support the transition. Our approach highlights the need for a multi-faceted approach to achieve net-zero emissions from heavy transport vehicles by 2050. By decarbonizing heavy transport vehicles, we can ominously diminish discharges, advance air value, and boost energy retreat, ultimately contributing to a sustainable transportation sector. Heavy-duty transportation is a significant contributor to greenhouse gas discharges, magnitude nearly 25% of overall transportation productions.

This paper presents a sustainable solution for decarbonizing heavy-duty transportation, focusing on hydrogen fuel cell expertise and electrification. We examine the benefits, challenges, and limitations of these technologies and discuss the necessary policy and regulatory frameworks to support their adoption. This very analysis highlights the potential for hydrogen fuel cells and electrification to reduce emissions by up to 70% and 100%, respectively. It can also explore the role of non-traditional energy, energy storage, and grid modernization in supporting the shift to a reduced-carbon transportation sector. By adopting this sustainable solution, the aspects like emissions, air quality, and energy security are becoming optimize and ultimately contributing to a net-zero emissions future. Hydrogen fuel cells offer a promising solution for decarbonizing heavy-duty transportation, providing a zero-emission alternative to traditional fossil fuels. This work determines the latent of hydrogen fuel cells in reducing emissions and improving air quality in the heavy-duty transportation sector. We discuss the benefits and challenges of hydrogen fuel cell technology, including infrastructure development, energy efficiency, and cost reduction. We also examine case studies of successful hydrogen fuel cell deployments in heavy-duty transportation and provide recommendations for policymakers and industry stakeholders to support the adoption of this sustainable technology. By transitioning to hydrogen fuel cells, we can significantly diminish discharges and generate an additional ecological future for heavy-duty transportation.

Keywords: hydrogen fuel cells, heavy-duty transportation, decarbonization, zero-emission vehicles, green transportation, energy transition.

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Metal 3D Printing vs. Traditional Manufacturing: Which Should You Choose for Aerospace Industry?

As metal 3D printing becomes the buzzword in the additive manufacturing industry, many argue it can overtake traditional manufacturing. But is this the case? We look at the pros and cons of both metal 3D printing versus traditional manufacturing to determine which the best is or whether they both play their part in producing spare parts.

The history of manufacturing dates back to the industrial revolution in the 1900s, when raw materials were transformed into useful products. Traditional manufacturing processes, such as molding, forming, machining, and joining, are mainly subtractive and suitable for large-scale production due to their costs and limited design flexibility. 3D printing, on the other hand, offers design flexibility, cost, and speed. Traditional manufacturing is commonly used in industries that mass-produce products made from materials like wood, steel, or plastic. Metal 3D printing, or additive manufacturing, offers unparalleled design flexibility, enabling the creation of complex geometries and customized parts that would be difficult or impossible to produce with traditional methods. It also reduces material waste and allows for rapid prototyping and iterative design. Traditional manufacturing methods, such as casting and forging, are highly efficient for mass production and can produce parts with excellent mechanical properties and surface finishes at lower costs per unit. A hybrid approach may provide the best solutions depending on specific project requirements and production scales.

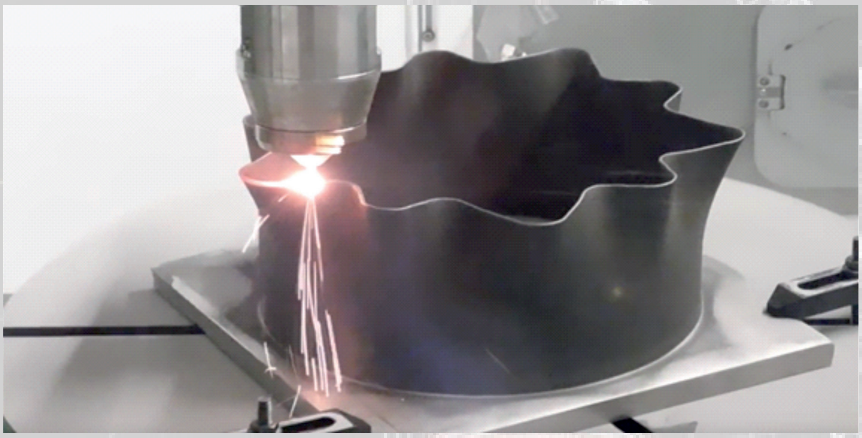
3D Printing in Aerospace Industry

The aerospace industry is increasingly focusing on lighter, stronger, and more durable components. 3D printing technology has opened up new possibilities for design improvements in aircraft, with even a minor reduction in weight potentially saving significant money over its lifetime. For commercial airliners, even a small reduction in weight can make a significant positive cost impact. For defence planes and space crafts, sturdier and lighter components allow better payload. For all types of aircraft, lighter components lead to better speed and higher fuel efficiency.

Benefits of 3D Printing for the Aerospace Industry

Weight reduction is a significant benefit of 3D printing, as even a small decrease in weight can save up to Rs. 1 billion for a plane's lifetime. New technologies and materials within the 3D printing field are fuelling this trend, such as metal powder-bed based additive manufacturing systems and new composite materials.

3D printing also offers improved aircraft design, enabling engineers to optimize designs that benefit from additive manufacturing processes, reducing life-cycle costs and increasing engine efficiency. Additionally, 3D printing increases production efficiency and improves supply chain lead times. The 3D printing material used in the aerospace industry must be sturdy, light, resilient, and strong.



This abstract examines the comparative aspects of metal 3D printing and traditional manufacturing methods, focusing on factors such as design flexibility, cost-effectiveness, material waste, production speed, and suitability for various applications. It suggests that a hybrid approach may often provide the best solutions depending on specific project requirements and production scales.

Additive manufacturing or 3D printing is the process of creating 3D objects or products layer by layer using a 3D digital model. The industry is one of the few where weight of components really matters, and additive manufacturing technology has created new possibilities to meet these challenges. By removing constraints related to traditional manufacturing processes, additive manufacturing has brought forth the potential for numerous design-related improvements in aircraft. For commercial airliners, even a minor reduction in weight can make a significantly positive cost impact. For defence planes and space crafts, sturdier and lighter components allow better payload.

The aerospace industry benefits from 3D printing technology in several ways. First, weight reduction can be achieved by removing constraints related to traditional manufacturing processes, which are essentially time-consuming and limited by the choice of raw material. Second, 3D printing offers improved aircraft design, enabling engineers to optimize designs that specifically benefit from additive manufacturing processes. Third, 3D printing increases production efficiency and improves supply chain lead times.

The aviation and aerospace industry has unique demands about the 3D material used, which must be sturdy yet light and resilient yet strong. 3D printing is now used to manufacture almost all aircraft parts like engine, nozzles, cabin accessories, air ducts, engine suspension, dashboard bezels, brackets, etc. Stratasys, an industry leader in the 3D printing sector, has introduced a thermoplastic filament called ULTEM™ 9085 Resin, which meets multiple aerospace industry standards for flame, smoke, and toxicity characteristics.

Sadik Iqbal
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Department Mechanical Engg.

Performance Enhancement of Partially Shaded Photovoltaic Array by Optimal Reconfiguration Scheme

The current research work deals with performance enhancement of Photovoltaic (PV) arrays under Partial Shading Conditions (PSC). Different shading patterns such as column shading, corner shading, row shading, diagonal shading, static PSC and dynamic PSC have been considered to realise the practical shading situations of PV arrays. The reversal of current flow in partially shaded PV modules leads to formation of hotspots and permanent failure of the module or entire array. To protect the PV arrays from thermal stress and hotspot effects, bypass diodes are integrated with each module in antiparallel to facilitate alternative pathway for surge current. To prevent circulating currents in the PV network, blocking diodes are used with each string of PV modules.

In the prevailing research, different PV array configurations have been analytically studied and development of new reconfiguration schemes is proposed. Different interconnection schemes for partially shaded PV modules are studied in the present research work. The Novel Broken Diagonal Static (NBDS) reconfiguration scheme is also proposed for the optimal reconfiguration of a PV array under shaded conditions. In the current research work, a novel Su-Do-Ku Reconfigured Series Parallel Total Cross Tied (SR-SPTCT) scheme has also been demonstrated for a partially shaded PV array. These techniques are found to be superior to conventional and modified reconfiguration techniques in terms of reduced mismatching losses, improved fill factor, increased performance ratio and enhanced global maximum power.

The present research also addresses the problem of extracting maximum power from shaded PV array. Due to high non-linearity in PV current and voltage during partial shading conditions, all the classical Maximum Power Point Tracking (MPPT) algorithms fail to efficiently track the Global Maximum Power Point (GMPP). An Artificial Neural Network based Dynamic Peak Tracking (ANNDPT) technique is proposed in this research work for maximum power point tracking in partially shaded PV arrays. The proposed ANNDPT technique is is free from several constraints of Meta-Heuristic optimization techniques, like large number of search agents, large convergence time, steady state oscillations, heavy data burden etc. which in turn lead to overall power loss. The proposed BDR, SR-SPTCT interconnection schemes and Artificial Neural Network Based Dynamic Peak Tracking (ANNDPT) technique have been simulated and demonstrated for 3x3, 6x6 and 9x9 PV arrays.

Keywords: Reconfiguration, Partial Shading, ANN optimization, Maximum Power Point Tracking.

Dr. Anup Kumar Nanda
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Free Vibration Analysis of Stiffened Composite Laminated Plates

The primary objective of this research is to perform a comprehensive free vibration analysis of stiffened angle-ply composite plates through experimental methods. Composite materials are increasingly being utilized in advanced engineering applications due to their superior strength-to-weight ratios, high stiffness, and versatile design capabilities. In this study, glass fiber is employed as the reinforcing material in the composite, while epoxy resin constitutes the matrix, creating a robust material system with desirable mechanical properties. The fabrication process of these composite plates has been meticulously detailed, emphasizing the significance of proper layer stacking, resin impregnation, and curing techniques to achieve high-quality specimens. Critical geometrical properties, including fiber orientation, ply thickness, and overall dimensions of the composite plates, have been accurately measured and recorded, ensuring the consistency and reliability of the experimental results.

The experimental setup designed for the vibration testing of these composite plates is described thoroughly, highlighting the precision and sensitivity of the instruments used. The testing procedure encompasses the use of a vibration exciter, sensors, and data acquisition systems, all carefully calibrated to capture the natural frequencies of the plates under various conditions. The study systematically investigates the influence of different boundary conditions, such as cantilever (CFFF), simply supported (SSSS), and clamped (FFFF) configurations, on the natural frequency response of the composite plates. These boundary conditions are critical in understanding the vibrational behavior of composite structures, as they simulate real-world constraints encountered in practical applications. In addition to boundary conditions, the research explores the effects of varying stiffener orientations, including X, Y, and combined X-Y configurations, on the vibrational characteristics of the plates. Stiffeners are integral in enhancing the stiffness and load-bearing capacity of composite structures, and their orientation plays a significant role in defining the dynamic response of the system. The study further examines the impact of the number of stiffeners (ranging from one to three) and their placement (eccentric top, eccentric bottom, and concentric) on the natural frequencies. This comprehensive analysis provides valuable insights into the optimal stiffener configurations for maximizing structural performance.

Furthermore, the research investigates the effect of aspect ratios (0.5, 1.0, 1.5, and 2.0) on the vibrational behavior of the composite plates. Aspect ratio, defined as the ratio of plate length to width, is a critical geometric parameter that significantly influences the stiffness and dynamic properties of the plates. By studying specimens with different aspect ratios and angle ply orientations of [45/-45]2s and [30/-60]2s, the research aims to establish a broad understanding of the interplay between geometry, ply orientation, and vibrational response. The angle ply orientations are specifically chosen to represent common layup patterns used in practical composite applications, thereby enhancing the relevance and applicability of the findings. The results of this study contribute to the broader knowledge base in the field of composite materials, providing a detailed experimental evaluation of the factors affecting the free vibration behavior of stiffened composite plates. The insights gained from this work can inform the design and optimization of composite structures in various engineering applications, including aerospace, marine, and automotive industries, where vibration performance is critical.

Dr. Amaresh Tripathy
Associate Professor
Department of Civil Engg.

EVALUATION OF PERFORMANCE OF MASONRY UNITS USING VARIOUS TYPES OF FIBRES

The evaluation of performance for masonry units consisting various types of fibres is crucial in enhancing their structural properties and durability. This study investigates the impact of incorporating different fibres (both synthetic, and natural fibres) on various properties of masonry units, such as its compressive strength, tensile strength, ductility, water absorption, and cube compressive strength. In this study, experimental tests were conducted to assess these properties by replacing the partial amount of cement with these fibres. Four percentages, 0%, 5%, 10% and 15% were considered and the cement bricks were made accordingly. For one set 3 bricks were prepared and tested under compression to determine the compressive strength of brick. Further, cube compressive was also performed for determining the compressive strength of mortar, while tensile strength was measured through split tensile tests. Ductility was assessed by analyzing the deformation characteristics of the masonry units under load. Water absorption was determined to gauge the porosity and potential durability issues of the fibre-reinforced units. The results revealed that the addition of fibres generally enhances the compressive and tensile strengths of the masonry units, with significant variations depending on the fibre type. Natural fibres showed superior improvements in compressive strength and tensile properties, while synthetic fibres contributed to enhanced ductility and reduced water absorption. The study underscores the importance of selecting appropriate fibre types based on specific structural requirements and environmental conditions. These findings contribute to the advancement of masonry construction by providing insights into optimizing the performance of masonry units through fibre reinforcement, ultimately leading to more resilient and durable building materials.

Dr. Dattatreya Tripathy,
Dr. Sanjay Kumar Behera

Modelling and Performance Analysis of Co-Channel Interference in Fractional Frequency Reuse (FFR) Cellular Network using Queuing Theory.

Fractional Frequency Reuse (FFR) is a significant technique employed in cellular networks to manage co-channel interference, particularly in environments with dense base station deployments. FFR partitions the bandwidth of a cell to minimize interference among neighbouring cells while maximizing the efficiency of frequency reuse. This method is particularly beneficial for mitigating inter-cell and cross-tier interference, which predominantly affects users at the edges of cells. Implementing FFR within multi-tier cellular networks presents several technical challenges. These include effectively partitioning the bandwidth, managing interference dynamically, and optimizing resource allocation among mobile stations located in varying positions within each cell. The development of accurate analytical models is crucial for understanding and optimizing the performance of FFR in cellular networks. Queuing theory provides a framework for analysing the behaviour of networks under various loads and conditions. In this paper by modelling user arrivals, service rates, and the distribution of users across the network for different FFR strategies, influence on network stability and performance is determined. The critical performance metrics, such as average wait times, system utilization, and throughput are determined. These metrics are crucial for assessing the impact of interference in FFR networks.

Keywords: Fractional frequency Reuse, Co-channel Interference, Queuing Theory, Performance Evaluation.

Shashi Bhusan Panda
Department of Electronics & Communication Engg,

ADDITIVE MANUFACTURING/ 3D PRINTING

The latest industrial revolution, Industry 4.0, is encouraging the integration of intelligent production systems and advanced information technologies. Additive manufacturing (AM) is considered to be an essential ingredient in this new movement. In this paper, a comprehensive review on AM technologies is presented together with both its contributions to Industry 4.0. The review focusses on three important aspects of AM: recent advances on material science, process development, and enhancements on design consideration. The main objective of the paper is to classify the current knowledge (and technological trends) on AM and to highlight its potential uses.

INTRODUCTION

The fourth industrial revolution, namely Industry 4.0, is the recent movement on intelligent automation technology. In this new era, the utilization of modern manufacturing skills within the context of integrating novel information technologies plays an important role on economic competitiveness [1]. As illustrated in Fig. 1, Industry 4.0 offers cyber and physical systems to cooperate profitably, aiming to build smart factories by redefining the role of humans. Its fundamental concepts associated with virtual environment comprise Internet of Things (IoT), Big Data, Cloud Computing etc., whereas its physical realm includes Autonomous Robots and Additive Manufacturing [2]. With respect to the cyber-physical systems, IoT is described as the concept of gathering information from physical objects using computer networks or accelerated wireless connections. The extracted information from the products, machines, or production lines constitutes substantial amount of statistical data to be exchanged and analyzed. Other sources of data are design records, customers' order, suppliers' delivery, stock and logistic related information. As a whole, this large quantity of data is defined as Big Data, which is another major notion in Industry 4.0. Moreover, cloud computing, which is related to the processing of all the available information, can also be considered as one of the most significant terms in virtual industrial world. All of these cyber technologies help to ensure the effective utilization of existing information for smart manufacturing of future [3].

MATERIALS

Material science key for understanding of developments in AM technologies. Researchers in this field have keen interest in new materials suitable for 3D printing applications. Although a large number of plastic/polymer constituents are available for AM [5], some specific materials attracts further attention of industry as illustrated in Fig. 2. In this section, the properties of prospective materials that are likely to be developed in the age of Industry 4.0 are to be discussed in detail and their potential uses are to be identified. I am planning to prepare my PHD to use in composite materials.

In this section, novel AM processes are to be presented with a major focus on the ones related to MAM and hybrid manufacturing. Although the number of innovative AM processes is increasing substantially, they take their root from well-established fundamental technologies shown in Fig. 3 [27], [28]. Probably, more enhanced processes will be developed with the technical advancements in AM. However, most of these processes are developed for printing customary materials like polymers, which are generally used for non-industrial applications. Due to the needs for heavy engineering applications in the context

of Industry 4.0, specific AM processes have confronted recently. Since metals are the most commonly preferred material in the industry, the issue of MAM has received considerable attention in this new era [10]. In addition to this, it is expected that the future of manufacturing will steer the industry towards the utilization of these processes in combination. Being known as hybrid manufacturing, this new popular field offers a way to practice subtractive methods accompanying with additive ones so as to fabricate better products with increased surface quality, fatigue strength etc. [20]. Nowadays, the growing interest in hybrid manufacturing leads to various manufacturing process combinations beyond the conventional AM processes.

In this above study I have planned to done some mechanical test like tensile, surface roughness, hardness and others.

CONCLUSIONS

Cyber-physical integration facilitates smart factories with high efficiency that are capable of fabricating high quality customized products. On one side, the advancement of information technology has accelerated the transition to forthcoming industrial era. In fact, the existence of the fourth industrial revolution substantially depends on the capabilities of AM. These issues were summarized in three specific topics in this paper, namely material, processes and design issues. In the future, it is likely that more interdisciplinary research efforts should be expended. On the other hand, the role of designers, factories, and customers will be redefined remarkably since the manufacturing business will be distributed to many separate locations like small workplaces or homes. In other words, the current barrier of mass production on location will be overcome with personal- and customized fabrication. As a general outlook, there is a trend toward new materials available for AM such as smart materials and metallic constituents to achieve required characteristics on purpose. Another popular trend aims at creating functional parts/machines in just a single step of fabrication. Due to the opportunities provided by the novel AM technologies, the design- and production challenges are only restricted by the imaginations of the individuals.

Debasish Mohapatra
Asst. Professor
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The Role of Nano fluids in Renewable Energy Engineering

Nanofluids, a new class of advanced fluids engineered by dispersing nanoparticles (ranging from 1 to 100 nanometers) into base fluids like water or oil, are emerging as transformative agents in renewable energy engineering. Their unique thermal properties significantly enhance the efficiency and performance of various renewable energy systems, making them a focal point in the quest for sustainable energy solutions.

In solar thermal systems, nanofluids offer considerable improvements in heat transfer efficiency. Traditional heat transfer fluids often suffer from limited thermal conductivity, which constrains the performance of solar collectors and heat exchangers. Nanofluids, with their superior thermal conductivity due to the high surface area-to-volume ratio of nanoparticles, enable more effective heat absorption and transfer. This can lead to increased efficiency in solar thermal collectors, enhancing the overall energy capture and conversion rates.

In wind energy, nanofluids can improve the cooling systems of wind turbines. The efficiency of wind turbine generators can be significantly impacted by overheating, particularly in high power systems. Nanofluids, used in the cooling circuits of these generators, offer better thermal management, reducing the risk of overheating and improving the longevity and performance of the turbines. Enhanced cooling translates to more reliable and efficient energy production, which is crucial for maximizing the output of wind farms.

Additionally, nanofluids are making strides in geothermal energy applications. The enhanced thermal properties of nanofluids can be utilized in geothermal heat exchange systems to improve the efficiency of heat transfer between the geothermal wells and the surface systems. By improving the thermal conductivity and heat transfer rates, nanofluids can help in the efficient extraction and utilization of geothermal energy, making geothermal systems more competitive and effective. In the realm of energy storage, nanofluids are being explored for their potential in improving the performance of thermal energy storage systems. These systems, which are crucial for managing the intermittency of renewable energy sources, benefit from nanofluids' superior heat transfer properties. Enhanced thermal storage and transfer can lead to more efficient and reliable energy storage solutions, contributing to the stability and consistency of renewable energy supply.

Despite their promising applications, the integration of nanofluids into renewable energy systems is not without challenges. Issues such as the stability of nanoparticle dispersion, potential environmental impacts, and the cost of producing high-quality nanofluids need to be addressed. However, ongoing research and technological advancements are continually overcoming these barriers.

In summary, nanofluids represent a significant advancement in renewable energy engineering. By enhancing thermal management and efficiency across various systems—from solar thermal collectors to wind turbine cooling and geothermal energy extraction—they offer a pathway to more efficient and reliable renewable energy solutions. As research progresses and these challenges are met, nanofluids are poised to play a pivotal role in advancing the future of sustainable energy.

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Modelling Lithium-Ion Battery for Electric Vehicle: Effect of Temperature at Systems Level

The Lithium-ion (Li-ion) battery remains an attractive proposition for the use in modern electric vehicles. The performance, behaviour and life of the Li-ion battery are strongly influenced by temperature and drive cycles. Understanding and accurately modelling the effect of temperature at the system level is crucial for optimizing the design, operation and efficiency of the electric vehicle battery system. Specifically, heat generation and dissipation play a significant role in battery performance and health. Both internal and environmental factors are responsible for heat generation and temperature rise, affecting the battery charging and discharging cycles. Although Li-ion batteries are widely used in most vehicles, the mechanisms of heat dissipation and internal parameters affecting temperature rise in the cell, the electrochemistry are poorly defined for most battery models available today. Thus, there is an urgent need of quantifying the extent to which the temperature may affect the cell performance and battery health, under various realistic driving conditions. Mathematical models of Li-ion battery have shown promising results on the improvement and design of fast charging and long-life batteries with high energy density and power density. Thus, a comprehensive model of battery must account for temperature-dependent design to assure the long-term battery life and accurately predict the electro-thermal behaviour of the battery. Therefore, in this work, we have systematically modelled and analysed the low voltage, low power Li-ion battery prototype models using electrical equivalent circuit models (2R-C and 3R-C models), with particular focus on temperature-independent and -dependent performances, and designed a suitable charger control system for electric vehicle applications. The mathematical model is implemented in MATLB/Simulink and validated with the literature data on SOC and OCC under various real-time temperature scenarios. It was found that the proposed Li-ion battery model with temperature effects can be efficiently controlled using simple PI control of the conventional battery charger used in this study. This proposed model is useful for the efficient design and control of battery chargers that accounts for wide variations in temperature under diverse driving conditions of electric vehicles.

Keywords —Lithium-Ion battery, electric vehicle, on-board charger, mathematical modelling, electro-thermal coupling, charger control, battery management system.

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Topic- Behavior of Glass Fiber Reinforced Self-Compacting Concrete Containing Mineral Additives

Objectives:

As Literature survey has outlined, the following objectives of this current research work are as follows

1. Determine the fresh and rheological properties of glass fiber reinforced concrete incorporating various mineral additives.
2. The main objective is aimed to analyze the optimum level fiber content for production of self-compacting concrete (SSC) mixtures.
3. To evaluate the global warming potential (GWP) in terms of CO2 reduction from cement blends and determine the cost assessment among all the considered parameters.
4. To prediction the strength attributes of Self-Compacting Concrete interpretable by Machine Learning Models.

Research Gaps

1. Majority of investigation have focused on mechanical aspects on self-compacting concrete, but limited literatures examine the mechanical and durability properties of SSC mixtures at elevated temperature.
2. It was also observed from previous studies that no one pays attention to the life cycle analysis of SSC mixes integrating with various supplementary cementitous admixtures (SCMs).
3. Most of the researchers did not sequentially analysis the effective characterization of SSC such as strength aspects (compressive, flexural & split tensile) and micro-structures (SEM, EDX, XRD & TGA).
4. From the literatures, it was marked that less number of research on non-destructive testing such as rebound hammer, ultrasonic pulse velocity, and pull-out test of SSC.
5. To forecast the strength parameter by applying the machine learning (ML) and deep learning (DL) through artificial intelligence (AI) technique on SSC.

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A NON LINEARITY ANALYSIS OF A SIX DOF INDUSTRIAL ROBOT MANIPULATOR.

Due to non linearity and having multiple solutions, it is quite complicated to analysis the inverse kinematic of a 6 DOF industrial robot. There is no distinctive solution for an inverse kinematic, hence a number of predictive approach are adopted to solve the problem. The conventional method like Jacobin transformation and Screw theory used to get the closed form solution of joint angles. The ANN and Fuzzy logic are applied to number of models to solve the inverse kinematic problem. The higher degree of polynomial solution does not solve by these method. To overcome the conventional technique problem many more optimization approach are applied. The ANN and fuzzy logic shows more converge to words the acceptable solution. Here 6-DOF of industrial robot is designed and the joint angles are simulated with the above method.

The use of Industrial robot have widly incresed in worldwide during last two decrds with increaseing the treand.Most of the operation i.e material handling ,welding , painting and asembling many more are performing by robort now a days to get faster producation rate.Though, we are using various technology to upgrade robot but still there are some basic problem which is unsolveable i.e Inverse kinematics is one off them. Due to complexicity design of manipulator and advance application , it is difficult to get close form solution.The adopted method to determine the joint position for a given set of end effectors position is known as inverse kinematics. Due to nonlinear and complex in nature of the equation the inverse kinematics analysis become quite complicated. In the paper, we are trying to introducing the concepts of robot kinematics and linked to open and closed kinematics chains Forward kinematics and inverse kinematics are proportional to each other. For a given set of joint variable, the finding of an end effectors or tool space position is called forward kinematics The Inverse Kinematics is the opposite forward kinematics. The study of motion of different link is called kinematic. In this chapter, it is describe that the relationship between joint and end effectors movements. More way, to evaluate the equations which will make direct the subordinate of end effectors coordinates on joint coordinates and vice versa.

A unique solution is expected for forward kinematic problem but inverse kinematics will not give any closed or unique solution for different configuration of robot manipulator. So different numerical approach and optimization technique are adopted to get closed form solution.

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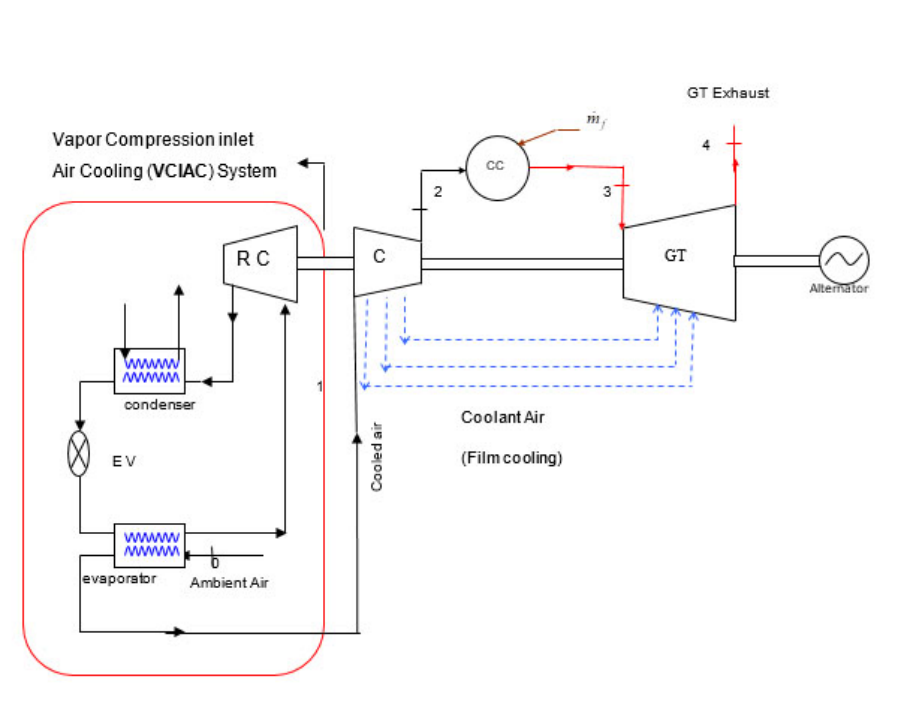
Methodology to Improve Thermodynamic Performance of Cooled Gas Turbine Cycle

The article analyzes the integration of a vapor compression inlet air cooling system to a cooled gas turbine cycle. Air film cooling has been adopted as the cooling technique for gas turbine blades. A parametric study of the effect of compressor pressure ratio, compressor inlet temperature (CIT), turbine inlet temperature (TIT), ambient relative humidity and ambient temperature on performance parameters of plant has been carried out. The integration of vapor compression inlet air cooling to gas turbine cycle has been observed to improve the specific work by more than 14.59 % and plant efficiency by 4.46 %. The increase in performance parameters due to integration of vapor compression inlet air cooling has been found superior in case of cooled gas turbine based combined cycle as compared to uncooled cycle. With reduction in compressor inlet temperature, the cycle shows an increase in plant specific work and plant efficiency. The work ratio representing the excess of turbine work over work of compression increases with increase in rIT and decrease in rp,c. For all values of TIT there exists an optimum rp,c at which the plant efficiency is maximum.

Keywords: inlet-air cooling; vapor compression; compressor inlet temperature; gas turbine performance;; film blade cooling.



Dr. Alok Kumar Mohapatra
Principal

The emergence of Resonant Tunneling Diodes (RTD)

Since the birth of quantum mechanics, quantum tunnelling has been an intriguing phenomenon for both scientists and scholars. Because despite being classically forbidden, aquantum particle still has a finite probability of tunneling through an extremely thin potentialbarrier which exceeds the energy of the electron and hence it has the non-zero possibility toexist on the opposite side of the barrier. Nuclear fusion and Tunnel diodes exploit quantumtunneling phenomenon, where the tunneling probability is given by, , and depends mostly onthe height (Φ) and width (d) of the barrier. Since the tunneling probability exponentiallydecreases for increased height and width of the barrier, tunnel diodes are associated with highleakage currents and low tunneling efficiency. So, an alternative device that is widely used for reduced leakage currents and significantly improved tunneling efficiency is ResonantTunneling Diodes (RTDs). RTDs are associated with quantum tunneling based on electron wave resonance in multi-barrier heterostructures. The electrons, at certain energy levels, cantunnel through some resonant states. The quantum tunneling through ultra-thin barriers (nm-scale) is quite a speedy process. So RTDs are capable of performing ultra-high-speed operations. A typical double-barrier RTD constitutes a quantum well that is sandwiched between two potential barriers. The transmission probability across the double barrier exhibits resonance-like peaks as and when the incident energy of the electron catches up with the bound state energies of the finite quantum well region. This phenomenon is known as & quot;resonant tunneling" wherein the transmission probability becomes unity indicating the complete transmission of the electron across the barrier. RTD's I-V characteristics exhibit Negative Differential Resistance (NDR) as the transmission probability modifies with the application of bias voltage. I-V characteristics of RTDs are highly sensitive to changes in resonant tunneling heterostructures and adjoining layers' conditions such as their thicknesses and chemical configuration. The ratio of the peak current to valley current in the device termed the peak to valley current ratio (PVCR), is an essential measure for device performance in digital circuits. The higher the PVCR ratio, the device is more efficient.

Keywords: Negative differential resistance (NDR); Peak-to-Valley current ratio (PVCR); Quantum tunnelling ; Resonant states; Resonant tunnelling diode.

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EDGE COMPUTING

Edge computing is purely based on networking technology that brings data processing and storage closer to the devices generating and utilizing the data. It aims to lower latency, enhance application performance, and reduce network costs. Edge computing involves processing data that is closure to its source basically at the network's edge rather than sending it to a centralized data facility. This approach also cut down on bandwidth usage and transfer costs in remarkable manner. By using local devices like smart phones, IoT gadgets and other edge devices with their own computational resources—such as CPUs, GPUs, and FPGAs—data can be analyzed and acted upon in real-time. This results in quicker responses and improved decision-making. As a result edge computing is gaining traction in various fields including smart homes, autonomous vehicles, industrial automation and healthcare. It also plays a crucial role in advancing technologies like the Internet of Things (IoT), artificial intelligence (AI), and machine learning (ML). In edge computing data is processed in real-time directly at the device or sensor level which minimizes latency and accelerates data processing and decision-making. This is especially valuable for applications needing simultaneous data processing such as autonomous vehicles, smart cities, and industrial automation. By handling data locally edge computing decreases the volume of data sent to the cloud and thereby conserving bandwidth and further reducing latency. Nonetheless, edge computing introduces new security challenges as edge devices might be more susceptible to cyber threats. The main reward of edge computing are its ability to cut down on latency and reduce the amount of data transmitted to centralized locations which helps alleviate network congestion and lower communication costs. By performing computations nearer to the data source edge computing facilitates quicker response times and overall improved performance. Edge computing offers numerous benefits but also comes with its own set of challenges:

1. **Security and Privacy Risks:** With many distributed devices each endpoint can become a potential target for cyber attacks. Data Protection Ensuring data security and privacy at each edge device can be complex, particularly as data may be processed and stored across various locations.
2. **Scalability Issues:** Managing and maintaining numerous edge devices can be challenging, especially as the number of devices grows.
3. **Data Consistency:** Ensuring that data processed and stored at various edge nodes is consistent and synchronized with central systems can be problematic.
4. **Version Control:** Managing software and firmware updates across numerous edge devices can be cumbersome and error-prone.
5. **Limited Resources:** Edge devices often have limited processing power and storage compared to centralized data centers, which can impact performance. Power Consumption Power management is crucial, especially for battery-operated edge devices, to ensure reliable operation.
6. **Network Connectivity:** Edge devices might experience inconsistent or unreliable network connections, affecting their ability to communicate and synchronize with central systems.
7. **Bandwidth Limitations:** While edge computing reduces the amount of data sent to the cloud, managing and optimizing network bandwidth for edge devices can still be challenging.
8. **Compliance and Regulatory Issues:**
   Handling data across different regions may raise compliance and regulatory issues related to data protection laws and regulations. Lack of standardized protocols and frameworks for edge computing can lead to interoperability issues and increased complexity.

So these challenges require careful planning and robust solutions to ensure that edge computing deployments are secure, efficient, and effective.

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An Introduction to Mathematical Research

Mathematical research is the process of creating new mathematical knowledge. In this sense, the word research might be something of a misnomer—after all, an artist or musician doesn't refer to their creative work as "research". Nevertheless, the term has become standard, probably because it reflects the professionalization of mathematics as an academic discipline. In common discourse, research refers to studying a topic, finding out what is known about it, and organizing this information in a useful way. Mathematical research includes some of this but it is much more. It is a creative activity and usually a collaborative one. Doing research commonly takes the form of solving a problem. To frame a mathematical topic as a problem makes it concrete. This allows you to focus your mental energy and measure your progress. At the community level, problems are an efficient way to communicate mathematics—and allow the eventual solver to get his or her due credit. Indeed, a fundamental problem that remains unsolved for a long time will acquire a certain fame and prestige, all of which can be claimed by the person who solves it. The great mathematician David Hilbert famously suggested 23 problems in his 1900 International Congress of Mathematicians address, which went on to guide research into the following century. In this address, Hilbert poetically says: "A mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock at our efforts. It should be to us a guide post on the mazy paths to hidden truths, and ultimately a reminder of our pleasure in the successful solution."

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Hybridization of meta-heuristic algorithm for load balancing in cloud computing environment

Load balancing in Cloud computing is one of the most challenging and useful research for distributing the tasks among the virtual machines at the Data centers. Cloud computing is the concept of on-demand resource sharing through the internet. Cloud consists of thousands of interlinked computers in a multifarious manner, where all files and applications are hosted. Cloud computing integrates the distributed and parallel computing strategy to offer sharing of resources such as software, hardware, information and files as per demand and request of other devices or computer on the cloud. This concept offers “pay as you need” model in the distributed networlc. In this strategy, the customer does not requjr!;! purchasing any computational platforms or software to perform a task and only require the connectivity of the internet to use the resources by paying the moriey for the duration it has been used. This process reduces the cost of purchasing each software package which are not required full-time and cloud computing provides the facility of dynamic use of the resources. VMs are the processing units in the cloud which compute and share resources as and when required dynamically during execution of the task. In the cloud networlc, a large number of VMs are connected keeping the resources in pre-emptive and non-pre-emptive manner. as a result resources are not distributed equally and some VMs do not get a chance to acquire the resources. When a task is. submitted in the cloud, VMs should execute th,e task in a faster manner to reduce its rup time complexity and in this context: all the VMs should run in. parallel manner. There arises the need of scheduling the assigned tasks and completing the execution with in available resources. When multiple tasks are assigned to one or more VMs, the11 they run concurrently to complete the assigned tasks. When the scheduler is scheduling the tasks for VMs, it should make sure that all tasks are not loaded in one VM only keeping other VMs completely free or underutilized. Hence, it is the responsibility of the scheduler that all the customer tasks should be equally balanced among all VMs in the cloud. To avoid the problem of load balancing among all VMs, it requires an intelligent load balancing

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Using Clustering Approach to Enhance Prioritization of Regression Test Cases

Regression testing is necessary to maintain software quality, so it is expen- sive. The prioritization test case is a popular strategy for lowering this expense. When a change is made to an existing system, this testing is done to check for faults. It is more effective for test cases to be scheduled utilizing the test case prioritization technique to meet specified performance criteria. Many scholars have developed regression test case prioritizing algorithms; based on clustering methodologies to minimize the cost and improve testing's ability to find faults. We describe a method in this research that can be used to increase the effectiveness of various clustering techniques. Code complexity and code coverage are used in prioritization strate- gies that use clustering approaches to enhance the effectiveness of the prioritization. Ambiguities and uncertainties are present in the process of choosing an appropriate test case and locating incorrect functionalities.

Utilizing a prioritizing strategy to plan the order of test cases being executed helps to improve regression testing. To enhance the commercial value of the systems, it is substantial progress that would be necessary as considerable advancements in soft- ware testing are developed. The researchers benefited from the test selection, test suite minimization, and test case priority techniques. Even if the set of test cases discards the collection of test cases, the test suite's reduction revealed a significant decline

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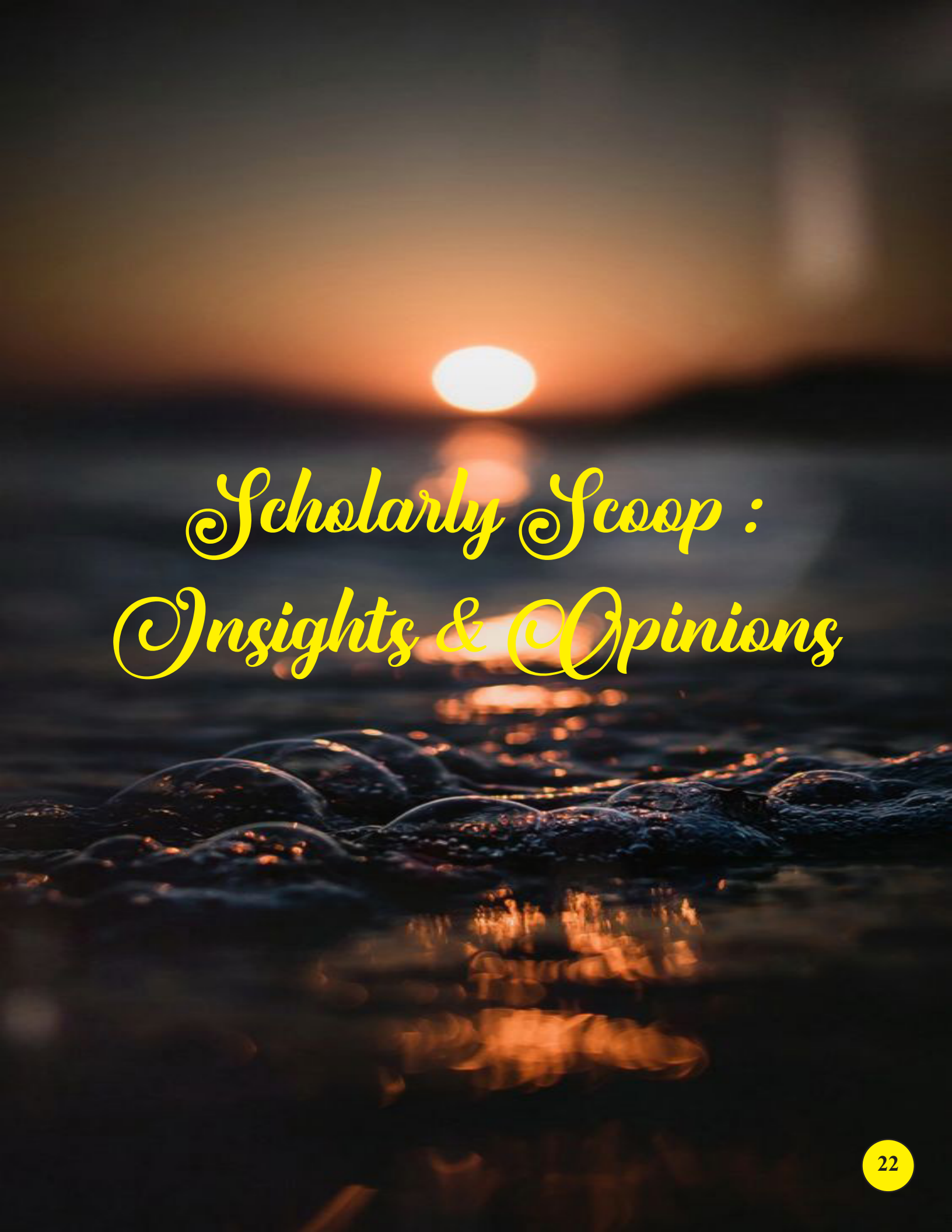

Scholarly Scoop : Insights & Opinions

360 Degree Fire Protection Robot

A fire fighter's work entails detecting and extinguishing fires. In this rapidly evolving technological age, the world is gradually moving toward automated systems. Fire fighters, on the other hand, are often in danger of losing their lives. The majority of the deaths were caused by toxic gases found in the fire fighting environment. As a result, in order to resolve these issues, our system was developed. Yes, the idea behind is really commendable. It can be deployed in areas where human access is not possible like nuclear reactors, for military applications, as unmanned guide vehicles for spy operations, mine diffuser, bomb detector etc. Here our project is controlled by Bluetooth using android to detect the fire and to prevent all from fire. It will be regulated by self-controller and hence it will be a 360' protection system from fire.Fire monitors and sprayers are an amiable and controllable high-capacity water jet used to deal with large fires. Unlike Fire extinguishers, Fire Monitors are permanently installed and cannot be moved. While traditional fire monitors systems need a on-vehicle human operator to change the direction of the water jet and aim it appropriately but our model will be controlled wirelessly and can be operated from a distant place so that no harm can be occurred during fire extinguishing.

Nowadays, machinery and robotic design become important in helping human. This Fire Protection Robot was design to help people in any destructive burnt situation where this robot can extinguish burnt area immediately using autonomous system. In real life, destructive burnt area often happens without our realization. Therefore, this type of robot will require a high demand in the market because of its usefulness to the human as well as the environment transmit fire information to cell phone using controller. The objective of the project will be to design a SMS electronic Fire Protection Robot toolkit which can replace the traditional Fire Protection Robot. The toolkit sends the fire and send SMS to owner of the house, the system is made efficient by SIMs so that the SMS can be received by number of devices boards in a locality using techniques of time division multiple access.

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Industrial Cooling Tower

Cooling towers are one of the most important industrial utilities used to dissipate the unwanted process heat to the atmosphere through the cooling water in the heat exchangers across the plant site. Cooling tower is one of the most expensive utility in terms of power consumption and water circulation. Maintaining water quality in the circulation loops is one of the major challenges in process optimization for most efficient performance. To identify the key performance parameters with respect to perspective of the operations' team, the water chemistry is the most crucial level and demands proper understanding to maintain complete control over the variations. Latest technological developments have made the water conservation more efficient and use of chemicals more limited by introducing "Recycling / reusing water practices" and "Chemical free platforms". With limited options available to the designed and operating cooling tower, these areas could be explored for better and cost effective performance and environment friendly impact.

This experiment was conducted to perform energy and mass balance on the cooling tower system and to observe the effects of one of the process variables on the exit temperature of water. For water cooling tower experiment, there are several parameters that can be adjusted to observe its effects on the evaporation of water. The parameters are temperature and flow rate of water, relative humidity and flow rate of air and cooling load. In this experiment, we choose the cooling load as variable while water flow rate and flow rate as constant parameters. The steady flow equations which is energy and mass balances were employed in order to provide an insight on the amount of energy transferred between phases under different conditions. The energy transfer calculated from the experiment for cooling load of 0.5 kJ/s , 1.0 kJ/s and 1.5 kJ/s

Keywords: Cooling Tower , Power Consumption and Recycling

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The Rise of Electric Vehicles: Driving Towards a Sustainable Future

Electric vehicles (EVs) have rapidly gained traction in the automotive industry, driven by a global push towards sustainability and technological advancement. These vehicles, powered entirely or partially by electricity, promise to reshape transportation and reduce our carbon footprint.

The Benefits of Electric Vehicles

1. Environmental Impact: One of the primary advantages of EVs is their potential to reduce greenhouse gas emissions. Unlike traditional gasoline-powered cars, which emit carbon dioxide and other pollutants, EVs produce zero tailpipe emissions. This shift can significantly improve air quality and combat climate change.
2. Energy Efficiency: EVs are generally more efficient than internal combustion engine vehicles. Electric motors convert over 90% of the electrical energy from the grid to power the wheels, compared to about 20% efficiency for gasoline engines. This means that EVs can offer better performance and longer ranges for the same amount of energy.
3. Lower Operating Costs: While the initial cost of an EV can be higher, the long-term savings are substantial. Electricity is typically cheaper than gasoline, and EVs have fewer moving parts, which translates to lower maintenance costs. Additionally, many governments offer incentives such as tax credits or rebates to offset the purchase price.
4. Innovation and Technology: The development of EVs has spurred advancements in battery technology, charging infrastructure, and autonomous driving features. As technology evolves, EVs are expected to become more affordable and offer even greater performance and convenience.

Challenges Facing Electric Vehicles

1. Charging Infrastructure: One of the main obstacles to widespread EV adoption is the availability of charging stations. Although the network is expanding, many areas still lack sufficient charging facilities, which can lead to range anxiety—concerns about running out of battery power before reaching a charging point.
2. Battery Life and Range: While EVs have made significant progress in range, they still fall short compared to the distance that can be covered by gasoline vehicles on a single tank. Battery life and the time required to recharge also remain concerns, though advancements are being made to address these issues.
3. Resource and Environmental Impact: The production of EV batteries requires materials like lithium, cobalt, and nickel, which involve mining processes that can have environmental and human rights implications. Additionally, the disposal and recycling of batteries present further challenges.
4. Cost and Accessibility: Although prices for EVs are decreasing, they still tend to be higher than their gasoline counterparts. This can limit accessibility for some consumers, especially in lower-income regions.

The Future of Electric Vehicles

The future of EVs looks promising, with continued investment in research and development aimed at overcoming existing challenges. Governments and private companies are focusing on enhancing battery technology, expanding charging networks, and integrating renewable energy sources to power EVs. Moreover, as consumer awareness grows and policies supporting sustainability become more prevalent, EVs are expected to play a crucial role in the transition to a greener economy.

In conclusion, electric vehicles represent a significant step forward in creating a more sustainable and efficient transportation system. As technology advances and infrastructure improves, the adoption of EVs is likely to accelerate, driving us towards a cleaner and more energy-efficient future.

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Smart Grid Technologies: Transforming the Future of Energy

The concept of the smart grid represents a revolutionary shift in how electricity is generated, distributed, and consumed. By integrating advanced technologies into traditional power grids, smart grids promise to enhance the efficiency, reliability, and sustainability of electrical power systems. Here's an in-depth look at smart grid technologies, their benefits, and future developments.

Smart Grid:

A smart grid is an upgraded electrical grid that uses digital communication technology to monitor and manage the transport of electricity from all generation sources to meet the varying electricity demands of end-users. Unlike traditional grids, which rely on one-way communication and centralized control, smart grids facilitate two-way communication between utilities and consumers, enabling more efficient and responsive energy management.

Key Technologies and Innovations

1. Advanced Metering Infrastructure (AMI)

- Smart Meters: Smart meters provide real-time data on electricity consumption, allowing both utilities and consumers to track usage patterns and manage energy more effectively. These meters can help identify energy-saving opportunities and improve billing accuracy.
- Data Analytics: The data collected by smart meters is analyzed to optimize energy use, predict demand, and identify potential issues in the grid. Advanced analytics tools help utilities make informed decisions about energy distribution and infrastructure upgrades.

2. Demand Response Systems

- Real-Time Adjustments: Demand response programs enable utilities to adjust electricity usage in real time based on supply and demand conditions. This can involve incentivizing consumers to reduce or shift their energy use during peak periods, thereby preventing blackouts and reducing the need for additional power generation.
- Automated Controls: Smart appliances and home energy management systems can automatically respond to signals from the grid, optimizing energy consumption based on current grid conditions.

3. Renewable Energy Integration

- Distributed Generation: Smart grids facilitate the integration of renewable energy sources, such as solar panels and wind turbines, by managing their variable output and ensuring stable power supply. Distributed generation reduces reliance on centralized power plants and enhances grid resilience.
- Energy Storage: Advanced energy storage technologies, such as batteries, are used to store excess energy generated from renewable sources. This stored energy can be dispatched when needed, helping to balance supply and demand and improve grid stability.

4. Grid Automation and Control

- Sensors and Controls: Smart grids employ sensors, automated controls, and advanced communication systems to monitor grid conditions in real time. This technology helps detect and address issues quickly, reducing outages and improving reliability.
- Self-Healing Capabilities: Modern grids are equipped with self-healing technologies that can automatically isolate faults and reroute power to minimize disruptions. This enhances the grid's ability to recover from disturbances and maintain service continuity.

5. Cybersecurity Measures

- Enhanced Security Protocols: As smart grids rely on digital communication, robust cybersecurity measures are essential to protect against cyber threats. Advanced encryption, intrusion detection systems, and secure communication protocols help safeguard grid infrastructure and data integrity.
- Incident Response: Utilities implement comprehensive incident response plans to address potential security breaches and mitigate their impact on grid operations.

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Solar Genesis

(A Rover Empowered By Solar Energy For Advanced Research, Exploration And Surveillance)

Solar Genesis marks the inception of a transformative chapter in exploration and technology, encapsulating the spirit of innovation and sustainability. This visionary project introduces a solar-powered rover that stands at the forefront of scientific discovery, equipped with advanced features and a commitment to environmental responsibility. The name "Solar Genesis" signifies not just a vehicle, but a catalyst for a new beginning Solar Genesis in the realm of exploration. The integration of cutting-edge technology, sustainability, and a sense of fresh beginnings positions this project as a trailblazer in the evolving landscape of space exploration. With the promise of autonomy and adaptability, the rover's intelligent features propel it through varied terrains, navigating obstacles with finesse and precision. This multifaceted functionality expands the potential applications of Solar Genesis, from scientific research on distant planets to practical terrestrial tasks in challenging environments. In the luminous glow of Solar Genesis, we witness not just a rover, but the dawn of a pioneering expedition a promise of new horizons, fresh discoveries, and a sustainable future for exploration Keyword- innovation, sustainability, scientific discovery, space exploration, autonomy, challenging environments

Meet Solar Genesis, our new solar rover project that redefines the boundaries of exploration and sustainability. Featuring a range of innovative features including high-resolution cameras, metal detectors and scratch protection, Solar Genesis represents a new era in remote sensing. Powered by the sun, Solar Genesis embodies our commitment to environmentally responsible exploration by using renewable energy to power its journey across diverse geographies. Driven by self-control and long-term performance, Solar Genesis dares to go to the farthest and most difficult places without being limited by the limitations of traditional electronic equipment. At the heart of Solar Genesis is its advanced camera, a smart device that can capture the world in incredible detail and detail From recording geological formations to observing wildlife, cameras provide instant visual information to guide the rover on a journey of discovery. To increase its effectiveness, Solar Genesis is equipped with a state-of-the-art metal detector that can detect buried objects and artefacts with sensitivity and accuracy. Whether conducting scientific research or improving safety procedures, metal products expand the rover's capabilities and make it an invaluable asset in many ways. Thanks to its advanced protection features, Solar Genesis can navigate difficult terrains with ease. Thanks to a combination of sensors and smart algorithms, the rover can operate gracefully and quickly, navigating around obstacles and adjusting its path to ensure a convenient, smooth journey. Join us on a journey of discovery and innovation in the Solar Genesis mission. With its pioneering spirit and commitment

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Animesh Pattnaik
Biswajit Mohanty
Dinesh Biswal
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Binary Harmony Search Based Feature Selection and Data Classification Technique

Nowadays data is rapidly growing at an exponential pace. To deal with such data explosion, we need effective data processing and analysis techniques. A most popular machine learning technique namly "feature selection" that plays the most vital role of machine learning technique where it selecting a subset of features from a dataset that still provides most of the useful information. In real-world applications misclassification costs of minority class could be extremely high. Therefore this is the most demanding query especially while the data are too high in dimensionality because of enhance in over-fitting and inferior representation interpretability. Recently Feature selection is one of the most popular way to deal with the trouble by figuring out the features that will be predict best to a minority class.

We live in a world, where vast amount of data are collected daily. Nowadays data played a vital role in every economy, business function, organization, industry, medical, computer science, engineering, energy and individuals [1]. To analyze such huge data is most important need. Real-world data are generally stored on many other different platforms in distributed computing environments together such as individual systems, database, otherwise even on the internet system and it also heterogeneous, incomplete and noisy due to their typical huge size. So it is truly very complicated to handle all these different kind of information and extracting the useful documentation. There are many data mining issues such as noisy and incomplete data, performance, complex data, data visualization, distributed data, incorporation of background knowledge, pattern evaluation, data privacy and security and so on [2].So that more challenges get exposed since the actual data mining process begins and the success of data mining lies in overcoming all those majority issues or problems. Optimization is defined as choosing the "best element" from some set of available alternatives. In short the term optimize is to make perfect. For compound optimization issues, evolutionary computation approaches are becoming most famous techniques to defeat over all those complications, for example Genetic Algorithm (GA) [3], Evolution Strategy (ES) [6], Harmony Search (HS) [10], Particle Swarm Optimization (PSO) [12], Ant Colony Optimization (ACO) [16], Tabu Search (TS) [18], Artificial Bee Colony (ABC) [19], Differential Evolution (DE) [20], Simulated Annealing (SA) [21], Firefly Algorithm (FA) [22] and so on.

Swatismita Das
Sudeep Padhi
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Navigating the Road Ahead: A Literature Review on Smart Highway Design

The rapid advancements in technology have given rise to innovative approaches in transportation infrastructure, leading to the concept of smart highways. Smart highway design encompasses a range of intelligent systems and technologies that enhance the safety, efficiency, and sustainability of road networks. This literature review aims to provide a comprehensive analysis of existing research and developments in the field of smart highway design, examining its various components, benefits, challenges, and future prospects. The review begins by exploring the fundamental concepts and principles of smart highways, including sensor networks, communication systems, and data analytics. It delves into the integration of emerging technologies such as Internet of Things (IoT), artificial intelligence (AI), and cloud computing into road infrastructure, highlighting their potential to revolutionize transportation systems. Moreover, it investigates the deployment of smart materials and structures, such as self- healing pavements and energy-harvesting systems, to enhance the durability and sustainability of highways. Additionally, the literature review investigates the impact of smart highway design on traffic management and safety. It examines the utilization of real-time data and predictive modeling to optimize traffic flow, manage congestion, and prevent accidents. Furthermore, it addresses the incorporation of intelligent transportation systems, including autonomous vehicles and cooperative systems, into smart highways, emphasizing their potential to improve road safety and efficiency.

Modern society heavily relies on transportation systems, with highways serving as vital arteries connecting cities, regions, and countries. However, as the demands on transportation infrastructure continues to grow, conventional highways face challenges related to safety, efficiency, and sustainability. In response, the concept of smart highways has emerged, integrating advanced technologies and intelligent systems to revolutionize road networks.

Smart highway design encompasses a multidisciplinary approach that leverages emerging technologies, such as the Internet of Things (IoT), artificial intelligence (AI), and data analytics, to enhance the functionality and performance of highways. By embedding sensors, communication networks, and smart materials into road infrastructure, smart highways aim to improve traffic management, reduce accidents, optimize energy consumption, and promote sustainable transportation.

This literature review aims to provide a comprehensive analysis of the existing research and developments in the field of smart highway design. By synthesizing and examining a wide range of scholarly works, case studies, and best practices, this review seeks to shed light on the various components, benefits, challenges, and future prospects associated with smart highways.

The review begins by establishing a foundation for understanding smart highways, elucidating the core concepts and principles that underpin this innovative approach. It explores the integration of sensor networks and communication systems, enabling the collection and transmission of real-time data for effective decision-making in traffic management. Additionally, it investigates the role of data analytics and AI algorithms in harnessing the power of big data to optimize traffic flow, predict congestion, and improve overall road safety.

Sumitra Singh
Suraj Sharma
Sonam Xaxa
Department of Civil Engg.

EVALUATION OF PROPERTIES OF CELLULAR LIGHT WEIGHT CONCRETE

One to a second support and piled in reversed order thereon, at least one of the two broadsides of each body slice being subjected to a treatment before being covered by the next transferred Cellular lightweight concrete slabs are manufactured by cutting a still plastic block of cellular concrete mass resting on a first support horizontally into slices which are then moved over one by slice. The treatment prevents the body slices from cementing together during the subsequent steam-hardening process and may also improve the quality of the slabs when hardened. An apparatus for such manufacture features a movable suction head for transferring the body slices as well as associated means for cutting and treating said slices. Within the cellular lightweight concrete industry it has for a long time been used a method of manufacturing cellular lightweight concrete products that comprises the steps of first molding a large, cellular and at least approximately parallel-epidemic body from a concrete mass, which in a given stage after molding is plastic but nevertheless self-supporting so that it does not need the support of the mold walls any more, subsequently dividing said body, when it is resting on a first support and while the concrete mass thereof is still plastic, by horizontal cuts into a plurality of slab-like slices, each of which has a thickness that is substantially less than the original height of the body, and finally steam-hardening a plurality of the slab-like slices thus obtained as a group in an autoclave, while they arrested one on top of the other to form a pile. This manufacturing method has many advantages but is not entirely free of problems, and the most dominant one of them is that the slab-like slices frequently show a great tendency of binding or cementing together during the steam-hardening process, so that they afterwards must be separated from each other by force, in which case the products can easily be damaged. This cementing results from the fact that the concrete material on the facing broadsides of the piled body slices, i.e. the recently cut, horizontal surfaces thereof, because of the plastic character of the concrete mass and other circumstances will show a tendency to again coalesce with one another at least in spots here and there after the passage of the cutting members, by means of which the cuts have been produced, and during the steam-hardening process this junction between the piled slices will then be considerably strengthened and form an unacceptly firm bond. It is known that such cementing can be counteracted at least to some extent by changing the composition of the concrete mass, but frequently a change of the concrete mix formula cannot be resorted to for various reasons.

Biswajit Malik
Kartika Chandra Sahoo
Subharaj Singh
Nitesh Nayak
Department of Civil Engg.

NATIONAL INSTITUTE OF TECHNICAL TEACHERS' TRAINING AND RESEARCH KOLKATA

(Ministry of Education, Govt. of India)

Diamond Jubilee Year

CERTIFICATE OF ACHIEVEMENT

This is to certify that the group consisting of **Siba Prasad Parida** and **Subhransu Sekhar Swain** has been adjudged as Runner-Up in the **Poster Making Competition** for the poster entitled "**Manufacturing of Eco-Friendly Bricks**" at the **Industry-Academia Conclave 2024,** organized by the National Institute of Technical Teachers' Training and Research Kolkata on 8th - 9th August 2024, at the NITTTR Kolkata Extension Center, Bhubaneswar.

NAVEEN B.P
Coordinator

DEBI PRASAD MISHRA
Director

Students Excellence

Congratulations to Raajdhani Engineering College students! Nafisha, Siba, and Subhransu won 2nd prize in the poster competition at NITTTR Kolkata Extn. Centre for their innovative eco-friendly bricks project. Their mentor, Dr. Dattatreya Tripathy, and the team received cash prizes for their achievement, bringing laurels to the institute."


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Catégorie / Category
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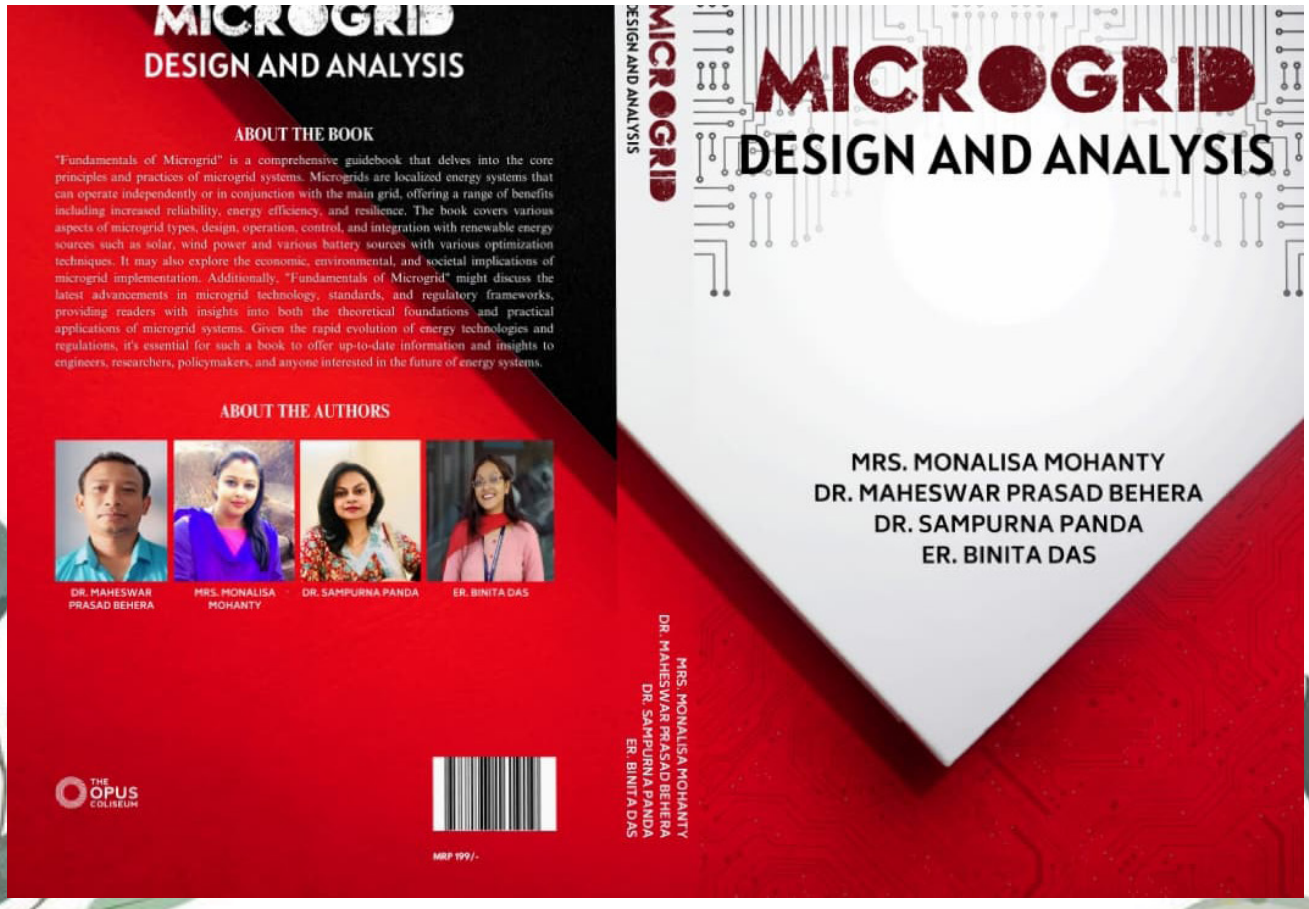
Canada

Professor Binita Das has achieved a remarkable milestone with the publication of her book and patent, showcasing her excellence in research and innovation. This outstanding achievement is a testament to her dedication, expertise, and contributions to her field. Congratulations to Professor Das on this well-deserved recognition!



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तारीख / Date	:	17/04/2024
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प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो *IOT BASED DATA ACQUISITION SERVER MACHINE* से संबंधित है, का पंजीकरण, श्रेणी 14-02 में 1.Dr. Pampa Sinha 2. Susovan Dutta 3.Dr. Snehalika 4.Swagat Das 5.Lipsa Subhadarshini 6.Dr.Anup Kumar Nanda 7.Ajay Kumar 8.Pradyumna Mallick 9.Subrat Behera के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

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It is with great pleasure that we announce the publication of a patent by Professor Pradyumna Mallick and Dr. Anup Kumar Nanda, recognizing their exceptional research and innovation.

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CERTIFICATE OF PRESENTATION

This is to certify that

Anup Kumar Nanda

of Raajdhani Engineering College, Bhubaneswar

has Presented a paper titled

A Cost-Effective Approach for Power Enhancement in Solar PV Arrays during Mismatch Scenarios

with Paper Id 153 in 1st IEEE International Conference on

"Smart Power Control and Renewable Energy"

(ICSPCRE-2024)

organized by Department of Electrical Engineering from July 19 - 21, 2024.

Prof. Monalisa Pattnaik	Prof. Arnab Ghosh	Prof. Pravat Kumar Ray
Organizing Chair	Organizing Chair	General Chair
ICSPCRE-2024	ICSPCRE-2024	ICSPCRE-2024

Dr. Anup Kumar Nanda has been honored with a certificate of participation at the esteemed IEEE conference, underscoring his commitment to academic excellence and professional development. We extend our warmest congratulations to Professor Mallick and Dr. Nanda on these outstanding accomplishments.

We extend our warmest congratulations to Professor Dr. Dattatreya Tripathy on the publication of your paper in the esteemed Science Citation Index (SCI). This remarkable achievement highlights your exceptional research skills and commitment to advancing knowledge in your field. Please accept our sincerest admiration for your accomplishment.

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Experimental and analytical investigation of opening effects on the in-plane capacity of unreinforced masonry wall

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ARTICLE INFO

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In-plane load capacity
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Finite element analysis
Eccentric opening
Unreinforced masonry

ABSTRACT

A test programme consisting of four half-scale URM walls was conducted under quasi-static cyclic loading to evaluate the negative influence of openings. Test results showed that the masonry adjacent to the opening experienced significant damage, and the specimens with a door opening was found to have complete detachment of the masonry pier, resulting in a reduction in the capacity of more than 25%. Furthermore, a detailed parametric nonlinear finite element analysis was performed to assess the influence of parameters affecting the in-plane load capacity of the URM wall. Numerical results showed that depending upon the size and location of openings and the material and geometric properties of walls, the in-plane load capacity was reduced by 6–82%. Considering the results of available experimental studies and present numerical analyses, a simplified equation was proposed to estimate the reduction in the in-plane load capacity of the specimen with different types of openings. The analytical study demonstrated that the proposed equation effectively provided reliable and consistent predictions of the strength reduction factor for walls with different types of openings.

We extend our sincerest congratulations to Dr. Alok Kumar Mohapatra, Principal, on the successful publication of the journal "Advances in Mechanical Engineering". This esteemed publication is a testament to your exceptional leadership and commitment to fostering innovative research in mechanical engineering. Your achievement is a source of inspiration to the academic community, and we wish you continued success in your endeavors.

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ADVANCES IN MECHANICAL ENGINEERING

Dear Author- Sabyasachi Sahu, D N Thatoi, Alok Ku. Mohapatra

This is to certify that the manuscript entitled **"Thermodynamic and Thermo-Environmental Assessment of Cooled Gas-turbine Based Combined-cycle"** with the **Submission ID AME-2024645** has been successfully accepted by the Journal **"Advances in Mechanical Engineering", ISSN- 1687-8132 in upcoming Volume 16, Issue 11, Nov 2024.**

Jesus Felez

Jesus Felez

Universidad Politécnica de Madrid, Spain

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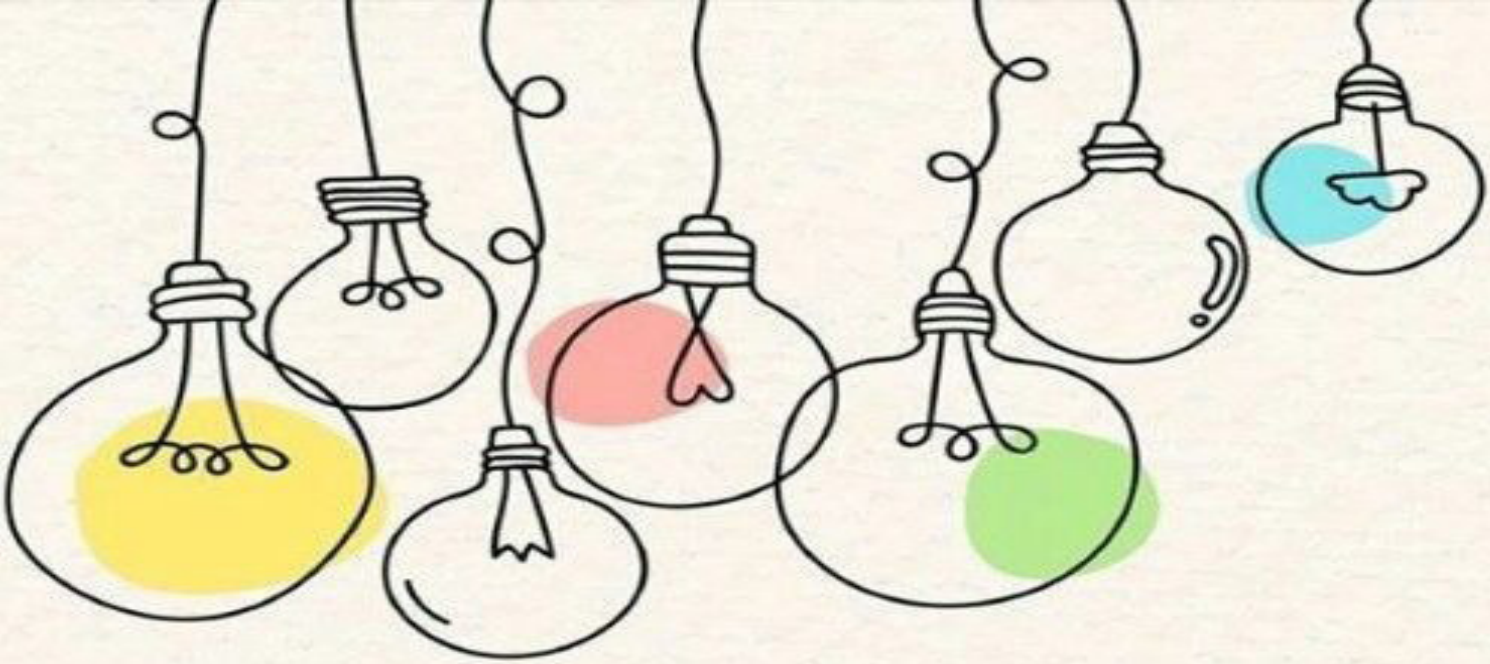


Spotlight Section

Bi-Annual Best

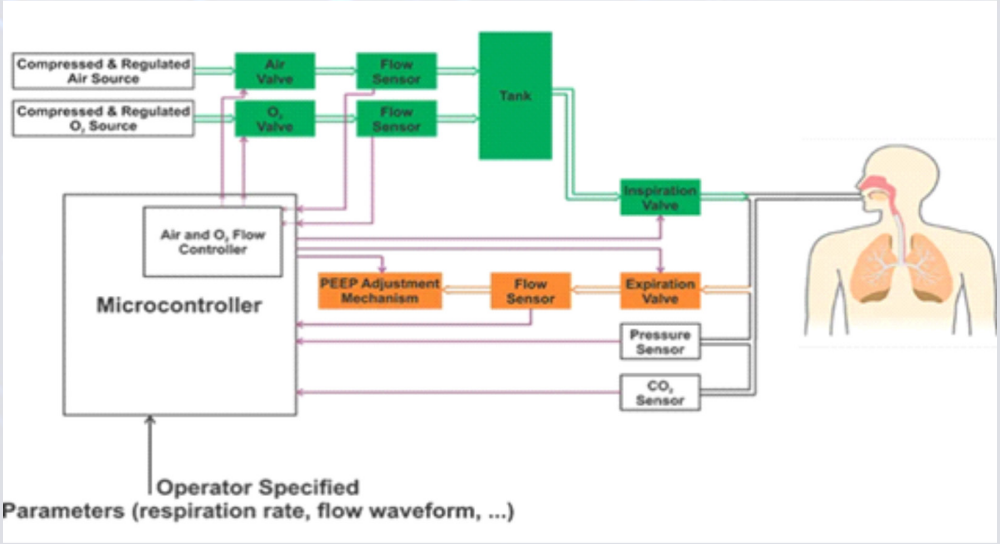
Using Pressure Sensors to Adjust the Oxygen Concentration: An Electrical Engineer's Intro to Mechanical Ventilation

Pressure sensors are key elements of mechanical ventilation. In a previous article, we discussed that a pressure sensor is required to monitor the airway pressure so that we can deliver breaths with specified pressure or flow profiles to the patient

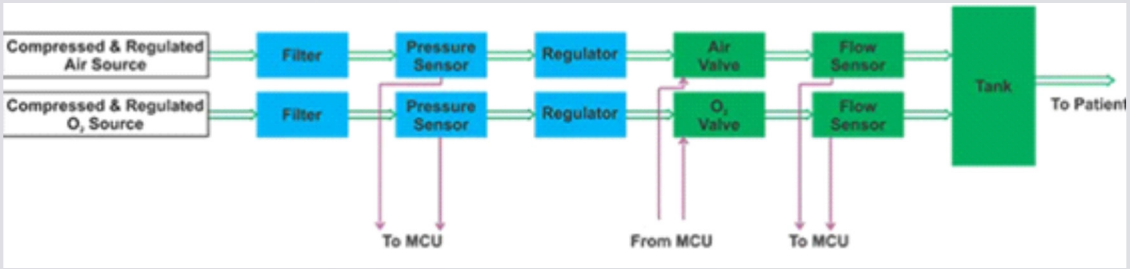
In this article, we'll look at other applications of pressure sensors in mechanical ventilation. In addition to the common uses of pressure sensors, we'll look at an interesting application of this type of sensor where pressure sensing is used to adjust the oxygen concentration in the air-oxygen mixture.

Pressure Sensors in Mechanical Ventilation

The block diagram of a ventilator is shown in the following figure. Please refer to my first ventilator article mentioned above for details.



Please note that the above image shows a simplified block diagram. Different ventilators may employ several other pressure sensors in addition to the one that measures the airway pressure. For example, some ventilators have internal regulators before the air and O2 valves. These ventilators may need a pressure sensor between the filter and the internal regulator as depicted in Figure 2.



Moreover, ventilators usually need to measure the barometric pressure (the pressure of the atmosphere) to offset the undesired variations in measurements that may be caused by the physical location of the ventilator.

In addition to these relatively straightforward uses of pressure sensors, there are two other interesting applications for these sensors: adjusting the oxygen concentration in the air-oxygen mixture and measuring the flow of gas. In this article, we'll discuss the first application. Measuring gas flow using a pressure sensor will be discussed in a future article.

Using a Pressure Sensor to Adjust the Oxygen Concentration

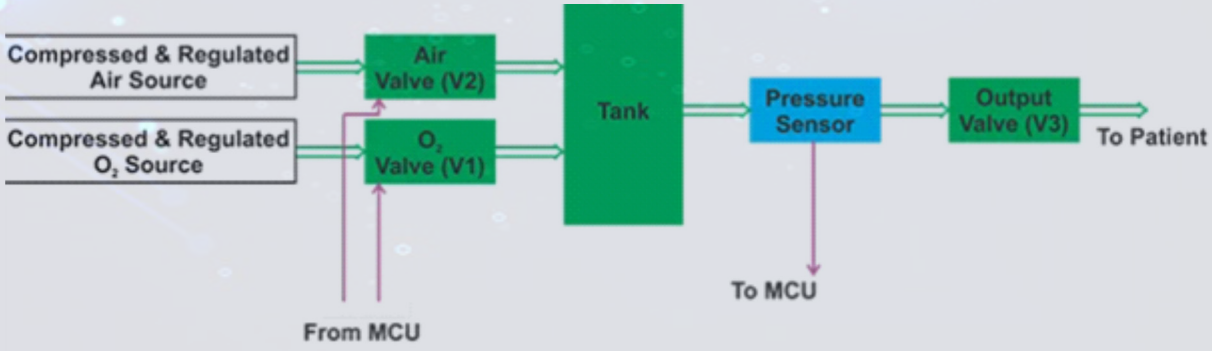
While we can use an oxygen sensor to measure the oxygen concentration in the "tank", there is another technique that detects the oxygen concentration by simply monitoring the gas pressure. To better understand this method, we need to first review a basic concept in chemistry called Dalton's law of partial pressures.

But what is partial pressure?

Consider a mixture of two or more non-reactive gases kept in a container with a given volume. The pressure exerted by molecules of an individual gas is referred to as the partial pressure of that gas. In other words, partial pressure of each gas is the pressure that the gas would exert if it were the only gas in the container.

Adjusting the Oxygen Concentration

The method we'll discuss in this section is employed in a reference design from NXP. In this case, we remove the flow sensors that are included on the output side of the air and oxygen valves, and a pressure sensor is used to monitor the pressure of the tank. Hence, the block diagram of this part of the ventilator is changed to the one shown in FIG



Conclusion:

In this article, we looked at applications of pressure sensors in mechanical ventilation. In addition to the common uses of pressure sensors, we looked at an interesting application where pressure sensing is used to adjust the oxygen concentration in the air-oxygen mixture. We examined the mathematical derivations and the state diagram of the control process. The main limitation of this method is that it only makes sure that the gases from the two inputs are added with the specified percentage. And, it cannot directly control the oxygen concentration.

Binita Dash
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Department of Electrical Engg.

WIRELESS ELECTRICAL POWER TRASMISSION

Since electric power was developed for productive use in the late 19th century, power has been delivered to consumers via overhead and underground conductors. The delivery system gradually evolved into today's power grid, a maze of transmission and distribution lines spreading across the country. While Nikola Tesla is credited with his development of alternating current lines, he also had the vision of using electromagnetic waves to transmit electric power. To this end, he conducted extensive experiments at his Long Island, New York, laboratory.

This is Nikola Tesla's Wardenclyffe experimental wireless transmission station constructed at Shoreham, Long Island, New York, in 1901. Tesla conducted numerous wireless experiments until the project was terminated because of a lack of funding.

The telegraph started the telecommunications industry in the 1840s. For decades, the telegraph and later telephone systems required physical conductors to send and receive messages. Around 1900, wireless telegraphy was developed by Guglielmo Marconi. This remarkable achievement opened the door for wireless technology in the telecommunications industry. In the 1930s, microwave technology was introduced for use in the military. More improvements in wireless transmission prompted the removal of telephone pole lines across the country.

Fiber optics were born in the early 1960s. In 1968, NASA used fiber optics in conjunction with television cameras sent to the moon. Cellular technology began in the 1970s and would be a game changer. Interestingly, while wireless technology has eliminated the need for lines with conductors, fiber optics require pole lines or underground facilities to place the cable. Most fiber-optic cable installations utilize existing wood pole lines that support electric power lines.

Wireless Power Transfer

Wireless power transfer (WPT) is the transmission of electrical power without wires and is based on technologies using time-varying electric, magnetic, or electromagnetic fields. Most of the early efforts for wireless power transfer used microwave frequencies as used with Wi-Fi and Bluetooth. These efforts have been successful, and hold promises for future applications such as wireless device charging. However, larger volume power transfers over longer distances is beyond the capability of microwave frequency technology.

Laser-based power beaming has emerged as a promising technology for longer-distance WPT. This system uses a power supply that generates a laser beam of light energy through the air to a photovoltaic receiver, where the light energy is converted back to electricity.

A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The word "laser" is an acronym for "light amplification by stimulated emission of radiation."

New Zealand's second biggest utility, Powerco, is in the process of conducting a test of its system at a grid-connected commercial power station. The company hopes to bring energy to communities far from the grid or transmit power from remote renewable sources, like offshore wind farms. Several other research projects are experimenting with laser-based power beaming, which is the most promising technology for longer-distance electric power transmission.

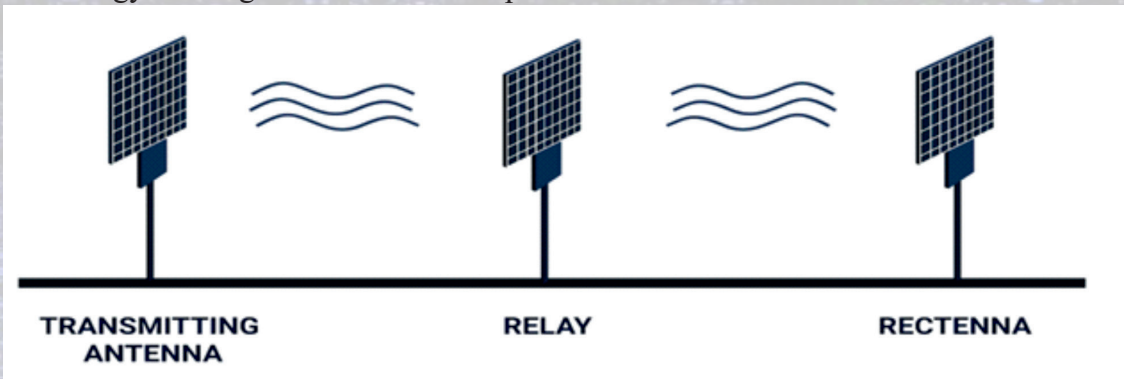

Fig. An example of how power can be transmitted without wires.

Future Scope

There are numerous promising near-term applications for laser power beaming, such as keeping drones up in the air continuously. Radiated energy could power autonomous ground vehicles or provide a temporary power source on the battlefield or in a disaster area. It could even transmit power wirelessly from a solar or wind energy facility to a central grid.

Wireless power transfer technology can reduce the need for copper and aluminum used for electric conducting wire. Research indicates that metals used to make electric conductors will become extinct in the distant future as other materials are being explored.

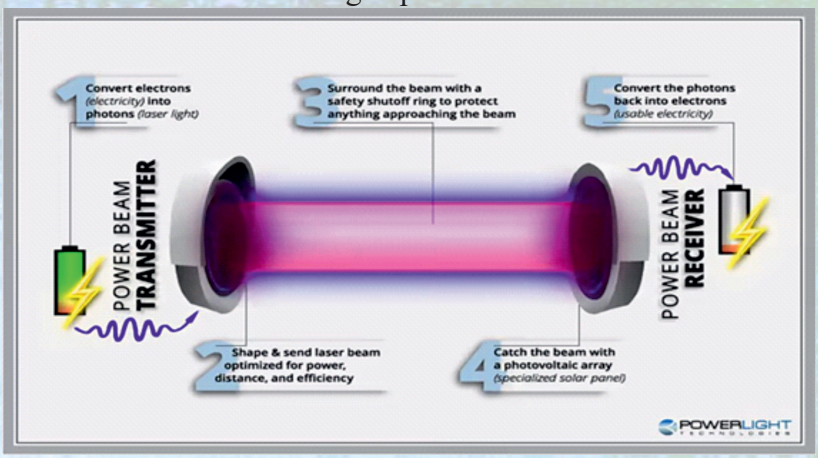

Fig. The fundamental components and operation of the power beam wireless power transfer technology.

The wireless power industry is expected to grow exponentially. Wireless power has a significant impact on almost all fields because it enables the Internet of Things to develop faster. Wireless in the low-voltage medium for various applications in buildings and other short-range situations will continue to

evolve. Scientists predict that, someday, it may be possible to beam energy directly from the sun to each location where electric power is needed.

Conclusion

Let's note the magnitude of power lines in the grid: The century-old U.S. electrical grid is the largest interconnected machine on Earth: 200,000 miles of high-voltage transmission lines and 5.5 million miles of local distribution lines, linking thousands of generating plants to factories, homes, and businesses. The role of the electrical grid in our economy has been so significant that it was named the "greatest engineering achievement of the last century" by The National Academy of Engineering.

In addition, with the emphasis of de-carbonizing the grid, thousands of miles of new lines are under construction or are in the planning stages. The number of transmission and distribution lines are increasing daily. Additionally, the use of electric power largely due to EV charging is projected to increase from 4,000 terawatt hours in 2020 to 7,000 terawatt hours by 2050.

So, we return to our original question: Are power lines on the way out? What is the future of linework? The answer should be centered around the fact that power lines and their components, such as structures, conductors, and transformers, will remain a vital component for the foreseeable future. Well-trained, qualified lineworkers are needed to continue constructing, maintaining, and operating the grid. There are no indications whatsoever that careers in the power and communications industries are in jeopardy. The dynamics of both industries offer more options for employment and career paths than ever before.

Dr. Anup Kumar Nanda
Associate Professor
Department of Electrical Engg.

Innovation is not about tools. Its about people, processes and pedagogy

Research & Development Cell

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