PROGRAM BOOK
&
ABSTRACTS

INTERNATIONAL CONFERENCE ON APPLIED SCIENCES AND SMART TECHNOLOGIES

SCIENCE AND TECHNOLOGY DISRUPTION
IN THE POST PANDEMIC ERA
FOR BETTER LIFE QUALITY

ORGANIZED BY
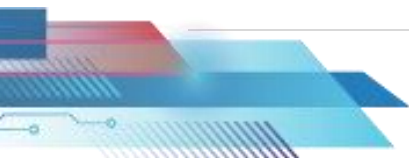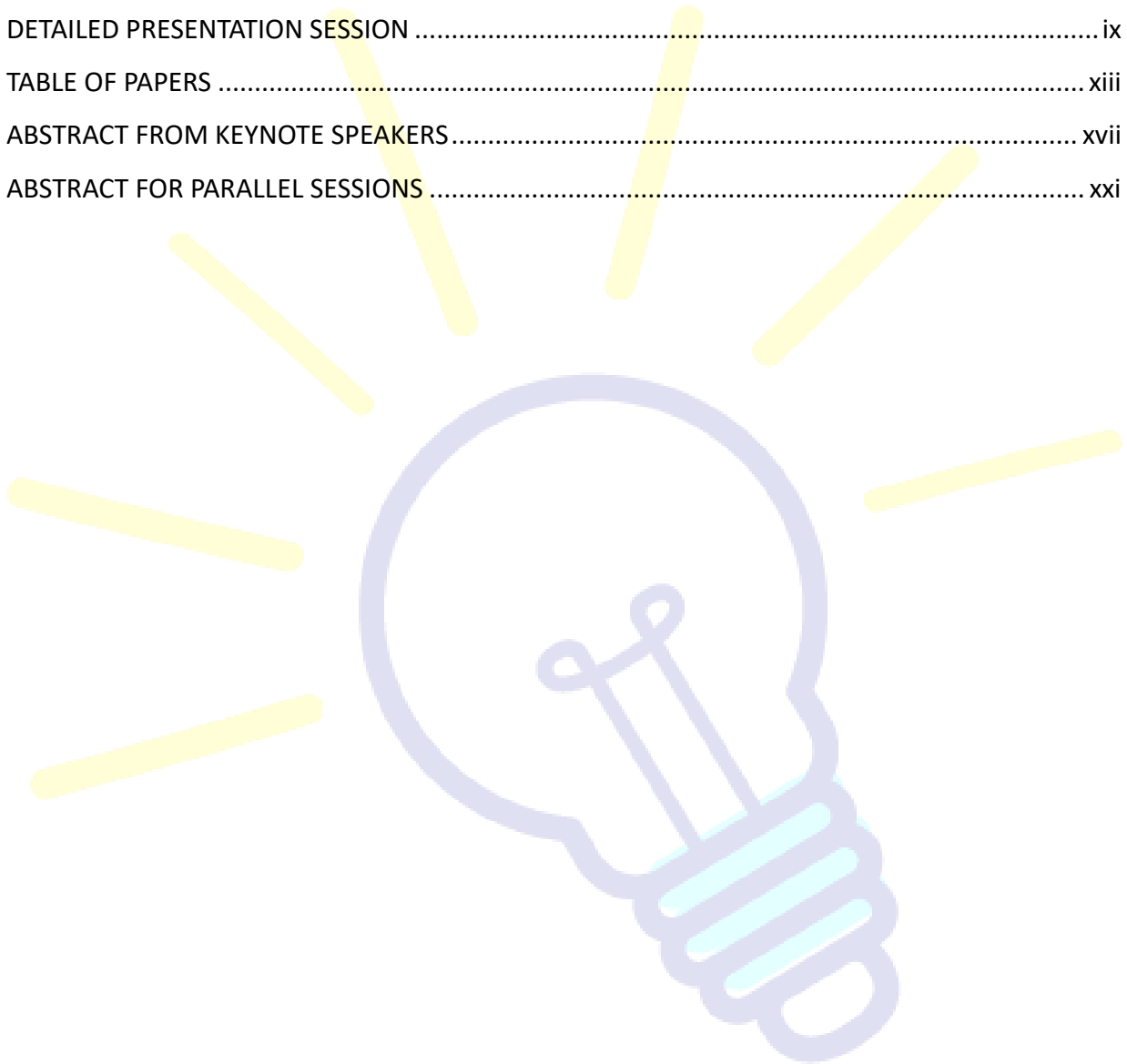**FACULTY OF SCIENCE AND TECHNOLOGY**
SANATA DHARMA UNIVERSITY

October 18, 2023
Yogyakarta, Indonesia

CO-HOST

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MESSAGE FROM DEAN'S

Dear participants,

First of all, all praise and gratitude should go to God Almighty for His blessings, the first international conference organized by the Faculty of Science and Technology of Sanata Dharma University can be held.

It is with pride and pleasure that I welcome you all to this special event, the International Conference on Applied Sciences and Smart Technologies (InCASST 2023). This International Conference organized by the Faculty of Science and Technology of Sanata Dharma University is not just an ordinary conference, but also a milestone to celebrate our thirty years of service in the field of education, knowledge, research, and innovation at the Faculty of Science and Technology of Sanata Dharma University.

For three decades, we have witnessed tremendous growth in the field of science and technology, and we have been involved in it. We have witnessed our lecturers conducting deep research and advancing the frontiers of knowledge. We have witnessed cross-country collaborations that connect us to the global scientific community.

This conference is a pivotal moment in our journey. It is a platform for thinkers, researchers and innovators from around the world to come together, share and inspire one another. Our conference theme, "Disrupting Science and Technology in the Post-Pandemic Era with Sustainable Development for a Better Quality of Life" reflects our determination to continue pushing the boundaries of knowledge, facing future challenges, and creating sustainable solutions.

This program book contains a summary of the events that will take place during the conference, a list of prominent speakers, and other important information. It is your guide to everything that will happen during the conference.

I would like to thank Prof. Tokuro Matsuo, Prof. Sudi Mungkasi, Ph.D., Assoc. Prof. Dr. Peerapong Uthansakul and Assist. Prof. Rando Tungga Dewa, for sharing as keynote speakers in this conference. I would also like to thank all the speakers who came from different parts of the world, who have been willing to share their knowledge with us.

I would also like to thank all those who have contributed in making this conference a reality. Thank you to the organizers who have worked hard to prepare this event carefully.

We believe that this conference will be a platform to build new collaborative networks, stimulate innovative ideas, and deepen our understanding of global challenges that require scientific solutions. Together, we will illuminate the path to a better and brighter future.

Warm greetings from us at Sanata Dharma University, Yogyakarta. May this conference be a fulfilling and rewarding scientific experience for all participants.

Thank you very much.

Ir. Drs. Haris Sriwindono, M.Kom., Ph.D.
Dean of Faculty of Science and Technology, Sanata Dharma University

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    - Dr. Ir. Ridowati Gunawan, S.Kom., M.T. (Sanata Dharma University-Indonesia)

KEYNOTE SPEAKERS

Prof. Ir. Sudi Mungkasi, Ph.D.
(Sanata Dharma University-Indonesia)

Prof. Ir. Sudi Mungkasi is a full professor at the Department of Mathematics, Faculty of Science and Technology, Sanata Dharma University, Yogyakarta, Indonesia. He obtained the degree of Sarjana Sains (S.Si.) in Mathematics from Gadjah Mada University, Yogyakarta, Indonesia in 2004. He received the degrees of Master of Mathematical Sciences (M.Math.Sc.) and Doctor of Philosophy (Ph.D.) in Mathematical Sciences from The Australian National University, Canberra, Australia in 2008 and 2013, respectively. He was a postdoctoral fellow at the Mathematical Sciences Institute of The Australian National University in 2013. The professional degree of Insinyur (Ir.) in Engineering Sciences was obtained from Sanata Dharma University in 2021. His research interests include applied and computational mathematics as well as modelling and simulation for physical, biological, chemical, and engineering problems. Currently, he serves as Vice Rector for Academic Affairs of Sanata Dharma University.

Prof. Tokuro Matsuo
(Advanced Institute of Industrial Technology - Japan)

Prof. Tokuro Matsuo is currently a Full Professor (tenured) at the Advanced Institute of Industrial Technology (AIIT) in Public University Corporation Tokyo Metropolitan University since 2012. Also, he is currently a Director of the Research Center for Artificial Intelligence and Service Science at AIIT and CEO of the International Institute of Applied Informatics (IIAI). His current research interests include agent-based electronic commerce, qualitative reasoning and simulation, material informatics, IT and business management, and IoT. He delivered 150 keynotes and invited talks at international conferences, symposia, and seminars in this decade. He also received over 10 awards on research and over 30 research grants from the government, research foundations, and companies.

Assoc. Prof. Dr. Peerapong Uthansakul
(Suranaree University of Technology-Thailand)

Peerapong Uthansakul has been working as the Associate Professor at the School of Telecommunication Engineering and the Director of the Institute of Research and Development, Suranaree University of Technology, Thailand. He has got more than one hundred research publications and is the author/co-author of various books related to MIMO technologies. Furthermore, he is the editor of "Suranaree Journal of Science and Technology" and other leading Thai journals related to Science and Technology. He has won various national awards from the government of Thailand due to his contributions and motivation in the field of Science and Technology. His research interests include green communications, wave propagation modeling, MIMO, Massive MIMO, Brain Wave Engineering, OFDM and advanced wireless communications, wireless sensor network, embedded systems, the internet of things, and network security. His current research interest is in Artificial Intelligence and Bio-Signal studies.

Assist. Prof. Dr. Eng. Rando Tungga Dewa
(The Republic of Indonesia Defense University-Indonesia)

Dr. Eng. Rando Tungga Dewa focuses on the fracture mechanics field in advanced technology. He is an Assistant Professor in the Mechanical Engineering Department, RIDU (The Republic of Indonesia Defense University). He has done some research topics including Nuclear Reactor Gen-IV design, vibration fatigue on structures, and advanced additive manufacturing technologies on energetic materials. He, at least published more than 20 peer-reviewed articles and attended 50 symposiums with H-index 8

SCHEDULE PROGRAM

1. InCaSST – October 18, 2023 07.30 AM, Eastparc Hotel.
2. Gala Dinner – October 18, 2023 06.00 PM, Eastparc Hotel.

Detailed Conference Program
Wednesday, 18th October, 2023
(Time based: Jakarta, Indonesia GMT+7)

Time	Event	Room
07.30 – 08.00	Registration and Welcome Drink	Garden Room
08.00 – 08.15	Opening Ceremony	
08.15 – 08.30	Greeting Speech	
08.30 – 08.45	Traditional Dance Performance	
08.45 – 10.35	Keynote Speakers Session: 　1. Prof. Tokuro Matsuo 　2. Asst. Prof. Dr. Eng. Rando Tungga Dewa 　3. Prof. Ir. Sudi Mungkasi, Ph.D. 　4. Assoc. Prof. Dr. Peerapong Uthansakul	
10-35 – 10.50	Parallel Session Preparation	
10.50 – 12.00	Parallel Session 1	Room 1: Orchid Room Room 2: Magnolia Room (3rd floor)
12.00 – 13.00	Lunch	Restaurant
13.00 – 14.40	Parallel Session 2	Room 1: Orchid Room Room 2: Magnolia Room (3rd floor)
14.40 – 15.00	Coffee Break	
15.00 – 16.10	Parallel Session 3	Room 1: Orchid Room Room 2: Magnolia Room (3rd floor)

Detailed Gala Dinner Agenda
Wednesday, 18th October, 2023
(Time based: Jakarta, Indonesia GMT+7)

Place: Garden Room

Time	Event	
18.00 – 18.15	Opening Live Music Performance	Registration
18.15 – 18.30		
18.30 – 18.45	Opening Ceremony and Greeting Speech	
18.45 – 19.00	Gala Dinner	Launching of "Bunga Rampai" book
19.00 – 19.20		Anniversary Celebration of FST
19-20 – 19.35		Awards
19.35 – 20.00		Live Music Performance
20.00 – 20.30		
20.30 – 20.45		
20.45 – 21.00		Closing Ceremony

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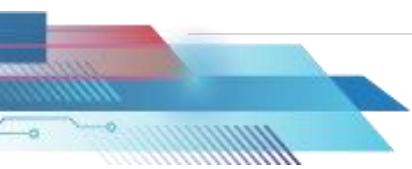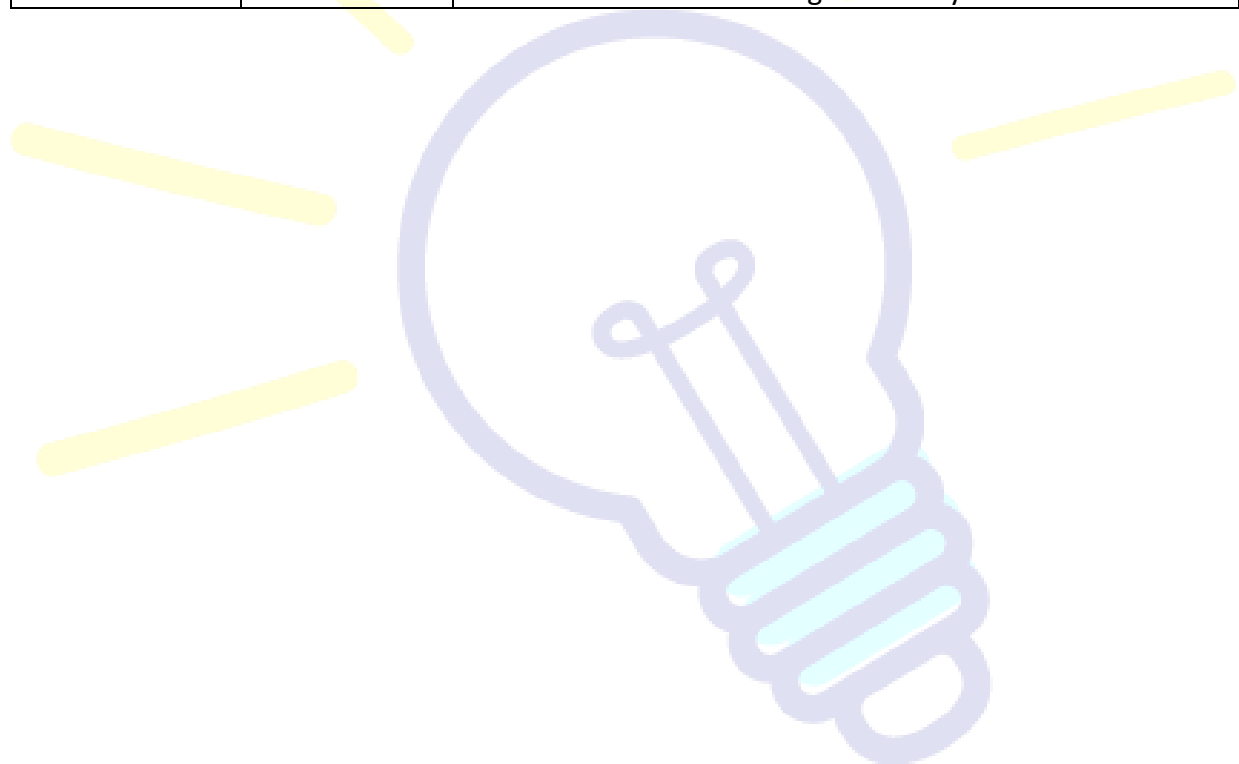
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Time based: Jakarta, Indonesia GMT+7

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Prof. Tokuro Matsuo	Towards Smart Applied Sciences with Multiple Sensors
Asst. Prof. Dr. Eng. Rando Tungga Dewa	Research and Development at RIDU: Technological Resources for Defense Equipment
Q&A	
Prof. Ir. Sudi Mungkasi, Ph.D.	Roles of Mathematics in Disaster Mitigations
Assoc. Prof. Dr. Peerapong Uthansakul	Feasibility Study of Brainwave Communications in the Post Pandemic Era: EEG Signals for Writing Imagination
Q&A	

PARALLEL SESSION 1.1. 10.50 – 12.00 WIB		
Room 1: Orchid Room **Moderator:** A. Prasetyadi, M.Si., Ph.D. **Topic :** Clean Energy and Green Technologies		
2674	Transparent Carbon Capture and Storage using Blockchain Technology	10'
2628	Effect of Curing Temperature on The Mechanical Properties of Coconut Shell Nano Carbon Reinforced Composites with Epoxy Matrix	10'
2655	The Role of Nanocatalyst of Pearl Oyster Shell in Pack Carburizing Process on Mechanical and Physical Properties of AISI 1020 Steel	10'
2825	Investigation of Eichhornia crassipes as a natural fibre in PMC for noise controller	10'
2840	Exploring The Potential of Go-Based Composite Hydrogels and Their Swelling Property for Controlled Drug Delivery	10'
2899	Alternative Method for Stop The Coconut Shell Charcoal Briquette Drying Process	10'
2889	The Effect of Chassis Weight Optimization on The Carbon Footprint of The Electric Prototype Vehicle	10'

PARALLEL SESSION 1.2. 10.50 – 12.00 WIB		
Room 2 : Magnolia Room **Moderator**: Dr. Adinda Ihsani Putri **Topic** : Waste Management and Recycling		
2671	Utilization of Used Oil Waste for Boiler Energy Source	10'
2625	Readiness Assessment of Lean Six Sigma Implementation in Manufacturing Industry as A Way To Ensure Sustainability	10'
2659	Modelling study of boiler using oil waste as an energy source	10'
2681	SCADA for Waste Sorting System as an Environmental Conservation Effort	10'
2687	Antibacterial Properties of Enzymatically Treated PET Fibers Functionalized by Nitric Oxide	10'
2843	Design And Feasibility Study of Mobile Biodigester for Military Operation	10'
2877	Optimization of pyrolysis of polypropylene and polyethylene based plastic waste become an alternative fuel oil using bentonite catalyst	10'

PARALLEL SESSION 2.1. 13.00 – 14.40 WIB		
Room 1 : Orchid Room **Moderator**: Dr. Achilleus Hermawan Astyanto **Topic** : Renewable Energy Technologies and Systems		
2661	An Overview of Wind Energy to Optimize Initial Potential in Java	10'
2666	Solar Power Control System on Smart Green Home	10'
2663	Numerical Investigation on the Effect of Blunt Body Deflector on Darieus Turbine Performance	10'
2773	Using A Stepper Motor as A Low-Power, Low-Rotation DC Generator for Renewable Energy Harvesting	10'
2786	Design And Implementation of A 232.2 KWP Rooftop and on Grid Solar Power Plant	10'
2812	An experimental investigation on CCFL characteristics during gas/low surface tension liquid counter-current two-phase flow in a small-scaling PWR hot leg typical geometry	10'
2830	Techno-Economic Analysis of Hybrid PV-Battery-Diesel System for Isolated Dockyard in West Papua	10'
2876	Machine Learning Based Modelling for Estimating Solar Power Generation	10'
2816	Aerodynamic Analysis of a Windmill Water Pump using Blade Element Momentum Theory (2816)	10'
2983	Coefficient of Power of Indonesian Traditional Wind Pump Blade Model (2983)	10'

PARALLEL SESSION 2.2. 13.00 – 14.40 WIB		
Room 2 : Magnolia Room **Moderator**: Ir. Augustinus Bayu Primawan, D.Tech.Sc. **Topic** : Environmental Impact Assessment and Management		
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2344	The Impact Assessment of Automated Drip Infusion Control Using Weighing Scale and Pinch Method on Subjects	10'
2635	Analysis of Coal Facies and Parting in The Balikpapan Formation, Kutai Basin, East Kalimantan	10'
2637	Distribution Model, Depositional Environment, and Facies Of Coal in the AE field, Kutai Kartanegara area, East Kalimantan	10'
2682	A Method for Assessing Green Value Chain Readiness	10'
2779	Study of Population Distribution and Benefits of Nipah (Nypa fruticans)	10'
2795	Development of Digital Livestock Monitoring in Sambilawang Village, Serang, Banten	10'
2817	Comparison of the K-Means Method with and without Principal Component Analysis (PCA) in Predicting Employee Resignation	10'
2844	The Key Impact Factors of Visitors' Environmentally Responsible Behaviour at Mlarangan Asri Beach Kulon Progo Regency	10'
2878	Environmental Management for Car Accident Precaution and Remote Notification	10'

PARALLEL SESSION 3.1.
15.00 – 16.10 WIB

Room 1 : Orchid Room
Moderator: Dr. rer. nat. Herry Pribawanto Suryawan
Topic : Environmental Impact Assessment and Management

2905	Replication Control Strategy Based on A Simple Game of Life in Opportunistic Mobile Networks	10'
2019	Gamification Design for Tourism Mobile Applications Temple	10'
2879	Fall Detection and Notification System to Fast Emergency Management for the Elderly	10'
2883	Classification of Delivery Types of Pregnant Women Using Support Vector Machine	10'
2885	A Study of Stochastic Epidemic Model Driven by Liouville Fractional Brownian Motion Coupled with Seasonal Air Pollution	10'
2019	Gamification Design for Tourism Mobile Applications Temple	10'
2886	Aerial Object Detection Analysis: Challenges and Preliminary Results	10'
2887	The Performance of DST-Wavelet Feature Extraction for Guitar Chord Recognition	10'

PARALLEL SESSION 3.2.
15.00 – 16.10 WIB

Room 2 : Magnolia Room
Moderator: Dr. Lusia Krismiyati Budiasih
Topic : Sustainable Agriculture and Land Use Practices

2855	Reuse Strategy and Management Models for Abandoned Industrial Areas. A Case Study in Yerevan	10'
2626	Assessing the Effectiveness of Agricultural Policies on Development: A Systematic Literature Review from Diverse Countries	10'
2622	Genetic Variability and Relationship of Agronomic Characters of Soybean Lines In Tidal Swamp Land	10'
2626	Assessing the Effectiveness of Agricultural Policies on Development: A Systematic Literature Review from Diverse Countries	10'
2789	Nutrition Control in Nutrient Film Technique Hydroponic System Using Fuzzy Method	10'
2907	The Inhibitive Effect of Vitamin B2, B6 and Vitamin C on The Cooper Corrosion	10'
2870	Batik Classification Using KNN Algorithm and GLCM Features Extraction	10'

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ABSTRACT FROM KEYNOTE SPEAKERS

Towards Smart Applied Sciences with Multiple Sensors

Takuro Matsuo

Affiliation   : Advanced Institute of Industrial Technology, Japan

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Abstract -

Nowadays, a lot of types of communication system to make consensus among people are provided. We can utilize these kinds of systems, such as Social network system, e-mail, and instant messenger system, to make a decision and determination through online discussion. In the next decade, we can forecast a lot of types of consensus formation systems are provided and we may find new communication systems integrating between cyber and physical environment. In this talk, I introduce our conducted experiments using cyber-physical discussion environment in the panel discussion session in the conference. In the session, facilitator asks question to panelists about issues on the discussion and attendees can also do as well by their voice. Each attendee also can post and declare his/her opinions and suggestions through the online discussion system during the session. One or two facilitators facilitate the discussion in the online system as well as real discussion. We found out a lot of interesting results of attendees survey taken in before/after the experiments. I also introduce the environment to provide useful information for attendees by the digital signage system in the conference venue. This digital signage system is connected to the attendees location capture system and conference registration system. These integrations between cyber and physical environments and data enable to make better consensus formation between all sorts of people.

Paper Id: 1002

Research and Development at RIDU: Technological Resources for Defense Equipment

Rando Tungga Dewa

Affiliation : The Republic of Indonesia Defense University, Indonesia

Email : rando.td@gmail.com

Abstract -

The defense forces are the bulwark of our nation's security, and it is imperative that we continually adapt and strengthen our strategies to safeguard our borders, protect our citizens, and secure our future. In this context, our national strategy in the defense sector must be comprehensive, forward-looking, and adaptable. While there are some key pillars of our national strategic direction in the defense sector that Our University focuses on Modernization and Technological Advancements, Investing in Human Capital, Cybersecurity and Information Warfare. In the face of evolving global threats and challenges, it has become increasingly evident that no single entity or sector can effectively address all the complex issues we face. The days of defense being solely a government matter are long gone. Instead, we must embrace a holistic approach that leverages the strengths of multiple stakeholders. Our research vision is to focus on research and development, design and identification, manufacture and testing and that is our progress in the milestone. In our research group, we are developing a new advanced composite material using bio materials, which is extracted from nature. We have facilities to conduct ballistic test using our compressed-air and real gun with a range of bullets. We are also considering smart materials to repair our combat aircraft in our facilities using novel shape memory alloy, called NITINOL. Future research in this area should focus on our independence in defense technology, addressing the unanswered questions raised by this study and exploring emerging trends. Methodological improvements such as novel fabrication, advanced materials, testing methodology could enhance the rigor and scope of future studies. Additionally, interdisciplinary collaborations and a long-term perspective on the impact of this research are encouraged.

ROLES OF MATHEMATICS IN DISASTER MITIGATIONS

Sudi Mungkasi

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Abstract -

Mathematics has played important roles in human life, such as in mitigating disasters. In this talk, I explain implementations of mathematics in the effort of simulating two types of disasters relating to physics and biology. To be specific, I limit the talk to physical disasters relating to water flows, such as floods. Furthermore, for biological disasters, I limit the discussion to infectious disease spread. Using mathematical models, problems to be solved are formed into systems of equations. The mathematical model for water flow problems is expressed as a system of partial differential equations. The mathematical model for infectious disease transmission is expressed as a system of ordinary differential equations. Solutions to the problems are obtained using approximation methods with the aid of computers. The simulated solutions can be used to mitigate disasters in case if they do happen.

Paper Id: 1004

Feasibility Study of Brainwave Communications in the Post Pandemic Era: EEG Signals for Writing Imagination

Peerapong Uthansakul

**Affiliation**   : Suranaree University of Technology, Thailand

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Abstract -

In the midst of the pandemic era, our lifestyles have undergone a profound transformation. Close physical contact now carries the risk of transmitting various diseases, prompting the need to explore novel communication technologies that do not require touch or speech. One promising avenue is brainwave communication, which enables individuals to connect without physical proximity, mitigating the risk of disease transmission while preserving the ability to convey facial expressions. This breakthrough can also be a lifeline for individuals with disabilities who lack direct communication but possess the capability to communicate through their thoughts. In this presentation, we will delve into the exciting potential of using brainwaves for communication, with a specific focus on harnessing EEG (Electroencephalography) electrical signals for imagined writing. Brain-Computer Interfaces (BCIs) have gained widespread popularity, employing EEG signals to control various devices for diverse applications. BCIs have proven invaluable for empowering individuals with disabilities who face challenges in conventional communication methods, as they provide an alternative means of expression without relying on speech. While previous applications of BCI systems, such as the P300-speller, SSVEP-speller, and Hex-O-spell, have made strides, they often demand continuous stimulation or necessitate interruptions in daily activities to ensure accuracy in brain response. This paper introduces a groundbreaking approach by demonstrating the feasibility of character-writing applications using only EEG signals, eliminating the need for constant stimulation, unlike existing literature.

Our approach employs a classification technique known as Artificial Neural Network (ANN) and concentrates on two fundamental characters: a straight line and a circle. Through rigorous experimentation, we've determined that the optimal electrode placement resides in the pair of electrodes (F3 and F4) on the frontal lobe, due to their crucial role in perception, information retention, and recall. Our experimental findings reveal an impressive classification accuracy of approximately 70%, marking a significant milestone in the development of character-writing applications.

ABSTRACT FOR PARALLEL SESSIONS

Paper Id: 2674
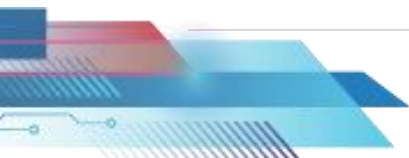
Transparent Carbon Capture and Storage using Blockchain Technology

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Abstract -

Carbon capture and storage (CCS) is one of the important initiatives widely used across different industries in reducing atmospheric carbon emissions, which is an essential environmental goal outlined in Sustainable Development Goal 13 (SDG 13) in 2015. In an effort to mitigate carbon-emission problem, CCS extracts (i.e., captures and compresses) and stores CO_2 from industrial by-products as an alternative to releasing it directly into the atmosphere. CCS presents opportunities for the captured CO_2 to immediate utilization or to be stored at adjacent facilities for future utilization in different industrial productions. Despite its potential in reducing carbon emissions, its effectiveness and possible economic incentivization are unknown due to a lack of transparency in tracking the quantitative output concerning carbon reduction at different stages of CCS activities (capture, transportation, and storage) currently deployed in different industrial plants. In this paper, we propose an enhanced CCS for recording and tracking the quantitative output of CCS activities using blockchain (i.e., a distributed-ledger) technology that promotes transparency among stakeholders, e.g., government, regulatory body, technical experts, and general public, and facilitates rewards toward effective carbon-emission reductions. Although blockchain is a promising technology that can increase the efficiency of CCS, we also identify a few future challenges, such as data privacy and scalability, that have to be taken into account toward implementing the proposed architecture.

Paper Id: 2628

Effect of Curing Temperature on The Mechanical Properties of Coconut Shell Nano Carbon Reinforced Composites with Epoxy Matrix

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Abstract -

This study aimed to examine the role of curing temperatures at 40, 60, and 80 degrees Celsius with an ageing time of 1.5 hours on the tensile strength, modulus of elasticity and ductility value of coconut shell nanocarbon-reinforced composite materials. The nanocarbon uses a top-down approach with high-energy milling (HEM). This study found that adding coconut shell nano carbon increased the tensile strength by 4.6% from 46 MPa, but the ductility value decreased to 4.2% from 5.28 kJ/m2. The curing treatment of nanocarbon composite gives the effect of increasing the tensile strength by 19.7% to 57.5 MPa, the modulus of elasticity increase by around 16.7%, becoming 3.80 GPa and the ductility value increase by 84% to 9.30 kJ/m2, that occurs at 80 degrees Celsius temperatures. The curing treatment of epoxy resin gives the effect of increasing the tensile strength by 20% to become 55,2 MPa, the modulus of elasticity growth around 10,5% from 2,96 GPa and the ductility value 11% of 5,28 kJ/m2, that occurs at 80 Celsius degrees temperatures.

Paper Id: 2655

The Role of Nanocatalyst of Pearl Oyster Shell in Pack Carburizing Process on Mechanical and Physical Properties of AISI 1020 Steel

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Abstract –

The most commonly used metal material in the industry today is steel. Steel is classified based on its carbon content. There are high-carbon steel, medium-carbon steel, and low-carbon steel. The steel used in this research is low-carbon steel, namely AISI 1020 steel, with a carbon content of around 0.1% to 0.3%. With a low-carbon content, the hardness is also low. Pack carburizing is carried out to overcome this issue. The media used are coconut shell nanocarbon and pearl oyster shell nanocatalyst. Specimens were made with a mixture of nanocatalyst variations given around 0%, 10%, 20%, and 30% with the use of 900º C temperature with a holding time of 60 minutes. Preparation of nano-sized media using the High Energy Milling (HEM) process using a shaker mill machine. The treated specimens were then subjected to Vickers hardness testing with 5 kg and 200 gf loading, microstructure observation, and FTIR observation. The highest Vickers macro hardness test was obtained through the 20% nanocatalyst variation, resulting in a hardness value of 255 HV. The increase that occurred compared to without treatment increased by 91%. Then the micro Vickers hardness testing resulted in a value of 399 HV. The resulting microstructure is evenly distributed pearlite grains and gradations of ferrite grains. The carburizing depth is achieved optimally through a 20% variation of pearl clam shell nanocatalyst, with a depth of ± 0.19mm. Then FTIR observation also shows the presence of new groups of vinylidene-type alkene compounds. These compounds are flammable and volatile, so they can provide additional energy in the pack carburizing process.

Paper Id: 2825

Investigation of Eichhornia crassipes as a natural fibre in PMC for noise controller

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Abstract -

This paper investigated the Eichhornia crassipes as fibers in polymer matrix composite (PMC) for sound absorption. The polyester resin R-108 was mixed with the fibers with the variation percentage. The fibers were varied with three different variations: 20%, 25%, and 30%. The Methyl Ethyl Ketone Peroxide catalyst was added to accelerate the solidification. The sound absorption experiment used a simple insulated box with a sound level meter. After the experiment, the noise absorption coefficient (NAC) result was calculated and analyzed. The maximum noise absorption was obtained at 25% of fibers, indicated by the NAC value of 0.384. In addition, the tensile strength was also obtained for the supplementary data for this study.

Paper Id: 2840

Exploring The Potential of Go-Based Composite Hydrogels and Their Swelling Property for Controlled Drug Delivery

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Abstract -

Swelling studies are important for hydrogels with potential applications in biomedical areas as the materials will be exposed to biological fluids. This study obtained composite hydrogels by physically cross-linked carboxymethyl cellulose (CMC) with GO. CMC is known to be non-toxic, non-allergenic, and possesses good biodegradability. To produce GO, a 'greener' modified Hummers' method was first employed by eliminating the use of sodium nitrate in the process to avoid the generation of toxic NOx gases. Iron (III) chloride was then used as a cross-linker in composite preparation. The responses of GO-CMC hydrogel networks to various solvents and temperatures were studied by measuring their swelling property. The solvents included water, salt solution, ethanol, hexane, and phosphate buffer solutions with various pH (pH 2.1, 5.0, and 7.4). The effect of temperature on swelling was studied at temperatures of 25, 35, and 45oC. Results showed that the presence of GO within CMC matrixes altered the structures and properties whilst enhancing the swelling property compared to its native CMC hydrogel, at studied temperatures. It was also observed that the swelling property of GO-CMC composite hydrogels depended significantly on the pH of the environment, a great attribute for drug carriers with pH-sensitive behaviour.

Alternative Method for Stop the Coconut Shell Charcoal Briquette Drying Process

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Abstract -

The drying processes of coconut shell charcoal briquette consist of drying and agglomeration. In industry, the drying process is determined by a quality control person that creates dependency. The justification was conducted by firing and hardness checking. The firing test consumes a lot of time. An alternative method for determining the stopping drying process is proposed. The method is based on the resistance of the briquette in addition to density. One hundred and fifty cube briquettes of 2,6 cm x 2,6 cm x 2,6 cm in wet, half-dry, and dry condition were tested its electricity resistance. The results show different resistivity of wet, half-dry, and dry. The dry has resistivity of 1.82×10^5 Ω. The other have less than that number by order more than 10. Some doubts were found due to low resistivity number close to half-dry condition. Density of the doubt were in the type. Therefore, a combination of density and resistance will be used to stop drying which can be done fast and out of experience dependency of the quality control person.

Paper Id: 2889

The Effect of Chassis Weight Optimization on The Carbon Footprint of The Electric Prototype Vehicle

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Abstract -

Electrification of vehicles has become increasingly widespread lately. It aims to reduce carbon emissions globally. Another step, namely reducing vehicle weight, is expected to reduce energy consumption during the operation. A vehicle part that can be reduced in weight is the chassis. This research compares the carbon footprint between the stock chassis and the lightweight version. The lightweight chassis requires additional energy during its fabrication. Life cycle analysis (LCA) is conducted to calculate the carbon footprint of each chassis. Material loss and manufacturing time are the main differences in the footprint. Manufacturing strategy is important in order to minimize the emission of the process.
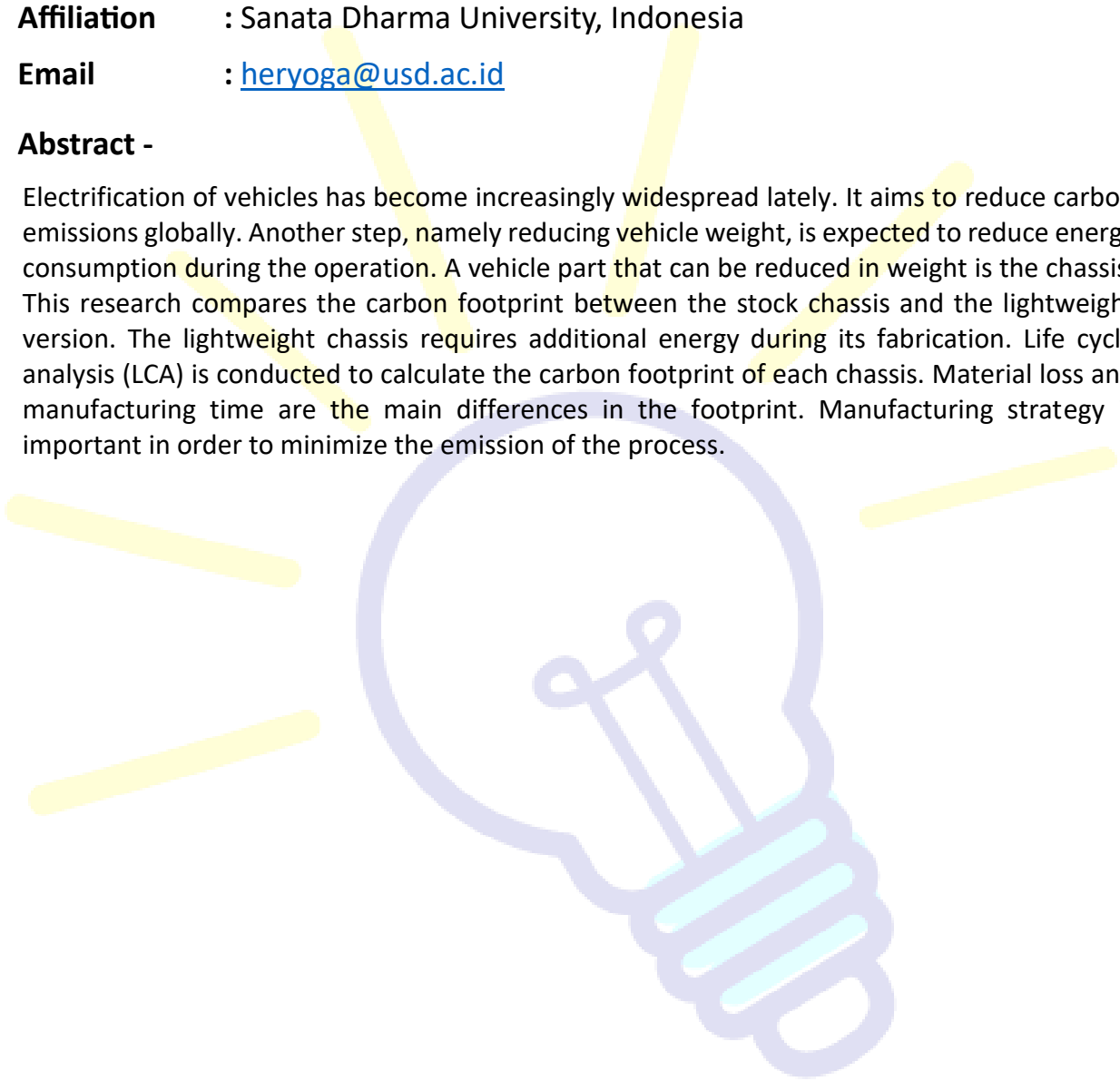
Paper Id: 2671

Utilization of Used Oil Waste for Boiler Energy Source

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Abstract -

Oil is one type of lubricating oil whose usage is increasing every year. The increase in oil usage automatically leads to an increase in waste generated. Used oil waste falls into the category of hazardous and toxic waste that requires special handling and processing. Used oil waste can be utilized as a valuable energy source with high economic value. The used oil waste to be utilized in this research serves as an energy source for the boiler. This research will consist of three main plant components: the Burner, plasma burner, and boiler. The used oil waste will be used as the primary fuel without any mixture for combustion. The waste oil will be heated in a spiral pipe to reach its boiling point, generating combustible gas steam. This flame energy source will be processed in the plasma burner to increase the flame pressure for boiler combustion. Control of the burner tank will be automated, making it easier for operators to manage the availability of burner fuel. Sensors will read the levels in burner tanks 1 and 2 to control the on-off operation of the oil pump. The values obtained by the sensor will be displayed on an LCD screen and can be monitored remotely using an IoT system. These values will be sent to the operator's smartphone to determine when it's time to refill the waste oil fuel tank.

Paper Id: 2625

Readiness Assessment of Lean Six Sigma Implementation in Manufacturing Industry as A Way To Ensure Sustainability

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Abstract -

Lean Six Sigma (LSS) is a strategy to overcome the problems that occur to improve the efficiency and effectiveness of the company through the elimination of variation and waste. efficiency and effectiveness will ensure the sustainability of the company. Several factors affect the success of LSS implementation in the company. Therefore, to be successful in LSS implementation, an assessment is needed to measure the level of LSS readiness (Lean Six Sigma Readiness/LESIRE). This article discusses the measurement of the readiness level of the plastic industry in Indonesia in the implementation of LSS. In addition to measuring the level of readiness, this article also discusses what important factors must be prepared in advance to be ready for LSS implementation. Data was collected by distributing questionnaires and processed using the fuzzy method. Factors that influence success consist of 5 enablers, 19 criteria, and 55 attributes. The results showed that the industry studied was categorized as Almost Ready. Attributes that need to be improved to increase LSS readiness are company initiatives in development, learning processes in development, improving workforce skills, customer-focused organizations or companies, strategic and visionary leadership, responsibility, authority and communication, planning, feedback loop design, eliminating waste, high impact of customer satisfaction, and technology improvement.

Paper Id: 2659

Modelling study of boiler using oil waste as an energy source

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Abstract -

Used oil waste is one type of waste that can be used as a source of energy. Waste oil that is used in this research is used as energy source for plasma burner and boiler plants. This final project is aimed at modelling a boiler with 3 input variables and 3 output variables (MIMO - Multiple Input Multiple Output). It's known that this MIMO system still exhibits interactions among the variables. To mitigate these interactions, a decoupler is designed. Subsequently, PID controllers are designed for this MIMO system. The PID parameter values are obtained through modelling using the Ziegler-Nichols method. The modelling is carried out based on the values obtained from the Ziegler-Nichols calculations, which are then implemented in Simulink within MATLAB. The test results indicate that employing a decoupler reduces the interactions between the systems. Therefore, Ziegler-Nichols and heuristic method is needed to find the PID parameter values. By utilizing the heuristic method, the system achieves stability with the value of Kp = 2,1, Ki = 0,005, dan Kd = 0 for the first variable, Kp = 0,0315 Ki = 0, dan Kd = 0 for the second variable, and Kp = 0,007 Ki = 0, dan Kd = 0 for the third variable.

SCADA for Waste Sorting System as an Environmental Conservation Effort

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Abstract -

Improperly managed household waste has led to environmental pollution. The methods of reducing, reusing, and recycling are effective in reducing waste volume. Therefore, waste needs to be sorted by type. Automated waste sorting using the SCADA (Supervisory Control and Data Acquisition) system consists of Capacitive Proximity Sensors, Inductive Proximity Sensors, and Infrared Proximity Sensors to detect the types of waste, a PLC TM221CE40R as the controller, and an Android-based HMI (Human Machine Interface) to monitor real-time waste bin fill levels. The types of waste to be sorted are organic, inorganic, and metal. The system comprises 1 main bin for users to deposit waste and 3 waste bins for the sorted materials. When users deposit a certain type of waste, the sensors detect the type of waste. This information triggers the motors of the 3 waste bins to rotate and stop right beneath the main bin, matching the waste type. The bottom of the main bin opens, allowing the waste to enter the appropriate container. Test results have shown that the system is capable of correctly sorting all types of organic and metal waste. However, for inorganic waste, the system correctly sorts only when the waste is clear in color.

Paper Id: 2687

Antibacterial Properties of Enzymatically Treated PET Fibers Functionalized by Nitric Oxide

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Abstract -

At present, microbes have enormous potential to become a major global public health issue. *Escherichia coli* is the prominent *cause* of cholecystitis, urinary tract infection (UTI), and other clinical infections. Meanwhile, Staphylococcus aureus is capable of *causing* various diseases from minor to severe infections. Due to its outstanding antibacterial properties, nitric oxide (NO) is essential for biological processes. Additionally, enzymatic hydrolysis using polyethylene terephthalate hydrolase (PETase) is one of the promising methods for PET upcycling. Recombinant PETase was used to enzymatically treat waste PET fibers, subsequently NO-conjugated PET fibers can be created from the porous structure of treated PET fibers. In this study, the first strategy for antibacterial applications by NO releasing PETase-hydrolyzed PET fibers was demonstrated. NO-conjugated PET fibers were successfully prepared which exhibits a continuous NO release profile over 12 h. The surface properties of functionalized PET fibers were successfully confirmed by fourier-transform infrared spectroscopy (FTIR), scanning electron microscope (SEM), and Griess assay. The antibacterial test indicated a reduction of E. coli by 90.2% and S. aureus by 71.1% after exposure to the functionalized material. Overall, this novel antibacterial agent may offer great potential applications in the medical field.

Paper Id: 2843

Design And Feasibility Study of Mobile Biodigester for Military Operation

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Abstract -

Military operations often require the support of field kitchens to meet troop consumption needs. In Indonesia the source of energy for cooking in the field kitchen usually comes from Liquefied Petroleum Gas (LPG). The use of LPG for cooking requires great effort in its transportation and takes up a lot of space. Anaerobic digestion has gained worldwide attention because it can convert organic waste into energy and offers significant environmental and economic benefits. An anaerobic digester or biodigester is a technology that utilizes a biological process in which organic matter is decomposed by anaerobic microorganisms in the absence of dissolved oxygen. This study aims to design and study the use of mobile biodigester as a sustainable energy source for heating and cooking in military operation compared to the usual operation. Kinematic modelling based on simple algebraic equations and few parameters used to estimate the size of the proposed mobile biodigester. The proposed mobile biodigester has 900 L volume capacity that can provide cooking energy for one company in military operation or equal to 90 people. Results showed that by utilizing minimal space in transportation, the mobile biodigester has the potential to be a sustainable and cost-effective solution for the energy needs of military units.

Paper Id: 2877

Optimization of pyrolysis of polypropylene and polyethylene based plastic waste become an alternative fuel oil using bentonite catalyst

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Abstract -

The conversion is accomplished by pyrolyzing plastic bag waste at relatively low temperatures, around 50-225°C and using a bentonite catalyst. The four products are alternative oils consisting of gasoline, kerosene and diesel, as well as non-condensable gas. Pyrolysis procedure as follows: (a). 3 kg of chopped plastic waste mixed with a mass fraction of bentonite catalyst of around 0.035-0.0125 of the weight of plastic waste and then put into the pyrolysator; (b). the pyrolysator is heated with 1.5 kg of LPG for 2-3 hours at a temperature ranging from 50-225°C; (c). pyrolysis results are stored separately in 3 pots: gasoline, kerosene and diesel; (d). to clarify the results of pyrolysis by adsorption using a sand filter. The variables studied were the type of PP and PE plastic materials and the effect of the mass fraction of bentonite catalyst ranging from 0.035 to 0.125. From the research obtained relatively good results as follows. Pyrolysis of 3 kg of PP plastic waste with the mass fraction catalyst of 0.100 resulted in a yield of 44.00% alternative gasoline, 10.76% alternative kerosene, 21.07% alternative diesel and the remaining non-condensable gases. The flash (ASTM D7094) points of alternative gasoline, alternative kerosene and alternative diesel are 84˚C, 68˚C and 100˚C respectively. The calorific value of each fuel product are 10,970 cal/g for alternative gasoline, 10,965 cal/g for alternative kerosene, and 10,816 cal/g for alternative diesel. In addition, the pyrolysis of PE plastic waste with the mass fraction of catalyst of 0.100 produced a yield of 27.65% for alternative gasoline, 17.11% for alternative kerosene and 43.79% for alternative diesel and the remaining was non-condensable gases. The respective flash points (ASTM D7094) of alternative gasoline, alternative kerosene and alternative diesel are 84˚C, 70˚C and 98˚C. The calorific value are as follows alternative gasoline 10,979 cal/g, alternative kerosene 11,008 cal/g, and alternative diesel 11,027 cal/g.

Paper Id: 2611

An Overview of Wind Energy to Optimize Initial Potential in Java

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Abstract -

The amount of energy derived from fossil fuels has been dwindling rapidly, while its consumption has gradually increased. Indonesia, especially Java and East Nusa Tenggara islands, has great potential for the development of renewable energy and an environmentally friendly economy. One of the more comprehensive energy resources is wind, which can provide renewable resources because it is renewable, widespread, and abundant. Wind energy can be used as an alternative energy material instead of fossil fuels in power generation systems. The purpose of writing this article is to explore the potential of wind energy as a renewable energy source in Java through a literature study. Data collection was carried out by collecting references from nationally and internationally reputable indexed books and journals related to the topic as well as government website platforms, reports and other relevant sources. The results showed that wind energy in several areas of Java Island has the potential to become renewable energy for power generation. The benefits of renewable energy can overweigh the drawbacks.

Paper Id: 2666

Solar Power Control System on Smart Green Home

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Abstract -

The need for fossil fuel electricity usage is increasing every year. If used for a long period of time, it will eventually run out. To reduce the use of fossil fuel energy, other alternatives are needed to maintain the availability of natural resources, one of which is by utilizing renewable energy. Utilization of solar power as an electrical energy source using photovoltaic panels. In its application, a solar power plant requires a controller that can regulate the energy produced. This controller is responsible for regulating the process of selecting the battery to be used. The working principle of this device is that when the battery reaches the minimum voltage threshold, the battery usage will be diverted to another battery with a voltage above the minimum threshold. The results of the research show that the system is capable of performing switching processes well using the smart switching method with a 100% success rate. The system uses an INA219 sensor for reading voltage and current from the battery. This research uses a 10-watt DC lamp, 20-watt DC lamp, and 30-watt DC lamp as loads. The battery can last for 4,8 hours by using a 10-watt DC lamp as a load, 2,4 hours by using 20-watt DC lamps as a load, and 1,6 hours by using 30-watt DC lamp as a load.

Paper Id: 2663

Numerical Investigation on the Effect of Blunt Body Deflector on Darieus Turbine Performance

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Abstract -

One of the renewable energy source that is abundant but has not been used optimally is wind energy. Roads are currently the main transportation infrastructure along with the increasing number of motorized vehicles. Wind is one of the best renewable energy sources that can be utilized on the highway where it can be used as a power source to drive the Vertical Axis Wind Turbine (VAWT). Darrieus type turbines can operate at low wind speeds and do not require a specific wind direction. However, the installation of this wind turbine on the highway can be hampered due to the presence of highway light poles. We simulate a light pole as a blunt object placed in front of the turbine which will then be observed for the ratio of torque produced to compare the performance of the turbine with a blunt body and without a blunt body. This study aims to determine the effect of the diameter ratio and distance between the turbine and the blunt object on the torque generated on the rotor. This research uses CFD simulation on NACA 4415 foil. The results showed that placing a blunt object in front of the Darrieus turbine increased the turbine torque. The most optimal increase in torque is obtained at a distance of 700 mm with a blunt body diameter of 0.6 DT or 0.3 DT which can increase the torque output of the turbine.

Using A Stepper Motor as A Low-Power, Low-Rotation DC Generator for Renewable Energy Harvesting

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Abstract -

Currently, the need for renewable energy is getting bigger, to study renewable energy generation requires a small-scale or miniature generator with a low rotation that can produce power for lamp loads. The selection of generators is not appropriate, using DC motors with high rpm, as generators still produce a small voltage (<12V) and a small current. The use of DC motors equipped with gears requires a large torque to rotate the rotor. The solution offered to overcome this problem is the use of stepper motors as a generator DC low rotation. The stepper motor has a multi-pole coil and permanent magnet qualified as a generator In this study uses the nema23 stepper motor as a DC generator. The stepper motor used is a 6-wire stepper motor (two pairs of coils), a half-wave rectifier, and a capacitor to buffer the voltage. The load is a 12VDC lamp. The measuring instrument used in the form of a DC power acquisition system (voltage and current) uses the INA219 module to detect voltage with a maximum of 16V and a current of 3.2A. The results obtained, the stepper motor generator can turn on the lights with a manual hand rotation.

Paper Id: 2786

Design And Implementation of A 232.2 KWP Rooftop and on Grid Solar Power Plant

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Abstract -

The need for large amounts of electrical energy and the negative impact of carbon emissions have encouraged all countries to develop renewable energy sources and reduce fossil energy sources which produce a lot of carbon emissions. One promising source of renewable energy is solar energy, which can be converted into electricity through Solar Power Plants. The Indonesian government has committed to increasing the renewable energy mix by 57% by 2035 and reducing carbon emissions by 29 % by 2030. To support the Indonesian government's commitment, the Widya Mandala Foundation has built Solar Power Plants on all campuses of Widya Mandala Surabaya Catholic University. This article intends to communicate the design and implementation of a 232.2 kWp rooftop and on grid Solar Power Plant located on one of these campuses. The Solar Power Plant has been designed and implemented using 430 units of 540 Wp solar panels, 2 units of 110 KWac inverters. It would produce 363.5 MWh of electricity per year. Based on the implementation results, the following output was obtained: from May to December 2022, was generated 221.788 MWh of electricity and 88.7 ton of CO_2 reduced. Then from January 2023 to May 2023, was produced 145,400 MWh of electricity and 58.2 ton of CO2 was reduced.

Paper Id: 2812

An experimental investigation on CCFL characteristics during gas/low surface tension liquid counter-current two-phase flow in a small-scaling PWR hot leg typical geometry

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Abstract -

A sharp increase in world energy demands which further results in another large progress in the development of nuclear energy establishes comprehensive developments on corresponding mitigation studies. Therefore, as a scenario of accident called LOCA is fundamentally considered, the related phenomena, i.e., the counter-current flow followed by flooding in the primary circuit of PWR, is of a great importance. The present work investigates characteristics of the flooding during a pair of gas/low surface tension liquid counter-current two-phase flow in a complex conduit representing a down-scaled of PWR hot leg typical geometry. Visual observations were obviously carried out to observe the flow phenomenology, while flow parameters were frequently varied. A typical result reveals that the gas flow rate to initiate the flooding decreases with the increase of liquid flow rate. Moreover, exhibiting locations of the onset called locus, a front flooding tends to occur during relatively low liquid flow rates while the higher liquid flow rates exhibit another flooding namely rear flooding. Accordingly, the present investigation provides a package of valuable information on a particular understanding towards the flooding characteristics to overcome the efforts on promoting safety managements on the operation of nuclear power plants.

Paper Id: 2830

Techno-Economic Analysis of Hybrid PV-Battery-Diesel System for Isolated Dockyard in West Papua

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Abstract -

An isolated dockyard located in West Papua currently relies on two diesel generators (DGs) with a total capacity of 1,100 kW to fulfil its energy demand. However, these DGs operate at low efficiency, resulting in a high levelized cost of energy (LCOE) of Rp9,064 /kWh and generating 496 metric tons CO_2 emissions equivalent per year. On the other hand, the dockyard holds significant solar energy potential. There is opportunity to utilise solar photovoltaic (PV) since its LCOE is also decreasing. This study aims to determine the optimal configuration and sizing of a PV-battery-diesel to minimise LCOE, considering CO_2 emissions and a maximum capital expenditure (CAPEX) constraint of Rp 16.4 billion. Four topologies are evaluated: DG, PV-DG, PV-battery, and PV-battery-DG topology. The results highlight the PV-battery-DG topology as the lowest LCOE of Rp3,185 /kWh while adhering to the CAPEX constraint. The PV-battery topology is the most effective in reducing emissions by 100%. Both the PV-battery-DG and PV-battery topologies are less sensitive to fuel price volatility but are more influenced by changes in inflation rates. In contrast, the DG and PV-DG topologies are relatively less responsive to inflation changes but significantly responsive to variations in fuel prices.

Paper Id: 2876

# Machine Learning Based Modelling for Estimating Solar Power Generation

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Abstract -

The solar power plant is a rapidly growing renewable energy source that has a potential role to play in reducing climate change and replacing fossil fuels. Estimation of the power generated by a solar power plant is required to determine the energy supply. Unfortunately, the solar power generated is highly uncertain because of the dependence of solar radiation and weather, making estimating solar power generation difficult. This study presents a development of machine learning to model a solar power plant. The aim is to obtain a model to estimate the generated power. The machine learning is developed by implementing the k-NN algorithm. A data set on the generation of power in a solar power plant is applied to train the machine. The development resulted in machine learning that was able to estimate the solar power generated with an accuracy of 69.6%.
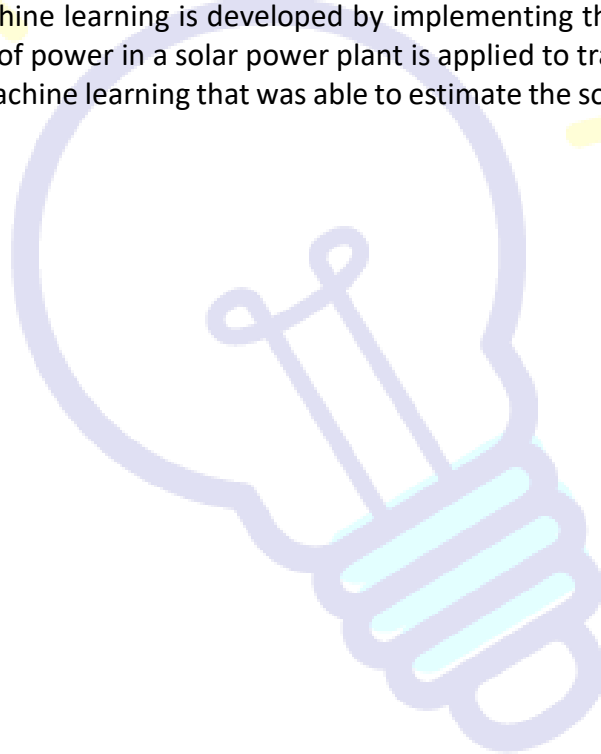
Paper Id: 2816

Aerodynamic Analysis of a Windmill Water Pump using Blade Element Momentum Theory

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Abstract -

A windmill water pump has been designed based on simulation data using the Blade Element. Momentum Theory (BEMT) method. Based on the simulation data, it can be seen that the windmill water pump using a 10-blade configuration with an incidence angle of 7 degrees is predicted to produce an output torque of 40 Nm. In order to keep the turbine manufacturing process simple, a turbine cross-sectional profile with a bent flat plate-based airfoil was chosen. The simulation results show that providing an incidence angle of 7 degrees will be able to compensate for the resulting decrease in aerodynamic performance when compared to using a cambered airfoil. Apart from that, dynamic analysis was carried out to predict the value of the turbine rotational speed. With a 10-blade configuration with a blade material density of 2900 kg/m3 at a wind speed of 5 m/s, it is predicted that it will be able to rotate the turbine at a steady rotation speed of 167 rpm. Meanwhile, when the material density value is increased to 3500 kg/m3, the rotor rotational speed is predicted to be 160 RPM. Even though the difference between rotor rotational speed and the increase in material density is not very significant, the time to reach steady-state conditions is very different. In detail, a turbine with a material with a density of 2900 kg/m3 requires a settling time of 168 seconds, while a turbine with a density of 3500 kg/m3 requires a settling time of 310 seconds. This difference is quite striking and shows that mass inertia only influences the dynamic response of the turbine to achieve steady rotational speed without significantly affecting the aerodynamics performance of the turbine.

Paper Id: 2983

Coefficient of Power of Indonesian Traditional Wind-Pump Blade Model

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Abstract -

Indonesia has wind energy potential as a renewable energy resource which is currently being developed intensively. Salt farmers have used it with wind-pump as part of the traditional salt-making process. They have the ability to manufacture, operate and maintain the Indonesian traditional wind-pump. The aim of the experiment was to find out characteristic of wind mill of the traditional wind-pump. The characteristics was expressed with relation of coefficient of power (Cp) and the tip speed ratio (tsr). The ratio of the wind mill model was 1: 2.5. The wind mill model consisted of four blades and 80 cm diameter. The experiment was done in a wind tunnel with wind speed of 5 m/s. The adjustable shaft load was electric machine. In the experiment, the wind speed range was 5.7 up to 6.3 m/s and shaft speed was 42.3 up to 387.4 rpm. The experiment resulted minimum and maximum tsr and Cp were 0.295 up to 2.705 and 2.623 up to 11.073, respectively. The experiment found out relationship of Cp and tsr in an equation. The equation showed that the traditional windmill model has maximum Cp of 10.62 at the tsr of 1.89.

Paper Id: 2680

Fast fashion Revolution: Unveiling the Path to Sustainable Style in the Era of Fast fashion

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Abstract -

The Fast fashion industry trend has proliferated due to its fast production and affordable prices. However, its negative impact on the climate and environment is significant. Previous research has revealed that Fast fashion contributes to high greenhouse gas emissions, excessive water usage, water pollution, and the generation of non-biodegradable textile waste. All of these factors harm environmental sustainability. Additionally, the mass production model of Fast fashion also encourages excessive consumption, creates non-biodegradable textile waste, and increases pressure on natural resources. This study aims to examine the relationship between fashion orientation (FO) and Fast fashion purchase intention (FFPI), as well as their impact on Fast fashion purchasing behaviour (FFPB). This research also explores the influence of sustainable clothing consumption attitudes (SCCA) as a moderating factor. Data were collected from 214 respondents through the nonprobability snowball sampling method. The analysis was conducted using the PLS-SEM method. The study's results indicate that FO significantly influences FFPI and strongly correlates with FFPB. Moreover, SCCA moderates the relationship between FFPI and FFPB. These findings imply that to address the negative impact of Fast fashion on climate change and the environment, changes in FO and FFPI are needed, as well as an increase in SCCA. Education and consumer awareness regarding the negative impacts of Fast fashion, promotion and support for sustainable clothing brands and products, and implementing policies that encourage more sustainable production and consumption practices are essential steps that can be taken.

Paper Id: 2344

The Impact Assessment of Automated Drip Infusion Control Using Weighing Scale and Pinch Method on Subjects

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Abstract -

A novel approach in infusion flow control technology under development is based on liquid weight and pinch valve control to stop and control the flow for better management. The main part of this device consists of a load cell, a microcontroller, and a pinch valve. In this method, a pinch valve controls the rate of infusion drops as prescribed to the patient, so that nurses do not have to keep on checking the infusion flow rate. The device detects the infusion flow from the measured liquid weight, which is mathematically converted to volume. A pinch valve, via a pinch-release method, controls the amount of fluid via the pinch duration. In this study, the effective duration of valve opening and the sensations of the fluid flow by the patients are also studied. The study, which involves fourteen healthy subjects, shows that a valve opening of a maximum of 70ms is still considered comfortable. Some subjects indicate discomfort with pinch opening longer than 70ms. A valve opening of less than 70ms shows no significant impact on the increase of outflow volume with a pinch-release period of 3000ms. The increase in outflow volume is quite linear concerning the pinch valve opening period.

Paper Id: 2635

Analysis of Coal Facies and Parting in The Balikpapan Formation, Kutai Basin, East Kalimantan

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Abstract -

The research area is located in RKBM coal mining area in East Kalimantan. One factor that influences the presence of parting in coal is the depositional environment. The existence of coal partings in this open pit area needs to be analyzed to determine the following steps in the exploration and further exploitation processes. The purpose of this study is a geological survey with the aim of knowing the coal facies and its parting characterization. The research was done by surface geological observation and drilling method. The results show that the facies association in this mining associated with delta systems such as channel, back swamp, flood plain, levee, crevasse splay, and inter distributary bay. The open pit area is composed of dominant lithology deposited in the upper delta plain environment. The presence of many and thin partings are often found in coal associated with the back swamp facies and deposited in the upper delta plain environment, which is mainly associated with fluvial systems. The distribution of parting in the study area is interpreted as not widespread because it is associated with back swamps that are affected by flood plains, and sometimes their distribution is cut off by channels.

Paper Id: 2637

Distribution Model, Depositional Environment, and Facies Of Coal in the AE field, Kutai Kartanegara area, East Kalimantan

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Abstract -

The AE field is a planned coal mining area in Kutai Kartanegara, East Kalimantan. A preliminary analysis of coal and non-coal lithology conditions, which act as constituents of the AE Field, must be carried out to determine the next step in the mining business. The physical properties of several coal seams in the AE Field are different, so characterization is necessary. The purpose of this study is to characterize coal and non-coal lithology in the study area, while the aim is to determine the facies analysis and depositional environment of coal. The research method used is surface and subsurface mapping (drilling). The results showed that the AE Field has four coal seams, namely seams-1, 2, 3, 4A, and 4B, which dip to the northeast. The coal formed in the lower delta plain transitional depositional environment, in the swamp, crevasse splay, channel, levee, and inter-distributary bay facies.

Paper Id: 2682

A Method for Assessing Green Value Chain Readiness

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Abstract -

Sustainable industrialization is the 9th goal of the 17 Sustainable Development Goals (SDGs) agreed by the United Nations. Green business practice is a basic concept that is important for the realization of sustainable industrialization. In a business practice, there is a value chain involved. The value chain is a series of activities to increase the added value of products/services so that the business practice has a competitive advantage. The first initiative towards green business is to conduct a descriptive and diagnostic analysis of the readiness of each activity in the value chain to become green. A suitable method is needed to perform accurate descriptive and diagnostic research. This article proposes a method of measuring the readiness of the green value chain. The green value chain readiness measurement method will use STEER (Sociocultural, Technological, Economic, Ecological, and Regulatory) as the measurement dimension. STEER has been widely used for macro analysis in business investment. The proposed green value chain readiness measurement method will use STEER to capture the existing condition of a business through the green readiness of each activity in the value chain. This measurement method is built through a literature review and uses a questionnaire as a data collection tool. Simple mathematical equations will be involved in indicating the level of readiness. The measurement results with the proposed method can map the green readiness of each activity in the value chain so that the company can start an initiative for green strategy to become a sustainable industry.

Paper Id: 2779

Study of Population Distribution and Benefits of Nipah (Nypa fruticans)

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Abstract -

The invasion of nipah (Nypa fructicans) occurred in the Air Telang Protected Forest (ATPF) as a result of mangrove forest degradation caused by anthropogenic activities in the area. This research aims to analyze the distribution of nipah populations in the ATPF and at the same time describe the benefits and potential of nipah both in the ATPF and in various regions in the world. The data collected in this research consists of two types, namely primary data and secondary data. Primary data was obtained through field surveys in the ATPF area, while secondary data was obtained through literature studies of relevant research results. Nipah populations can be widely distributed in degraded mangrove forest ecosystems and invade areas outside their natural habitat because they have high adaptability to the environment, high seed productivity and effective and adaptive seed distribution. Even though the spread of nipah in the ecosystem can hinder the succession of mangrove forests, it turns out that nipah has great benefits for the community and contains important compounds that are useful for making foods, drinks and medicine.

Paper Id: 2795

Development of Digital Livestock Monitoring in Sambilawang Village, Serang, Banten

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Abstract -

The stockbreeders in Sambilawang Village still rely on traditional methods, using record books, to manage their livestock. However, this approach has led to numerous human errors such as missing records, lost documents, and mix-ups. For instance, when workers need to find specific information, they have to go through each record manually. Additionally, the large number of livestock they need to manage makes it challenging for stockbreeders to provide timely updates on the growth of their livestock to potential investors or buyers. This indirectly affects the farmers' income and hampers their collaboration with potential investors, resulting in losses in livestock sales. Consequently, more people in the village may consider changing their professions, leading to a decrease in the number of stockbreeders and causing disruptions in meat distribution. Therefore, there is a need for an efficient monitoring system using a mobile application to facilitate and support farmers in their daily monitoring tasks. This study aims to develop a digital platform with an interactive concept for both stockbreeders and investors. The platform will not only monitor the growth of livestock but also provide easy access to information about their health and condition. Through notifications about readiness for sale, breeding, or milking, both stockbreeders and investors can stay updated at any time. The application will also make it easier for investors to buy and sell livestock.

Paper Id: 2817

Comparison of the K-Means Method with and without Principal Component Analysis (PCA) in Predicting Employee Resignation

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Abstract -

Employees are individuals who work for a company or organization and receive a salary. Employees are the most important assets that need to be effectively managed by the company in order to maximize their contribution. However, many employees feel dissatisfied with the outcomes of their contributions to the company, as they do not receive the expected rewards. This study utilizes a dataset from Kaggle.com, consisting of a total of 14,999 data rows with 10 attributes. In the first experiment, the dataset was reduced using PCA before applying the K-means clustering method. In the second experiment, the dataset is directly fed into the K-means clustering method without PCA. To evaluate the clusters in the K-means method, this study applies the sum of squared error (SSE) method and the silhouette coefficient method to determine the optimal clusters. The study concludes that there are two dominant factors, last evaluation and average monthly hours, that contribute to employees resigning from a company. The SSE evaluation indicates that both methods have an elbow point at 3 clusters, suggesting that dividing the data into more than 3 clusters does not provide significant additional information. The silhouette coefficient evaluation shows that K-means without PCA obtain the best silhouette coefficient value of 0.5674, while K-means with PCA obtain a silhouette coefficient value of 0.5491. Although K-means with PCA have the advantage of reducing the dimensionality of the dataset, they have a longer execution time compared to K-means without PCA, with an execution time of 181.53 seconds for K-means with PCA and 95.84 seconds for K-means without PCA.

The Key Impact Factors of Visitors' Environmentally Responsible Behaviour at Mlarangan Asri Beach Kulon Progo Regency

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Abstract -

Environmentally responsible behavior (ERB) facilitates the sustainability of tourism destinations. This research aims to identify the main impact factors in encouraging visitor ERB at Mlarangan Asri Beach and examine the impact mechanisms. A total of 150 visitors were surveyed at Mlarangan Asri Beach in Kulon Progo. The results of structural equation modeling show that personality traits have a positive and significant effect on environmentally responsible behavior and visitor satisfaction, but visitor satisfaction has no effect on environmentally responsible behavior, and satisfaction does not mediate the influence of personality traits on environmentally responsible behavior. responsible for the environment.

Paper Id: 2878

Environmental Management for Car Accident Precaution and Remote Notification

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Abstract -

Cars have been utilized as reliable means of transportation beyond the capacity of motorcycles. However, the misuse and abuse of these vehicles through unsafe practices like speeding and reckless driving poses a great risk tht results in accidents – and sometimes – with casualties. In such unfortunate circumstances, the importance of prompt accident notification is extremely important for the driver. This notification should encompass vital accident details and precise location information. Thus, the implementation of a comprehensive system for accident warnings and the remote transmission of accident data emerges as an imperative safety measure. In this system, accidents are assessed based on the vehicle's slope relative to the road and speed. The vehicle's slope is measured using ultrasonic sensor, which calculates the ground clearance distance at two different locations of the vehicles. The two sensors will provide warning when there is a difference of more than 3 cm. Speed is measured using GPS, with the limit set at 90 km/h. If crashed occurs, Airbag Sensor gives logic '1', then GPS will take current coordinates and date of the accident, then sends it via SIM800L in SMS format to registered number. Thus, the dangerous condition signed by 4,7 cm difference marked by Red LED and formed 7o angles which caused by excessive manoeuvre while GPS has 95% accuracy with speedometer. Thus, this voice output sure be great while quiet environment which output quality is 45dB at conversation environment.

Paper Id: 2905

Replication Control Strategy Based on A Simple Game of Life in Opportunistic Mobile Networks

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Abstract -

Although a flooding-based message dissemination in opportunistic mobile networks yields high delivery performance, the nodes' resources, such as energy and buffer, are rapidly depleted due to the enormous quantity of message replicas dispersed over the networks. This study aims to reduce the number of message replicas in the networks while maintaining an acceptable delivery rate. Inspired by Conway's Game of Life, which uses cellular automaton-based neighbor conditions to regulate the total population, we propose RiGoL, a replication control-based technique for determining how many neighbors hold the same messages. We utilize a counter to keep track of the number of neighbors and two thresholds, namely forward and drop thresholds. Our strategy works as follows: when a pair of nodes meet, the node checks to see if the peer has the same message. The counter is increased by one if the peer does not hold the same message. On the other hand, if the peer already has the message, the counter is decremented by one. Only when the counter exceeds the forward threshold, then the message forwarded to another node. In contrast, the message is deleted from the node's buffer if the counter value is less than the drop threshold. We conduct extensive simulations using ONE Simulator to evaluate our proposed strategy. The simulation results show that although RiGoL yields lower delivery performance than Epidemic, RiGoL successfully reduces the total amount of relayed messages.

Paper Id: 2019

Gamification Design for Tourism Mobile Applications Temple

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Abstract -

The tourism sector in Indonesia is a foundation for introducing and promoting the wealth and beauty of Indonesia's nature. The interest in tourism destinations in Indonesia is formed into three patterns: natural, cultural, and manufactured. Cultural tourism has the largest presentation among nature and manufactured, with supporting sectors from cultural and historical heritage tourism. Temples are historical buildings with a long and interesting history to study. However, many tourists come just to capture the moment without learning the history of the visited temple. Therefore, this research offers the creation of a mobile tourism application design, especially for historical tourism, using gamification methods so that tourists who come not only capture moments but also learn the history of these temples. The results of this study show an interval value range with an average score of 84.8% in the category of Very (agree/good/like), which indicates that the proposed mobile application prototype design meets expectations in helping tourists to obtain information about the temple history effectively, with gamification elements used in this study including points, levels, challenges, rewards, and feedback.

Paper Id: 2879

Fall Detection and Notification System to Fast Emergency Management for the Elderly

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Abstract -

An elderly person needs special attention from his family environment, but in general elderly people still want to live independently and not depend on their family environment. On the other hand, elderly people have a high risk of falling accidents because they experience a decline in health, especially physical health, which can result in serious injury or death if treatment cannot be done immediately. To overcome this, a tool is needed that can detect falls in the elderly so that it is hoped that the elderly can be treated immediately. The elderly fall detection tool is designed using accelerometer, gyroscope and GPS sensors. The function of the tool is to detect an elderly person's fall and then respond by sending information to family members from the cellphone number that has been stored in the tool's programming. The tool has dimensions of 3.4 x 7 x 3 cm which can be put into an elderly person's pocket. Testing of the tool was carried out by the subject performing a falling movement 10 times. The tool succeeded in detecting and sending fall information to Telegram 9 times so that the success rate of the fall detection tool was 90%

Paper Id: 2883

Classification of Delivery Types of Pregnant Women Using Support Vector Machine

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Abstract -

One of the ways to reduce maternal mortality is by diagnosing childbirth to find out whether a mother will give birth normally or not so that appropriate treatment can be done. This study aims to improve maternal safety and health by classifying delivery type of pregnant women, either Caesarean or normal types, using the Support Vector Machine method. The dataset used in this study was taken from a hospital in 2020. It consists of 25 attributes and 302 records that include information about the health conditions of pregnant women and babies. Several experiments were performed towards the dataset with and without balancing. Three types of SVM kernels, namely Linear, RBF, and Polynomial kernels, were then implemented to classify the dataset using several variations of parameters of C, gamma, and degree. The validation was performed using several k-fold cross validations. The results of this study show that the highest accuracy is 92.98% at 5-fold cross validation using the RBF kernel with parameters C = 10 and gamma = 1. The performances of the three SVM kernels varied depending on the type of data used.

A Study of Stochastic Epidemic Model Driven by Liouville Fractional Brownian Motion Coupled with Seasonal Air Pollution

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Abstract -

Air pollution can cause and provoke respiratory diseases. It is an important topic to the public, particularly in developing countries. Since there are many uncertain factors in the environment, stochastic differential equation model is a powerful tool to study the changes of air pollution and the transmission of infectious diseases. The removal of air pollutants as well as the transmission of diseases can be influenced by random perturbations with memories. In this research, we develop a mathematical model in the form of a system of stochastic differential equations driven by fractional Brownian motion of Liouville-type, coupled with seasonal air pollution, to study the dynamics of infectious respiratory disease spread.

Paper Id: 2886

Aerial Object Detection Analysis: Challenges and Preliminary Results

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Abstract -

Computer vision allows computers to retrieve information from images, videos, and other visual inputs. Currently, Unmanned Aerial Vehicle (UAV) technology is also used to assist computer vision in collecting image data from the air. This paper aims to perform tree object detection using UAVs by capturing images perpendicularly from above the object. Image data was collected from around Sleman Yogyakarta using DJI Pro 3 from 5 to 12 July 2023. A total of 162 images were used as a dataset. The YOLOv8n model was implemented to 162 images as the training and validation data. Next, 12 other images were used as testing data. The results showed that YOLOv8n could detect trees well from above. The confidence value of the testing dataset with the appropriate image capture is more than 80%. As a deep learning algorithm for object detection, the YOLO model can perform object detection quickly and accurately. The subsequent research will focus on analyzing the implementation of object detection using the YOLO algorithm to measure open green areas on the campus of Sanata Dharma University.

The Performance of DST-Wavelet Feature Extraction for Guitar Chord Recognition

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Abstract -

Small systems can be designed to be more energy-efficient compared to larger systems. On small systems, the need for data processing with small data sizes becomes a necessity. In the context of small systems for guitar chord recognition, there are indications that further efforts can be made to reduce the size of feature extraction data. This paper introduces DST (Discrete Sine Transform)-Wavelet feature extraction to achieve this reduction. Basically, this work evaluated the frame blocking length, the number of DST cutting factors, and the type of wavelet filters (Daubechies and biorthogonal families) to obtain the optimal number of feature extraction data. Based on the evaluation, the optimal result obtained was a number of four feature extraction data. This optimal result was obtained by using a frame blocking length of 512 points, a DST cutting factor of 0.5, and a biorthogonal 3.3 wavelet filter. Testing with 140 test chords using these four feature extraction data could give an accuracy of up to 92.86%.

Paper Id: 2855

Reuse Strategy and Management Models for Abandoned Industrial Areas. A Case Study in Yerevan

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Abstract -

In the conditions of ever growing urbanization and increasing prominence of the sustainability agenda the issue of urban quality is subject to prior consideration worldwide. In this context the revitalization of abandoned industrial areas entails the reconstruction of buildings, structures and spaces with significant functional potential. This paper explores the methodologies proposed for the reconstruction of abandoned industrial areas in Yerevan, focusing on development of environmental-economic criteria. This approach aligns with the principles of sustainable economic and urban development, considering comprehensive impact on environmental, social, and economic aspects throughout the entire reconstruction process. The developed methodology offers an inclusive analysis of existing environmental-economic conditions of the abandoned industrial areas of Yerevan, ensuring compliance with current legal norms and standards. The applied calculation method uses an innovative analytical formula that enables investors to estimate the projected costs more accurately and precisely. It is proposed to apply a new application developed using BIM technologies which provides an opportunity to carry out a systematic assessment and analysis of abandoned industrial areas based on formula averaged values of environmental-economic parameters. The tool also facilitates development of a management model that will allow evaluation of the feasibility of abandoned industrial area reuse. The conclusions derived from this study offer an exceptional opportunity to identify practical and optimal solutions for regeneration of the urban built environment, guided by the principles of sustainable urban development and by careful consideration of potential risks.

Paper Id: 2626

Assessing the Effectiveness of Agricultural Policies on Development: A Systematic Literature Review from Diverse Countries

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Abstract -

This study aims to assess the effectiveness of agricultural policies on development by examining global insights from diverse countries. The assessment would resume the valuable insights from a comparative analysis of agricultural policies in selected countries. The research methodology is a systematic literature review. This systematic literature review analyses the effectiveness of agricultural policies on development, focusing on selected countries: Mali, Cameroon, South Africa, Indonesia, Vietnam, the United States, European nations, and Brazil. The findings are summarized lessons learned in agriculture development from these countries. The valuable insights reflected by the selected countries to develop the agriculture sector to have better food security, poverty alleviation, income generation, environmental sustainability, and rural livelihood improvement. The research synthesizes and compares findings from a range of studies to provide a comprehensive understanding of the impact of agricultural policies on development outcomes. By examining the strengths and weaknesses of these countries' agricultural policies on development, policymakers and researchers can gain valuable insights to inform future policy decisions and enhance agricultural development worldwide.

Paper Id: 2622

Genetic Variability and Relationship of Agronomic Characters of Soybean Lines In Tidal Swamp Land

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Abstract -

Genetic variability and the relationship between agronomic characters have an important role in the development of high-yielding soybean varieties. The aim of the research was to study the genetic diversity and the closeness of the relationship between the agronomic characters of soybean lines in tidal swamp land. The results showed that broad genetic variability was found in the number of branches and seed yield, while the other characters had narrow genetic variability. Individuals in the family are relatively evenly distributed. Based on the PCA biplot, the contribution of agronomic characters was in the similar direction as seed yield, except for maturity. However, there were no characters that are significantly correlated with seed yield. Significant phenotypic correlations were obtained among the number of filled pods, plant height, the number of branches, and the number of reproductive nodes. Almost all of the high agronomic characters belong to the Dh/Arg progenies. The highest seed yields were obtained by Dw/Arg-7 and Dw/Arg-12, namely 2.49 and 2.41 t/ha, respectively. The lines with high seed yield potential was also shown by the Gjs/Arg and Sh/Arg progenies. Dw/Arg-7 and Dw/Arg-12 can be assessed in plant breeding process to obtain high yielding soybean varieties adaptive to tidal swamp areas.

Paper Id: 2789

Nutrition Control in Nutrient Film Technique Hydroponic System Using Fuzzy Method

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Abstract -

Hydroponics is a method of growing crops without using soil media, instead, it utilizes water or other porous materials. The automation system that is applied for measuring nutrient concentration, water level, water supply, and water volume controlling can be done by Arduino Mega microcontroller. Temperature, TDS, and ultrasonic sensors are installed on the microcontroller for data measurement. The results of the data are processed using the Mamdani fuzzy logic method. The fuzzy logic results are used in controlling nutrition and water volume. The system can be monitored remotely with the aid of the Blynk app. The results of the automation system concluded that the desired condition reaches an average time of 13 minutes 49 seconds. The results of the fuzzy logic processing of the system have an accuracy value of 94.24% after being compared with the MATLAB simulation.

Paper Id: 2907

The Inhibitive Effect of Vitamin B2, B6 and Vitamin C on The Cooper Corrosion

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Abstract -

Corrosion of copper (Cu) in sodium chloride (NaCl) and hydrochloric acid (HCl) can be inhibited by using inhibitors of vitamins B_2, B_6 and Vitamin C. The concentration of each vitamin varies between 400 – 1.100 ppm. The copper used is type Cu-OF/CW008A measuring 5 cm x 5 cm x 0.5 cm. The concentration of NaCl solution used as a corrosion medium was 30,000 ppm and 0.4 M HCl concentration. The corrosion process is carried out within 6 – 12 days. Calculation of the corrosion rate on Cu was carried out using the gravimetric method. The corrosion rate in acidic media (HCl) is greater than in neutral NaCl media. This phenomenon is caused because the H^+ ions in HCl acid readily accept electrons from the oxidized Cu metal. The vitamin inhibitor layer on the surface of the Cu metal reduces the contact between the Cu metal and the corrosion medium, so that the interaction of H^+ ions in the corrosion medium with the Cu surface is inhibited. Vitamin C can have multiple functions, at certain concentrations it can function as an inhibitor but if the concentration is enlarged it functions as an activator.

Batik Classification Using KNN Algorithm and GLCM Features Extraction

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Abstract -

Batik is one of the Indonesian cultures that has been recognized by UNESCO as an intellectual right of Indonesia. The popularity of batik internationally raises concerns about the Indonesian people's understanding of batik if Indonesian people only refer to all types of batik just as 'batik'. By utilizing K-Nearest Neighbour (KNN) algorithm which is a simple classification algorithm, then a system can be created that can classify batik types. The first step of KNN is training, which stores each training pattern. The second step is classification, whenever classifying a pattern, KNN examine all training patterns to determine the K closest patterns using certain calculations such as Euclidean Distance and Manhattan Distance. Before classification, a characteristic that represents a pattern is needed. Gray-Level Co-Occurrence Matrix (GLCM) is an algorithm that has proven to be very powerful as a feature descriptor in representing the texture characteristic of an image. This research experiments with the value of K in KNN = 1, 3, 5, and 7 with the distance calculation using Euclidean and Manhattan. The GLCM characteristic used are Entropy, Energy, Contrast, Homogeneity, Dissimilarity, Correlation, ASM, and the average of each characteristic. From the research that has been done, the system created obtained the highest accuracy of 75% with the combination of parameters; pixel distance = 7, K value = 1, 1st fold as test data and 2nd and 3rd fold as training data, and by using StandardScaler.

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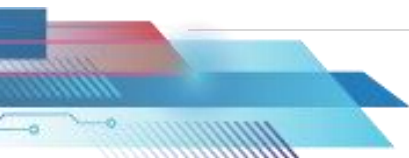
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The 1st International Conference on Applied Sciences and Smart Technologies (InCASST 2023) has been organized by the Faculty of Science and Technology, Sanata Dharma University, Yogyakarta, Indonesia. This event was held on October 18–19, 2023, in Yogyakarta, Indonesia. As an effort to contribute in distributing research outcomes, especially in the search for renewable and clean energy, waste management, environmental management, and sustainable agriculture. InCASST 2023 presented four honorable international keynote speakers from representative countries: 1) Prof. Tokuro Matsuo, Advanced Institute of Industrial Technology - Japan; 2) Prof. Ir. Sudi Mungkasi, Ph.D., Sanata Dharma University-Indonesia; 3) Assoc. Prof. Dr. Peerapong Uthansakul, Suranaree University of Technology – Thailand, and 4) Assist. Prof. Dr. Eng. Rando Tungga Dewa, The Republic of Indonesia Defense University-Indonesia. This event selected local researchers and overseas fellows to share their best research works at this conference to reach a broader network of researchers. After a rigorous selection process, the Scientific & Editorial Board decided to publish 46 papers in E3S Web of Conferences, open-access proceedings in environment, energy, and earth sciences, managed by EDP Sciences, and indexed on Scopus, Scimago.

The published papers have passed all necessary improvement requirements following the Web of Conferences standard, reviewer's comments, and similarity tests by the Turnitin program. We want to thank the official committee, scientific & editorial boards, and organizing partners. Thanks to our co-host partners, Universitas Katolik Widya Mandala Surabaya, Universitas Prasetya Mulya, and Institut Teknologi Nasional Yogyakarta, for trusting and supporting this conference. Finally, we would like to briefly thank all presenters and attendees for their participation in sharing wonderful ideas and making creative decisions to inspire further research and exchange scientific reasons. We hope this time, all papers can be compiled into scientific works as the first publication of the 2023 InCASST. Lastly, we hope this conference encourages further research collaboration and see you at the next conference.

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Investigation of Eichhornia crassipes as a natural fibre in PMC for noise controller

Paulina Dwi Nawanti[1]*, Dionisius Brian Deva* Erwandha[1], *Budi* Setyahandana[1] and *I.M.W.* Ekaputra[1]*

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Abstract. This paper investigated the Eichhornia crassipes as fibers in polymer matrix composite (PMC) for sound absorption. The polyester resin R-108 was mixed with the fibers with the variation percentage. The fibers were varied with three different variations: 20%, 25%, and 30%. The Methyl Ethyl Ketone Peroxide catalyst was added to accelerate the solidification. The sound absorption experiment used a simple insulated box with a sound level meter. After the experiment, the noise absorption coefficient (NAC) result was calculated and analyzed. The maximum noise absorption was obtained at 25% of fibers, indicated by the NAC value of 0.384. In addition, the tensile strength was also obtained for the supplementary data for this study.

1 Introduction

Noise pollution has become one of the unsolved problems in the capital city, especially for the developing country. Indonesia, as one of the developing countries, has contributed to noise pollution on the roadway. The noise source mainly comes from the racing type of motorcycle since this type has become popular recently [1]. The noise is becoming worse when the muffler has been modified. The incorrect material for the muffler's silencer made the vibration because the exhaust gas flow could not be adequately silenced. One of the materials used for silencers is fibre glass. However, it has been investigated that manufactured fibreglass can be toxic to human health [2]. The fibreglass produced styrene that can be neurotoxic. An alternative material, such as organic material, may be proposed to replace the fibreglass, such as Eichhornia crassipes, known as water hyacinth.

Generally, Eichhornia crassipes can be planted or overgrown without any special treatment. It can be found easily in a tropical country such as Indonesia. Even in some areas in Indonesia, it is thought of as Weed. The Eichhornia crassipes have yet to be processed correctly. Instead of applying it as organic material to replace synthetic or inorganic material, many ways were carried out to destroy this plant manually or chemically. The massive growth of Eichhornia crassipes can be seen in Figure 1.

Tang and Yan have reported that sound absorption could be controlled with the fibrous material. The fibrous material can be classified into inorganic, synthetic, natural, and

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nanofibers [3]. Inorganic and synthetic materials have commonly been used for many sound absorption components.

Fig. 1. The Eichhornia crassipes.

Several examples of inorganic and synthetic materials were glass wool, fibreglass, carbon fibre, polyester fibre felts, polypropylene, etc. Some of those materials have many issues with human health. An alternative fibre that is environmentally friendly must be developed to replace them. Natural fibre is an appropriate choice. However, there was limited investigation that has been reported about the use of natural fibres for sound absorption. Several natural fibres developed for sound absorption components are listed in Fig. 2.

In this study, Eichhornia crassipes were applied as the fibres in polymer matrix composite (PMC). The fibres were dried and mixed with the polyester resin with the lay-up method. The composition between fibres and resin was varied. The fibres were varied into 20%, 25%, and 30% with the polyester resin. After the PMC had been manufactured, the sound absorption experiment was conducted. The noise absorption coefficient (NAC) result was then obtained and discussed. In addition, several data on mechanical properties were also obtained for supplementary data.

No.	Fibers	Key findings
1	Bamboo fiberboard	Better noise reduction properties than plywood with similar density
2	Tea-leaf fiber felts	Tea-leaf fiber exhibits better sound absorption than polyester and polypropylene nonwovens
3	Ramie fiber reinforced poly (L-lactic acid) composites	Composites with short ramie fiber have better sound absorption property than the ramie fabric reinforced composites
4	Coir fiber	Coir fiber has naturally good acoustical absorption in medium and high frequency range
5	Bamboo fiber	Bamboo fiber has good absorption properties
6	Goose fiber felts	The fractal phenomenon of down fiber for sound absorbing
7	Jute composite materials	Jute shows better acoustical attenuation and flammability properties than glass fiber
8	Coir fiber felts	Natural coir fiber had an average acoustic absorption of 0.8 for f > 1360 Hz, f > 940 Hz and f > 578 Hz at thicknesses of 20, 30 and 45 mm
9	Polyurethane foams loaded with tea-leaf fiber and luffa cylindrica	The incorporation of tea-leaf-fibers into polyurethane can improve the acoustic absorption properties significantly
10	Natural fiber mixed nonwoven composites	The samples including 70% cotton and 30% polyester resulted in excellent absorption in the mid-to-high frequency ranges
11	Ramie, flax and jute fibers	Acoustic absorption properties of these natural fibers were calculated by the *Delany-Bazley* and *Garai-Pompoli* models, the results showed good agreement with the experimental data
12	Hemp fiber	Alkalization at higher temperature and higher

Fig. 2. Natural fibres for sound absorption [3].

2 Methods

The Eichhornia crassipes fibres were dried before mixing with the resin. The drying process was conducted under the sunlight for several days. The fibres were then brushed with a wire brush into the finer fibres, as shown in Figure 3. The alkaline process was applied by soaking the dried fibres in the 5 % NaOH solution for 2 hours. All fibres were cut uniformly with 1 Cm of length. The type of resin and catalyst were polyester and Methyl Ethyl Ketone Peroxide, respectively. The resin, fibre, and catalyst were mixed into the container. All the components were stirred in the container to ensure that the resin, fibre, and catalyst were distributed uniformly. The process was conducted repeatedly for different variations of fibres. The resin composition varied by 20%, 25%, and 30% with the resin. Before pouring the mixing components, the mould was coated with a release agent to prevent the PMC from becoming sticky to the mould surface.

Fig. 3. The finer fibres after being brushed.

After the PMC freezing, the solid PMC was formed into the dimension of $23 \times 23 \times 0.5$ Cm, following the apparatus used for the sound absorption experiment. For the supplementary data, the tensile specimen was manufactured for the tensile test by following the ASTM D3039 [4].

Figure 4 shows the schematic illustration of the sound absorption apparatus. The apparatus was a simple box consisting of a sound source area and measured sound area. The sound was generated from an audio frequency generator and connected to the amplifier. The amplified sound was entered into the sound source area and passed through the PMC partition. The sound is measured by a sound level meter after passing through the PMC partition. The sound frequency was varied for each fibre percentage to determine the NAC value [5]. The frequency range applied to the apparatus's inside was from 100 to 7000 Hz.

3 Data and analysis

In this study, the fibre is stirred with resin and catalyst in the container and poured into the mould. The orientation of fibre in solid PCM is randomly oriented. The solid PCM is in plate form, as shown in Figure 5 (a)-(c). Each plate was then placed in the middle of the box as a partition.

Figure 6 shows the measurement result of sound intensity for each partition type. The maximum sound intensity was measured at a frequency of 3500 Hz. The sound intensity was measured around 85 dB for the box without partition. The sound intensity becomes lower with the box with partition. For all fibres composition, the sound intensity can be absorbed on average about 30%. This sound absorption quantity is performed by NAC value, as shown in Figure 7. The 25% of fibre shows the highest sound absorption. This fibre composition has an optimal number of pores to reduce the sound intensity. An additional percentage above

25% of fibres may produce overlapped pores, decreasing the number of pores. It also relates to the dimension of partition used in this study. If the dimension of the partition is made more significant, the percentage of fibres may be optimal above 25%. It has also been reported by Tang and Yan that there is a maximum value of NAC at a critical fractal dimension and sound frequency [3].
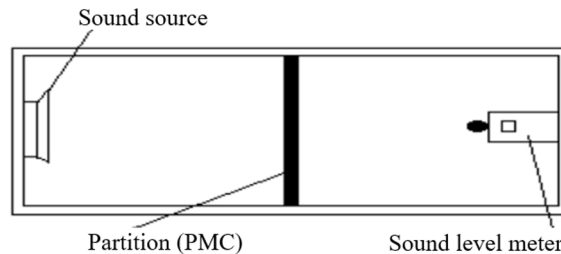

Fig. 4. The sound absorption apparatus.

Figure 8 shows the tensile test result for PMC under various percentages of fibres. It shows that both tensile strength and modulus elasticity decrease with the increase of fibre percentage. The Eichhornia crassipes will have a high tensile property if loaded parallel with the load direction. However, the PMC used in this study has a random orientation due to its manufacturing process. The perpendicular orientation of fibres may be found in a higher percentage. Hence, the tensile strength and modulus elasticity of PMC will decrease. The high percentage of fibres may also reduce the binding force between the resin and fibre [6]. Moreover, the natural fibres are generally having a low interfacial strength due to hydrophilicity to the matrix [7,8]. Fibres may experience debonding with the resin. It becomes worse when the specimen is being cut or deformed. The methods have been reported to increase the bonding between the natural fibres and the matrix were by controlling the alkali treatment and hydrolysis method [9,10].
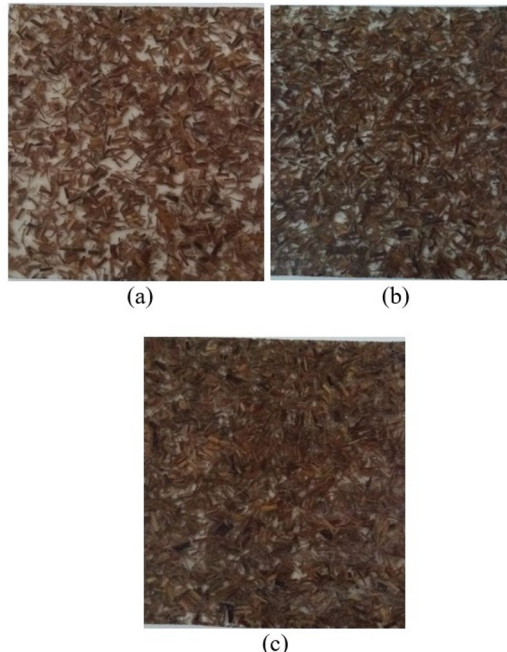

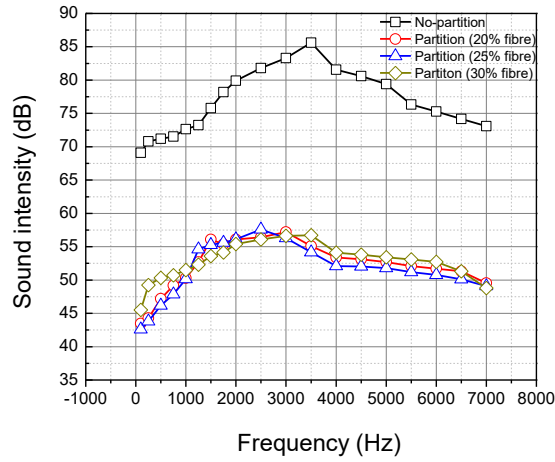**Fig. 5.** Random orientation fibres in resin (a) 20%, (b) 25%, (c) 30%.

Fig. 6. Sound intensity in various partition.
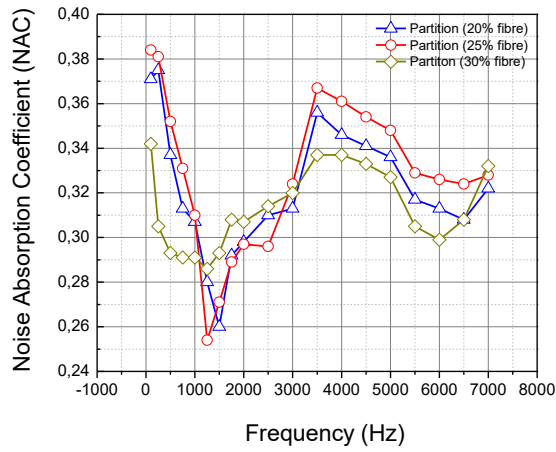

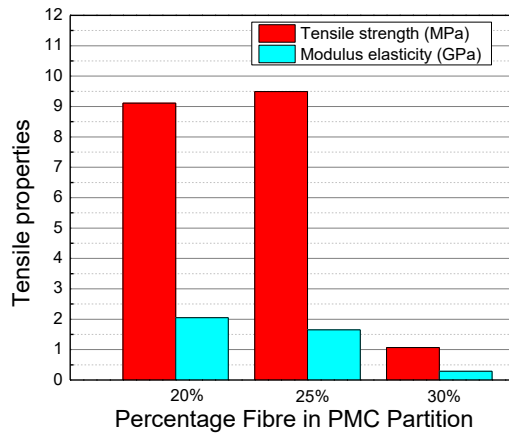**Fig. 7.** Noise absorption coefficient for different fibre percentages.

Fig. 8. Tensile stress result for different fibre percentage.

4 Conclusions

This preliminary study obtained the sound absorption value for PMC at various percentages of Eichhornia crassipes fibres. The PMC with 25% of fibres performed an optimum sound absorption indicated by the highest value of NAC. For the design purposes, the simple tensile characteristic was also calculated. The tensile test showed that the strength and modulus elasticity of PMC decreased with an increase in the percentage of fibres. Several issues during the machining process of PMC must be solved in future research to provide a high bonding between the resin and fibre.

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