ACADEMIC SESSIONS AND VICE CHANCELLOR'S AWARDS – 2024

ABSTRACTS

FACULTY OF GRADUATE STUDIES & LIBRARY
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"*Nurturing Excellence in Research: Boosting Empowerment-Oriented Advances in Academic Productivity*"

BOOK OF ABSTRACTS

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Message from the Chairperson - Academic Sessions and Vice Chancellor's Awards - 2024

At a remarkable milestone where scholarly excellence thrives, and innovative minds converge in pursuit of knowledge and discovery, it gives me immense pleasure to extend this warm welcome to the Academic Sessions and Vice Chancellor's Awards 2024 of the University of Ruhuna. As we unite under the resounding theme of "Nurturing Excellence in Research: Boosting Empowerment-Oriented Advances in Academic Productivity," we embark on an exhilarating voyage of celebration and commendation, acknowledging the extraordinary academic accomplishments and groundbreaking research endeavours that define our vibrant university community.

The Academic Sessions serve as a radiant beacon of scholarly excellence, offering a vibrant platform for academics and students to illuminate the corridors of knowledge with their groundbreaking research, vibrant discussions, and enriching collaborations. This annual symposium not only reflects our steadfast dedication to academic brilliance but also underscores our commitment to cultivating an environment where innovative ideas flourish, and interdisciplinary connections thrive.

In parallel, the Vice Chancellor's Awards stand as a poignant tribute to those individuals who exemplify the highest standards of dedication, creativity, and impact in their respective fields. These accolades symbolize the University of Ruhuna's unwavering commitment to nurturing talent, fostering intellectual curiosity, and fostering a culture of excellence that transcends boundaries and inspires future generations.

As the Chairperson of this esteemed event, I am deeply moved by the sheer depth and breadth of research presented today. To all participants, I extend my heartfelt admiration for your tireless efforts, unwavering perseverance, and relentless pursuit of knowledge. Your contributions not only enrich our academic community but also hold the promise of transformative impact on society at large.

In this moment of gratitude, I extend my sincere appreciation to the Vice Chancellor of the University of Ruhuna, Senior Professor Sujeewa Amarasena, and the Deputy Vice-Chancellor, Senior Professor Saman Chandana Ediriweera, for their invaluable guidance and unwavering support in orchestrating this monumental event.

A special note of appreciation goes to our distinguished keynote speaker, Emeritus Professor H. Janaka De Silva of the Faculty of Medicine, University of Kelaniya, whose wisdom and insights have enriched our intellectual discourse and ignited our imagination.

To all the awardees, I offer my heartfelt congratulations. Your extraordinary achievements serve as a beacon of inspiration, guiding us towards greater heights of excellence and innovation. Let us also pay homage to the esteemed academics bestowed with the title of Professor Emeritus, whose indelible contributions have left an indelible mark on our academic landscape.

All the reviewers and editorial panel members are owed a debt of gratitude for their unwavering commitment and invaluable expertise in reviewing abstracts and papers. Your meticulous

evaluation and profound insights have been instrumental in upholding the integrity and quality of our academic deliberations.

Last but certainly not least, I extend my deepest thanks to the committee members, as well as the academic and non-academic staff, whose dedication and tireless efforts have been the bedrock of our success. Your collective contributions have made this event a resounding triumph, reflecting the essence of collaboration and camaraderie.

As we embark on this odyssey of academic exploration and discovery, let us reaffirm our commitment to fostering a culture of excellence, innovation, and collaboration. Together, let us continue to push the boundaries of knowledge, inspire future generations, and carve out a brighter future for our beloved university and our nation.

Snr. Prof. P. Mangala C.S. De Silva,
Chairperson,
Academic Sessions and Vice Chancellor's Awards 2024,
University of Ruhuna.

Message from the Vice Chancellor - Academic Sessions and Vice Chancellor's Awards - 2024

It is with immense pleasure and anticipation that I extend my warmest greetings to all participants of the Academic Sessions 2024 at the University of Ruhuna. This annual gathering serves as a testament to our unwavering commitment to academic excellence and innovation, as well as a platform to showcase the remarkable research achievements within our university community.

The theme for this year's Academic Sessions, "Nurturing Excellence in Research: Boosting Empowerment-Oriented Advances in Academic Productivity," is particularly poignant given Sri Lanka's current development trajectory. The nation faces multifaceted challenges stemming from financial constraints and socioeconomic disparities. In such a context, it becomes increasingly imperative to leverage the power of research and innovation as catalysts for positive change and sustainable development.

Research excellence serves as a cornerstone for academic advancement and societal progress. Beyond mere scholarly pursuits, research has the potential to address pressing societal issues and propel economic growth. By fostering a culture of inquiry, collaboration, and innovation within our academic community, we empower individuals to transcend disciplinary boundaries and generate transformative solutions that address the root causes of societal challenges.

Research and innovation emerge as powerful tools for empowerment and inclusive growth in confronting financial constraints and socio-economic disparities. Through rigorous inquiry and collaborative efforts, we can develop evidence-based strategies to tackle poverty, inequality, and environmental degrada-tion. Moreover, research-driven initiatives have the potential to stimulate economic growth by fostering entrepreneurship, driving technological innovation, and attracting investment in critical sectors.

At the University of Ruhuna, we are committed to fostering an environment conducive to groundbreaking research and scholarly inquiry. Through strategic partnerships, interdisciplinary collaboration, and knowledge exchange initiate-ves, we endeavour to harness the collective expertise of our faculty, students, and research community to tackle the multifaceted challenges facing our nation.

As we embark on this journey of exploration and discovery, let us reaffirm our shared commit-ment to excellence, integrity, and social responsibility. Together, let us harness the power of research to pave the way for a brighter, more prosperous future for our beloved Sri Lanka.

I extend my sincere appreciation to all participants, organizers, and supporters of the Academic Sessions 2024 for their dedication and contributions to this transformative endeavour. May this gathering inspire new insights, foster meaningful collaborations, and propel us toward our shared vision of academic excellence and societal advancement.

Snr. Prof. Sujeewa Amarasena,
Vice Chancellor,
University of Ruhuna.

Message from the Deputy Vice-Chancellor – Academic Sessions and Vice Chancellor's Awards - 2024

It is with great pleasure and honour that I write this message for the 19th Vice Chancellor's Awards and 20th Academic Sessions of the University of Ruhuna. This forum stands as the pinnacle event for the university, symbolizing academic integrity, research excellence, and the distinctive contributions of our scholars. This respected gathering is a platform to showcase groundbreaking research findings to significantly advance knowledge. Notably, it offers a prime opportunity for young academics to engage with their seasoned counterparts, enriching their research endeavours. In turn, senior academics have the chance to nurture the development of their junior colleagues.

This year's theme prompts us to explore unconventional avenues of thought, aligning seamlessly with the objectives of the Academic Sessions and Vice Chancellor's Awards. Academic productivity, the cornerstone of scholarly achievement, encompasses various activities, including research, publication, teaching, mentorship, and community service. Central to this process are key indicators such as research output, funding acquisition, teaching efficacy, collaboration, and networking. This forum marks an auspicious commencement in our ongoing journey of comprehension and advancement.

I extend heartfelt congratulations to the deserving recipients of awards across various categories, as well as to those whose research has earned recognition in this esteemed forum. Special commendation goes to professors honoured with Emeritus Professorship for their exceptional contributions. I also wish to express gratitude to Senior Prof. Mangala De Silva and the dedicated team at the Faculty of Graduate Studies, as well as Mr. Nimal Hettiararchchi and his diligent staff at the University of Ruhuna Library, for their meticulous organization of the 19th Vice Chancellor's Awards and 20th Academic Sessions.

I wish the 19th Vice Chancellor's Awards and 20th Academic Sessions of the University of Ruhuna all success.

Senior Prof. E.P.S.Chandana
Deputy Vice Chancellor
University of Ruhuna

Agriculture, Environment and Biological Sciences

Relationship among Cost of Production, Producer Price, and the Guaranteed Price of Paddy in Sri Lanka

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Abstract

The Paddy Marketing Board has been purchasing paddy at a guaranteed price to enhance the livelihood of the farmers. Scholars, farmers, and the media argued that the lower guaranteed price (GP) did not get fair prices for the farmers. Therefore, farmer organizations forced the Government to increase GP. As different players in the value chain have different views, the real association between cost of production (COP), producer price (PP), and guaranteed price (GP) is questionable and has not been adequately explored yet. Therefore, this study was conducted to identify the relationship among COP, PP, and GP of paddy marketed in the Sri Lankan context through correlation analysis of secondary data using SPSS software. Results revealed that the COP in 2022 stated by the Farmer organization was higher than the average COP determined by the Department of Agriculture due to variations in other expenditures. Hence, the profit for the farmer is not up to the level assumed by the government, which harms the producers. Based on the results of the analysis, the study proved that the GP and the PP are higher than the COP and showed a strong positive correlation among COP, PP, and GP, proving that farmers can sell their paddy at a higher price than COP. Accordingly, as requested by the Farmer organization, the increase of GP will increase the PP, enabling farmers to earn more profit. In contrast, the increase in GP might have increased the price of rice, which would have harmed consumers. The results will be important for policymakers and scholars to make effective policies. Further research is needed to identify the variation of COP, PP, and GP to make a firm decision, especially in deficit markets or deficit productions

Keywords: Correlation Analysis, Cost of Production, Guaranteed Price, Producer Price, Surplus Production

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Does Mowing and Plant Composition Alter the Activity of Litter Decomposition? - A Case Study on Solidago Stand Restoration Methods

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Abstract

Soil ecosystem services are facilitated by the breakdown of organic matter. The speed of this decomposition process is predominantly influenced by the nature of the plant material undergoing decomposition and the abundance and variety of organisms involved in processing organic matter. Consequently, any disruption to the soil ecosystem will impact the decomposition process. Invasive plants, such as *Solidago* species, cause a significant ecological threat to natural habitats, emphasizing the need to develop effective and environmentally safe methods to control their presence. This study utilized decomposition rates as indicators of soil health in the context of grassland restoration following *Solidago* invasion. The field experiment on *Solidago* species removal and land restoration was established in April 2020 in a 5×3 factorial arrangement in a completely randomized block design with four replications. Various seed mixtures (including grasses, grasses with legumes, seeds collected from a seminatural meadow, and the use of fresh hay with no seeds) were sown, and different mowing frequencies (1, 2, and 3 times per year) were implemented. Two types of litterbags were prepared. The large litterbags were prepared using fibreglass mesh (aperture 5 mm) to allow free microbial and small soil animals, and small litterbags with nylon (aperture 0.02 mm) were used to allow free microbial. Three seasons ([June 2021, August 2021, and April 2022) of data on litterbag biomass reduction were collected. Two hypotheses were tested: (1) the plant species composition used in the restoration process affects litter decomposition rates, and (2) mowing regimes influence litter decomposition rates. Seed mixture, mowing, season and interaction between seed and season were significant with both mesh sizes ($p < 0.05$). The findings revealed that decomposition rates were higher in plots with the highest species diversity (seminatural meadow), indicating a positive correlation between increased species diversity and enhanced soil processes. Additionally, mowing two and three times per season positively influenced the decomposition process. In conclusion, higher plant species composition and mowing more than once increase the decomposition rates and can serve as a valuable tool for identifying appropriate grassland management practices.

Keywords: Decomposition rates, Ecosystem service, Goldenrod, Plant invasion, Grassland, Ecosystem restoration

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Analysing the Impact of Total Dry Matter on Plant Growth and Fibre Yield of Banana

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Abstract

Banana, a widely cultivated fruit crop in Sri Lanka, is not only valued for its popularity as a fruit but also a valuable source of natural fibre due to its desirable properties. Among the 29 banana varieties in Sri Lanka, the Embul (AAB) and Seeni (ABB) varieties are in high demand. Dry matter (DM), representing the material left after water removal, is a crucial factor in understanding banana growth and fibre yield. Yet, a research gap persists in understanding how DM affects these aspects in the Sri Lankan context. This study analysed DM content on banana plant growth and fibre yield by addressing this gap. Data on leaf dry weight, pseudostem dry weight, root dry weight, fibre dry weight, and pseudostem volume (V) were collected from Embul and Seeni banana varieties established at the same growth stage over a year in a field located in Badulla (Latitude: 6.9934°N, Longitude: 81.0550°E) within the Intermediate Zone (IM1). Thirty-five replicates were used for the model development, and 10 replicates were used for the model validation. Predictive models were constructed employing correlation analysis and bootstrap regression. Consequently, plant growth was modelled as $V=244DM_T-101629$ and $V=105 DM_T-11940$, while fibre yield (FY) was predicted as $FY=0.2DM_T-35.3$ and $FY=0.2DM_T-18.2$ for Embul and Seeni respectively (DM_T is the total DM). These models demonstrated accuracy in future predictions, with $R^2>0.6$ and Mean Absolute Percentage Error (MAPE) < 8.05, suitable for banana plants aged six months or older. Overall, the study highlights the significant impact of total dry matter on both plant growth and fibre yield.

Keywords: bootstrap regression, correlation analysis, Embul, residual matter, Seeni

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Influence of Organic and Inorganic Soil Amendments on Temporal Improvement of Formation of Soil Aggregates in *Eleusine coracana* Cultivated soil

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Abstract

Soil aggregation is related to biological, physical, and chemical activities in soil. Agriculture-based soil amendments may encompass hydrophobic properties that interfere with soil aggregation. This study examined the influence of soil amendments and their hydrophobicity on soil aggregation in *Eleusine coracana*-grown soil. Cattle manure (CM), hydrophobic leaf litter (*Casuarina equisetifolia*, CE), biochar from CE (BC_{CE}) (450 °C, 20 minutes), and quick lime (CaO) were mixed with sieved surface soil (3% CM, 3% CE, 3% BC_{CE} and 1% CaO in air-dry weight basis). The control was primarily surface soil (Rhodudults with grass-dominated vegetation). The study involved five treatments (triplicated), including the control. The hydrophobicity was examined using the water drop penetration time (WDPT) test. Initially, CM and CE-added samples were slightly repellent, while control, BC_{CE}, and CaO-added samples were non-repellent. The samples were filled into the polybags (3750 g per bag) and moistened up to 80% of the soil's field capacity. Sprouted *E. coracana* seeds were transplanted in polybags, and the moisture content was maintained by adding water (first 2 weeks: once every 4 days; after two weeks: twice a week). After 10 weeks, formed aggregates were separated by sieving. The percentage of total aggregate formation was calculated as the total soil in a polybag (air-dry basis). The highest and the lowest aggregate formation were recorded in the CE-amended sample (21.4%) and BC_{CE}-added sample (4.1%), respectively. The CE and CM-amended samples (slightly repellent mixtures) showed significantly higher aggregate formation compared to the control ($p<0.05$). The BC_{CE}-added sample showed the lowest aggregate formation despite biochar being a soil improvement agent. The exact mechanism for the reduced aggregation by BC_{CE} has not been fully addressed; it can be related to the presence of sodium, which discourages flocculation. Future studies considering various soil amendments and biochar applications would provide a more comprehensive understanding.

Keywords: hydrophobicity, soil aggregates, soil amendments

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Healthy Ice Cream as an Alternative to Conventional Counterpart: A Conjoint Analysis of Consumer Preference

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Abstract

Ice cream is a delicious and nutritious dairy product preferred by consumers in all age categories. However, the high sugar and fat content of ice cream has raised concern about its healthiness. Current health-conscious consumers seek healthy foods without compromising taste. A study was conducted to investigate the consumer preference for healthy ice cream using conjoint methodology. A Convenience sampling technique was used to select 300 consumers residing in Southern Province of Sri Lanka. They were asked to rank 16 hypothetical choice cards with appropriate ice cream images and relevant information to evaluate healthy ice cream profiles obtained using the orthogonal design of SPSS software. According to the conjoint analysis, the sugar content of ice cream was identified as the most important factor for the overall consumers, followed by flavour, fat content, price and quality certification. The ideal healthy ice cream profile for the overall consumers was identified as having chocolate flavour, being fat-free with no added sugar, having SLS certification and being priced at Rs. 480/L. Cluster analysis revealed that there were 2 clusters with different ideal product profiles; cluster 1: chocolate flavoured, low fat with no added sugar, having ISO certification and priced at Rs. 520/L and cluster 2: vanilla flavoured, fat-free with no added sugar, having SLS certification and priced at Rs. 480/L. Consumers in cluster 1 ranked sugar content in ice cream as the most important factor of concern, followed by fat content, flavour, price and quality certification, indicating their high health consciousness, while consumers in cluster 2 identified flavour as the most important factor, followed by sugar content, fat content, price and the quality certification. Chi-square analysis revealed that the consumer demographic profiles were significantly ($p<0.05$) different among clusters with respect to age, education level, occupation and household income. The conjoint analysis results revealed that even though the consumers are health conscious, their flavour preference also plays a significant role in selecting healthy ice creams. Therefore, further studies are suggested with real samples to find out the actual preferences of the consumers and make inferences.

Keywords: Attributes, Cluster analysis, Conjoint analysis, Healthy ice cream

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Determination of Acute Toxicity of the Surfactant, Sodium Lauryl Sulfate on Ostracod *Stenocypris* sp.

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Abstract

Detergents are typical xenobiotic chemicals with polar head groups (hydrophilic) and non-polar hydrocarbonic tails that are hydrophobic. Sodium Lauryl Sulfate (SLS) has been categorized as an anionic surfactant that can be used as an emulsifying cleaning agent in household detergents such as dishwashing soaps, toothpaste and shampoo. Mechanisms related to the effects of SLS on aquatic fauna are poorly investigated, and Stenocypris sp. (Ostrocod), in particular, was not studied from this perspective. The present study was conducted to observe the behaviour, morphological changes and mortality of *Stenocypris* sp. at different concentrations of SLS. Concentrations of 0.05 µmol/dm^3, 0.1 µmol/dm^3, 0.2 µmol/dm^3, and 0.4 µmol/dm^3 were prepared with three replicates into 6 L glass tanks along with a control tank. Fifteen individuals of *Stenocypris* sp. of the same size (~0.5 mm in length) were added into each tank. Water pH, temperature and conductivity were measured daily in each tank. The morphology and behaviour of individuals in the experimental series were similar to those in the control tank until 48 h. However, after 48 hrs, "attachment to the glass surface" was the only shown observable behavioural difference among individuals in the control tanks. Furthermore, discolouration of the body was observed in individuals exposed to SLS compared to the controls. The Adductor Muscle Scar, thoracopods, gut and Caudal Ramus of the organism were broken and disfigured in the concentration of 0.2 µmol/dm^3 after 72 h of exposure. Based on the probit scale, the 72h lethal concentration (LC50,72 h) of SLS for Stenocypris sp. was determined as 0.101 µmol/dm3. It was concluded that the detergents containing SLS used in daily household activities have potential toxicological effects on aquatic biota by altering their behaviour, morphology and survival. Therefore, monitoring environmental concentrations of surfactants and developing management practices to mitigate potential environmental impacts are highly recommended.

Keywords: Adductor Muscle Scar (AMS), Caudal Ramus, Detergents, Sodium lauryl sulfate (SLS), *Stenocypris* sp.

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Evaluation of Protective Effect of Poly-β-Hydroxybutyrate Producing Halophilic Microorganisms on *Vibrio*-Challenged *Artemia*

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Abstract

Infectious diseases pose a significant obstacle to expanding aquaculture production, prompting the prolonged use of antibiotics for prophylactic and therapeutic purposes. However, concerns about the adverse effects of antibiotics have sparked interest in alternative approaches. Probiotics and poly-β-hydroxybutyrate (PHB) have emerged as potential biocontrol agents. This study explores the protective effects of PHB-producing halophilic microorganisms in gnotobiotic *Artemia franciscana* during a *Vibrio campbellii* challenge, representing the first investigation of its kind. Various halophilic bacterial and archaeal species were screened for PHB production qualitatively (using Sudan Black B and safranin staining technique) and quantitatively (using a spectrophotometric method), revealing *Halomonas ventosae*, *Halomonas* sp., *Halomonas boliviensis*, *Haloferax mediterranei*, and *Haloferax volcanii* as capable PHB accumulators. *H. ventosae* and *Hfx. mediterranei* stood out, achieving 46% and 31% of cell dry weight (CDW) when growing on complex media with 2% glucose. Then, the gnotobiotic Artemia challenge test was used to evaluate the protective effect of selected PHB-producing halophiles. In these vivo challenge tests, supplementing *H. ventosae* and *Hfx. mediterranei* in culture water significantly increased the survival of Vibrio-challenged gnotobiotic *Artemia* compared to the challenged control. Survival increased significantly with increasing cell density of halophiles. Moreover, the survival of the challenged group supplemented with halophiles was comparable to that of the unchallenged control at the halophile cell concentration of 5×10^7 cells ml^{-1}. Notably, amorphous PHB concentration estimates indicating complete protection in *Artemia* were 2.5 mg l^{-1} for *H. ventosae* and 3.5 mg l^{-1} for *Hfx. mediterranei*. However, higher amorphous PHB content in the halophiles did not result in higher survival, indicating that cellular components of halophiles other than PHB might be responsible for the protective effect. While these findings suggest that halophile supplementation protects *Artemia* against *Vibrio campbellii*, the study did not conclusively attribute this protection solely to the PHB content in the halophiles.

Keywords: Gnotobiotic *Artemia*, Halophiles, poly-β-hydroxybutyrate, *Vibrio campbellii*

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Preliminary Study on Evaluating the Possibility of Starting a *Holothuria atra* Farm in Point Pedro

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Abstract

Holothuria atra is cultured in a farm in Allaipiddy (AL) area of Jaffna district and value-added products of sea cucumber are produced. Hence, the present study was conducted to study the possibility of starting a *H. atra* farm in the Point Pedro (PP) region in Jaffna district, and compare the environmental parameters with those of Allaipiddy area. Water and soil samples were collected in PP and AL regions to evaluate the probability of starting a farm in PP. Furthermore, a mixed-method approach was used to gather the data in two locations. Primary data in the PP area were collected from 50 fishers by using open-ended semi-structured questionnaires. In addition, a separate survey was carried out in the AL farm. Results of the water quality analysis indicated that the parameters such as pH and temperature did not significantly differ ($P > 0.05$) in PP and AL areas, but DO, electrical conductivity, turbidity, TDS, and salinity were significantly higher ($P < 0.05$) in PP area than in AL area.

Survey results of the PP area revealed that the average age group of fishers was 25-50 years; 52% of fishermen were engaged in fishing at 4 p.m. and mainly received the credits via relatives (38%). The monthly income of fishers at PP was 50,000-60,000 LKR, and they consumed less than 1kg of fish daily. Sixty-four percent of fishers vend sea cucumbers, which were caught as bycatch with an average price of 12-50 LKR. Nearly 84% of fishers are aware of the sea cucumber culture methods. Economic analysis for the bycatch of sea cucumber for the month of February indicated the generated income of 195,760 LKR as the total value. The major constraints for starting a sea cucumber farm in PP were high wave action and the coral reefs on the sea bed, which prevented initiating a sea cucumber farm in PP. However, it is better to establish a sea cucumber processing plant to develop a sea cucumber industry in the Point Pedro area.

Keywords: Allaipiddy, By-catch, Point Pedro, Processing plant, Sea cucumber

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Education, Humanities and Social Sciences

A Study of "Kavadi" Dance Performance in Devinuwara Perahera Ceremony

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Abstract

Perahera is a grand spectacle that captivates the hearts and minds of locals and visitors alike. However, the enchanting village of Devinuwara stands out prominently on the cultural map, owing to its association with the esteemed Vishnu Maha Devalaya. This grand celebration serves as a platform for the mesmerizing Devinuwara Kavadi dance, a form of artistic worship that embodies profound religious devotion towards the revered deity, Vishnu. The research problem was, what is the uniqueness of the "Kavadi" Dance performance in the Devinuwara perahera ceremony? The main objective of the research was to investigate the uniqueness of the "Kavadi" Dance performance in the Devinuwara perahera ceremony. An extensive literature survey was undertaken to gather valuable insights, supplemented by an immersive field study. In the field study, in-depth interviews with 50 individuals were conducted to obtain the required data, and a semi-structured interview method was used. The sample was chosen using the purposive sampling method. What sets the Devinuwara Kavadi dance apart from its counterpart, the Katharagama Traditional Kavadi Dance, is the distinctiveness that lies in the structure and materials of the Kavadi Koodu, the costumes worn by the performers, the intricate artistry involved, the presence of tattoos, and the customs that are deeply ingrained in the performance. This Kavadi dance can be seen in other areas, such as Trincomalee, Beliatta, Sinigama, Tangalle, etc. Even though those areas Kavadi dancers absorb the features of the Devinuwara Kavadi, the Devinuwara Kavadi can preserve their unique identity. It is important to acknowledge that present-day factors have resulted in certain alterations in the physical presentation of adolescent individuals who engage in the Devinuwara Kavadi Dance. These modifications include the adoption of various hair colours and the practice of piercing the eyes, nose, and ears. Despite those modern dynamics, the Kavadi performance in Devinuwara Perahera emphasizes the devotion to the lord Vishnu.

Keywords: Dance, Devinuwara, Kavadi, Perahera, Vishnu.

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පී. එස්. ගොඩකන්ද සහ එච්. පී. විමලසිරි*

සිංහල අධ්‍යනාංශය, රුහුණ විශ්වවිද්‍යාලය, මාතර.

සාරසංක්ෂේපය

පෙරහැර සිංහල සංස්කෘතිකාංග අතර ප්‍රමුඛත්වයේ-හිලා සැලකෙයි. ඒ අතරින් මහනුවර දළදා පෙරහැර ප්‍රධාන වෙයි. ඒ හා සම්බන්ධ සකලවිධ අංගයන් අතර හස්තීයාගේ භූමිකාව සුවිශේෂ වූවකි. කරඬුව වැඩම කරවන මංගල හස්තිරාජයාගේ සිට පෙරහැරට සම්බන්ධ වන සෙසු සෑම හස්තියෙකුගේ ම දර්ශනීයත්වය හා විචිත්‍රත්වය රඳා පවතින්නේ ඔවුන්ගේ ඇඳුම් පැළඳුම් මත ය. විවිධ වර්ණයෙන් හැඩයෙන් හා අලංකාර මෝස්තරවලින් සමලංකෘතව නිමවන එම ඇඳුම් විලාසිතා හස්තියාට උරුම මහේශාඛ්‍යබව, ගර්වය හා හක්තිය තීව්‍ර කරන අතර ප්‍රේක්ෂක ආකර්ෂණය දිනා ගැනීමෙහි ද මුඛ්‍ය සාධකය බවට පත්වෙයි. එම හස්ති වස්ත්‍ර නිර්මාණකරණය විවිධ සම්ප්‍රදායයන් අනුව විවිධ ලක්ෂණ පෙන්වයි. එබැවින් දළදා පෙරහැරෙහි අලි ඇතුන් වෙනුවෙන් නිමවන හස්ති වස්ත්‍රාභරණ කට්ටලයේ විශේෂතා, ඒ සමහ බැඳුනු වත්පිළිවෙත් සහ භූෂණ පරම්පරා පිළිබඳ ව ගවේෂණය කිරීම මෙම පර්යේෂණයේ අරමුණ යි. පෙරහැර සංස්කෘතිය තුළ දළදා පෙරහැර සහ දළදා මාළිගාව හා බැඳුනු හස්ති වස්ත්‍රාභරණකරණය විශේෂ වන්නේ කෙසේ ද යන්න සොයා බැලීම මෙහි පර්යේෂණ ගැටලුව යි. ඒ සඳහා ප්‍රධාන මූලාශ්‍ර ලෙස ප්‍රාමාණික උගතුන්ගේ අදහස්, ශාස්ත්‍රීය ලේඛන සහ පර්යේෂණ නිබන්ධ ඇසුරු කෙරිණි. ඊට

අමතරව මහනුවර දළදා මාළිගාවේ ලේකම් තුමා, ගජනායක නිලමේ, මංගල හස්තියාගේ භූෂණ කාර්යය සිදු කරන ජයතිස්ස ඇහැලමල්ලේ මහතා, පශු වෛද්‍ය විද්‍යාව පිළිබඳ මහාචාර්ය අශෝක දංගොල්ල මහතා සහ දළදා මාළිගාවට අනුබද්ධිත හස්ති වස්ත්‍ර නිර්මාණ ශිල්පීන් හමු වී සම්මුඛ සාකච්ඡා හා ප්‍රශ්නාවලි මඟින් තොරතුරු එක් රැස් කෙරිණි. අලි ඇතුන් වෙනුවෙන් නිර්මාණය වන හස්ති වස්ත්‍රාභරණ කට්ටලය විධිමත් ආකාරයකට සකස් වූයේ දළදා මාළිගාව සහ දළදා පෙරහැර මුලික කරගෙන ය. පසුකාලීනව විවිධ සම්ප්‍රදායන් යටතේ විකාසනය වුව ද තවමත් හස්ති වස්ත්‍රාභරණ-කරණයෙහි නියුත ශිල්පීන් ගුරු කොට ගන්නේ දළදා මාළිගයෙහි හස්ති වස්ත්‍රාභරණකරණය යි. එබැවින් තිරිසන්ගත සත්ත්වයෙකු වස්ත්‍රාභරණ-යෙන් සැරසීම සිංහල සංස්කෘතිය හා බැඳුනු විශේෂ කරුණක් වන්නා සේ ම හස්තියාගේ වස්ත්‍රාභරණ නිර්මාණය හා භූෂණය ගෞරවය හා හක්තිය පදනම් කරගත් සංස්කෘතික අංගයක් ලෙස විකාසනය වීමේ දී මහනුවර දළදා මාළිගාව හා මහනුවර දළදා පෙරහැර හා බැඳුනු හස්ති වස්ත්‍රාභරණකරණය විශේෂ වන බව මෙමගින් නිරීක්ෂණය වෙයි.

ප්‍රමුබ පද : අනන්‍යතා ලක්ෂණ, දළදා පෙරහැර, පෙරහැර සංස්කෘතිය, හස්ති වස්ත්‍රාභරණ, සංස්කෘතික අගය

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Returned Female Migrant Workers: Challenges Towards Reintegration

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Abstract

In Sri Lanka, labour migration is the second largest source of foreign remittance. Among the migrant labour participants, females mostly represent the low-skilled employer category, namely domestic workers and caregivers. Gulf countries are the main destination for these domestic workers. Previous studies have shown the socio-economic issues that those females are facing. In the National Labour Migration Policy implemented in 2008 highlighted in its policy to empower and reintegrate the returnee migrants. This study questions whether the policy objective has reached its goals and what are the limitations to reach the policy objectives. To reach this question, the study aims to analyse how far the female returnees are economically secure in their future. Primary data were collected through 20 returnee female migrants selected purposively, and in-depth interviews were conducted with those females. This study also used the Ministry of External Affairs and related corporate records as secondary data sources. This qualitative study revealed that, unlike male returnees, the majority of females are not engaged in any other work after returning home, though they are still able to work. Female migrants were mostly from the low-skilled job category, and their experience may not help them to establish any small-scale business. Neither has the government taken any special programmes under the reintegration policy to help these returnees, too. The future of these women is insecure due to not having a good amount of savings. Dependency of their family members is more prevalent among female returnee migrants. The findings of the study concluded that a lack of savings or zero capital becomes a major barrier for them to establish their own small-scale business. These unsuccessful cases captured the problems of reintegration, and the aim of the National Migration Policy on the reintegration of returnee migrants has not succeeded.

Keywords: Female, Labour migration, National Migration Policy, Reintegration, Returnee migrants

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Effectiveness of Formative Assessments for Undergraduates in Geography through Student-Centred Community-Based Studies

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Abstract

This study investigates the effectiveness of teaching geography through student-centred socio-emotional programs, focusing on practical engagement in geospatial issues. The research, conducted with 105 second-year Bachelor of Geography students at the University of Ruhuna, assigned them the task of exploring the economic and political crisis in Sri Lanka (2023) and its impact on the school education system in their respective Grama Niladhari (GN) Divisions. The students were required to identify, implement, and report on a creative social activity addressing the identified issues, and a total of 40 marks were allocated for the two assignments. Qualitative research methodology and inductive research approach were applied to the study, and reports provided by the students were analyzed using the Explanatory analysis method. Further, 15 students were randomly selected to gather data through open interviews. The findings reveal a higher level of dedication and enthusiasm among students for these assignments than traditional assessments. Many students showcased innovative and creative solutions to problems in school education within their areas, demonstrating increased engagement in active tasks over conventional classroom or written assignments. Notably, the distribution of scores for this assignment exhibited a distinct pattern, with academically weaker students achieving significantly higher scores than their performance in the other three assessments. Conversely, some high-performing students experienced a reduction in marks for this specific task. The study concludes that creating opportunities for students to learn subjects through structured social welfare activities is an effective student-centred approach to teaching Geography. That process can be theoretically linked with the Constructivism Learning Theory.

Keywords: Student-centred education, socio-emotional skills, Geography

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අලි-මිනිස් ගැටුම කෙරෙහි බලපාන ග්‍රාමීය සමාජ, ආර්ථික හා දේශපාලන බල ව්‍යූහීය සාධක

කීර්ති ජයවර්ධන*, සරත් අමරසිංහ සහ එන්.වී.ජී.ඒ. හේමන්ත කුමාර

සමාජවිද්‍යා අධ්‍යයනාංශය, රුහුණ විශ්වවිද්‍යාලය, මාතර.

සාරසංක්ෂේපය

අලි-මිනිස් ගැටුම ශ්‍රී ලාංකේය සමාජය තුළ දීර්ඝ කාලයක් තිස්සේ පැනනැගී ඇති දික්ගැස්සුණු සමාජ ගැටුමක් වේ. ගැටුම වැලැක්වීම සඳහා විවිධ ක්‍රියාමාර්ගයන් ගනු ලැබුවත් සමකාලීන සමාජය තුළ මෙම ගැටුම තවදුරටත් වර්ධනය වීමක් දැකිය හැකිය. ගැටුම තුළ සහජාතිය හා විෂමජාතිය ලක්ෂණ අන්තර්ගත වීමත් එම ලක්ෂණ ගැටුම තිරස් ගැටුමක් බවට සමාජගත වීමට අවශ්‍ය සාධනිය පසුබිම ගොඩනංවා ඇති බව සනාථ කළ හැකිවේ. අලි-මිනිස් ගැටුම වැලැක්වීම සඳහා විවිධ ක්‍රියාමාර්ග අනුගමනය කරනු ලැබුවත් එම ගැටුම සමාජය තුළ තවදුරටත් වර්ධනය වී පවතින්නේ ඇයි? යන්න අධ්‍යයන ගැටලුව වේ. අලි-මිනිස් ගැටුම කෙරෙහි ග්‍රාමීය සමාජ, දේශපාලන හා ආර්ථික සාධකයන්හි බලපෑම හඳුනා ගැනීම අධ්‍යයනයේ අරමුණ විය. අධ්‍යයනය සඳහා සමීක්ෂණ ක්‍රමවේදය යටතේ මිශ්‍ර ක්‍රමය උපයෝගී කර ගන්නා ලදී. ප්‍රමාණාත්මක දත්ත ඒකරාශී කරගැනීම සඳහා ප්‍රශ්නාවලිය ක්‍රමය භාවිත කළ අතර ගුණාත්මක දත්ත ඒකරාශී කරගැනීම සඳහා කේන්ද්‍රගත සාකච්ඡා හා නියමු සාකච්ඡා භාවිත කරන ලදී. සසම්භාවී නියැදිය යටතේ ස්තෘත නියැදිය අධ්‍යයනය සඳහා භාවිත කළ අතර නියැදියට අදාළව ප්‍රතිචාරකයන් 50ක් තෝරා ගන්නා ලදී. මොනරාගල දිස්ත්‍රික්කයේ තණමල්විල ප්‍රාදේශීය ලේකම් කොට්ඨාසයට අයත් හම්බේගමුව හා හම්බේගමුව ජනපදය ග්‍රාම නිලධාරී කොට්ඨාස දෙක අධ්‍යයන ක්ෂේත්‍රය ලෙස උපයෝගී කරගන්නා ලදී. ජාතික දේශපාලන බල ව්‍යූහය ග්‍රාමීය සමාජයේ දේශපාලන ක්‍රමයට බලපෑම් කිරීමත් දේශපාලන හිතෛෂීත්වය මත ඉඩම් විකිණීම, හොටෙල් ව්‍යාපාර ආරම්භ වීම හා කොම්පෝස්ට් ව්‍යාපෘති රක්ෂිතය තුළ ආරම්භ කිරීම නිසා සත්ව ප්‍රජාවගේ නිජබිම් අහිමිවීම ගැටුමට සඳහා ප්‍රධාන සාධකයන් වී ඇති බව අනාවරණය විය. මේනිසා ජීවනෝපාය මාර්ග අහිමිවීම, කෘෂිකර්මාන්තයෙන් ඉවත් වී ඉදිකිරීම් කර්මාන්ත සඳහා ප්‍රජාව ප්‍රවේශ වීම ගැටුමේ අනාවරිත සාධක වෙති. එමෙන්ම ආරක්ෂණ යාන්ත්‍රණය බිඳ වැටීම, ගෘහස්ථ හිංසනය, අඩු වයස් විවාහයන් ඇතිවීම, පරපෝෂිය ප්‍රජා කණ්ඩායම් ග්‍රාමීය සමාජය තුළ නිර්මාණය වීම ගැටුම තුළින් අනාවරණය වූ සෙසු කාරණා විය. ගැටුමත් සමග නව සංස්කෘතික පරිසරයක් ග්‍රාමීය සමාජය ස්ථාපිත වී ඇති අතර එම නව සංස්කෘතික පරිසරය තුළ ප්‍රජාව අනුවර්තනය වීමක් සිදුවී ඇත. මේනිසා ගැටුම වැලැක්වීමට වඩා සමථන කාර්යක් තුළින් විසඳුම් කිරීයාවලියකට යොමු වීමට අවශ්‍ය ක්‍රියාමාර්ග සකස් කළ යුතු වේ.

මූල්‍ය පද: අලි-මිනිස් ගැටුම, දික්ගැස්සුණු සමාජ ගැටුම, දේශපාලනික බල ව්‍යූහය, පරපෝෂිය ප්‍රජා කණ්ඩායම්, මෙගා සංවර්ධන ව්‍යාපෘති

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A Comparative Study of the Buddhist Attitude Towards Humanistic Approach

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Abstract

Humanism is a constructive philosophy that goes far beyond the negating of errors in thought to the whole-hearted affirmation of the joys, beauties, and values of human living. We can discern five humanistic approaches as the essence of the humanist approach: understanding reality, understanding ourselves, the good life and the whole person, morality, and practical action. Buddhism is also an anthropocentric constructive philosophy that discusses the above approaches to a greater extent. Hence, those approaches would be compared to find out the humanistic approach of Buddhism. The problem of this research is whether Humanism is a new philosophy or a new edition of Buddhism. The objective of this research is to emphasize the humanistic approach of Buddhism. Therefore, Early Buddhist teachings in *Sutta Piṭaka* were compared with five humanistic approaches. This is qualitative research based on literature. Therefore, information has been collected from the primary sources in *Sutta Piṭaka* and the relevant secondary sources and articles related to the field. Findings were philosophically analysed to compare Buddhism and Humanism. Although Buddhism and Humanism appear to be philosophical genres from two different time zones with entirely different orientations, it is surprisingly evident that there is much of a common ground that can be observed between the two disciplines. However, five humanistic approaches show us the level that can be compared with Buddhism and Humanism. Therefore, a conclusion can be given based on the findings discussed in this paper. Buddhism is a great teaching that can be experienced with a humanistic approach than Humanism.

Keywords: Buddhism, Compare, Humanism, Humanistic Approaches, *Sutta Piṭaka*

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Political Literacy of Undergraduates with Special Reference to Faculty of Humanities and Social Sciences in the University of Ruhuna

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Abstract

Political literacy is the major factor that guides the citizens of any state to use the power of the vote properly. The literature has emphasized the severe drawbacks of liberal democracy due to the inactive citizens who are active only during the period of elections and do not have a knowledge or understanding regarding political phenomena related to the decision to vote or a proper attitude other than the factors related to the leaders. Identifying the factors affecting the political literacy of undergraduates at five levels: political expertise, knowledge, awareness, interest, and participation, was the core objective of the study. The sub-objective was to identify the difference among the levels of each factor. The sample size of the study was 299 undergraduates in the Faculty of Humanities and Social Sciences, University of Ruhuna, Sri Lanka, selected using a simple random sampling method. Descriptive and inferential analytical tools were utilized to analyze the primary data. Multivariate Analysis of Variance (MANOVA) was used in the inferential techniques. The Wilk's Lambda and Hotelling's Trace test statistics and Bonferroni post-hoc analysis were conducted to detect the exact levels of interdependent variables, which vary with five aspects of political literacy. The effect of the academic year, frequency of political discussions in the family, colleagues' interest in politics, participation of societies and social works in the university, medium of studying, and nature of the living area were recognized as the significant factors that affect political literacy according to the results. The objectives of the study have been satisfied by identifying that all the variables showed significant mean differences in political expertise, knowledge, awareness, interest, and participation over different levels of the considered variables. There is a variation in the political literacy of the undergraduates according to their social factors. Considering the social factors of relevant authorities, there should be a proper mechanism to enhance political literacy among the young generation.

Keywords: Bonferroni Post Hoc Analysis, Hotelling's Trace test statistic, multivariate analysis of variance, Political literacy, Wilk's Lambda

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Factors Influencing LIS Academic Migration Decisions to Workplace Mobility and Overseas Departure

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Abstract

Recently, there has been an increase in university academics leaving their home countries and workplaces in quest of better overseas opportunities. Studying the factors influencing scholars' decisions to migrate is important because these decisions can directly affect parts of the knowledge-based economy, future research, and innovation. This study engages in an in-depth study of the factors observed by the literature review and whether they affect the migration intentions of Library and Information Science (LIS) academics. Regression analysis and basic statistical metrics have been utilized to present the survey results based on a randomly selected sample of 100 LIS academics at the universities in 2023. According to the LIS academics' perspectives, their job satisfaction has decreased over time, with the mean of the respondents' job satisfaction with their work experience ranking as less than 5 years (4.63), 6 to 10 (4.07), 11 to 15 (3.57), 16 to 20 (2.11), and more than 20 years (1.22). As a result, they are resigning from their jobs and leaving the country in greater numbers. According to the study, three major factors influence the decision to migrate: career opportunities, income and cost of living, and higher studies. Opportunities for professional respect and motivation should be established to reduce university LIS academics' dissatisfaction with their employment. Also, it is better to introduce benefit packages such as research grants and funding based on the level of education, special skills, research, and professional experience. While local universities offer a high standard of education, it is important to ensure that they are affiliated with world-ranked international universities. As recommendations, the government should invest a greater percentage of GDP in education and research while addressing the socio-political challenges that have led to more professional migration.

Keywords: Academic Migration, Academic Mobility, Library and Information Science Academics, Job satisfaction, Brain Drain

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Human Health, Pharmaceuticals and Medicine

Validation of the Sinhala version of the Comprehensive Needs Assessment Tool for Informal Cancer Caregivers (S-CNAT-ICs) in Sri Lanka

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Abstract

Cancer is a major condition that affects many people, directly and indirectly. This study examined the psychometric properties of the Sinhala version of the Comprehensive Needs Assessment Tool (S-CNAT). A 41-item CNAT was administered to 226 ICs providing palliative care for patients with advanced cancer at the Apeksha Hospital in Sri Lanka. It has seven unmet needs domains. A cross-cultural adaptation of the CNAT was done using WHO guidelines. ICs completed the S-CNAT, the Centre for Epidemiological Studies-Depression (CES-D), the World Health Organization-Quality of Life-Brief (WHOQOL-BREF), and demographic details. Reliability was assessed using test-retest and internal consistency. The convergent and divergent validity of the S-CNAT was tested using the CES-D scale and WHOQOL-BREF. The construct validity was assessed by performing exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

The mean (±SD) age of the ICs was 41.78(±14.54) years. Most ICs were female (60%) and married (72%). The test-retest reliability was 0.965, and the Cronbach's alpha was 0.903. Both EFA and CFA revealed a structure comprised of seven factors (35 items); re-named as healthcare staff/nurses' support and information, physical/practical needs, medical officers' support, psychological needs, social and family support, spiritual/religious support, and hospital facilities/service. The S-CNAT was found to have a negative correlation with the WHOQOL-BREF, while it was positively correlated with the CES-D. The S-CNAT is a valid and reliable tool for assessing informal cancer caregivers' unmet needs (S-CNAT-ICs). The findings of this study will help health authorities understand and assess the unmet needs of ICs. The healthcare support needs were the most prominent unmet needs among ICs.

Keywords: Cancer, CNAT, Informal caregivers, Reliability, Sri Lanka, Validity

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Standardization, Release Kinetics, Acute Toxicity Assessment of Nanoencapsulated Aqueous Extract of *Coccinia grandis* L. (Ivy Gourd)

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Abstract

Coccinia grandis L. (Ivy Gourd) has been widely used in traditional medicine preparations as a glucose-lowering agent. Polyphenols were found to be mainly responsible for the antidiabetic activity of *C. grandis*. Nano-encapsulation of aqueous extract of *C. grandis* (ACG) is a timely approach to enhanced controlled release of polyphenol and to preserve the stability of phytoconstituents in developing novel pharmaceutical agents. Our research group confirmed the successful loading of ACG into the alginate matrix through standard characterization techniques previously. The present study aimed to standardize ACG, assess release kinetics, and determine the acute toxicity/adverse effects of ACG-loaded alginate nanoparticles. Standardization of ACG was conducted based on the standard protocols. The *in vitro* release of bioactives from nano-encapsulated ACG was determined at both pH 1.2 and pH 6.8 and data were fixed into zero-order, first-order, Hixon-Crowell and Higuchi models. The accelerated stability of nano-encapsulated ACG was evaluated based on total polyphenol content and thin layer chromatography fingerprints over a month at 27 °C and 5 °C. Acute toxicity assessment was carried out with the oral administration of nano-encapsulated ACG at a range of selected doses (110–2000 mg/kg) in healthy Wistar rats, complying with Organisation for Economic Co-operation and Development (OECD) guidelines. Proximate analysis showed moisture content, total ash, acid-insoluble ash, and water-soluble ash values of $0.49\pm0.00\%$, $3.96\pm0.44\%$, $0.70\pm0.01\%$, and $1.13\pm0.02\%$, respectively. Phenolics, flavonoids, tannins, alkaloids, saponins, steroids, and terpenoids were present in ACG as phytoconstituents. The ACG did not detect heavy metals, including lead, arsenic, cadmium, and mercury. The release of polyphenols was obtained in a controlled manner, and the release pattern was best fitted to zero-order and first-order kinetic models at pH 6.8. In contrast, the release of polyphenols was restricted at pH 1.2 due to forming a compact acid-gel structure of ACG-loaded nanoparticles. The accelerated stability assessment revealed that phytoconstituents were well-preserved upon encapsulation. The acute toxicity assessment revealed that the selected doses were safe for further studies. In conclusion, nanoencapsulated ACG was found to be a safe, stable drug lead with a controlled release profile that can be used to develop commercially viable pharmaceutical agents.

Keywords: Alginate nanoparticles, *Coccinia grandis* L., Standardization

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Nano-Hydroxyapatite-Enhanced PLA Microspheres - Osteogenic Potential for Bone Repair Applications

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Abstract

Treating bone defects encompasses autologous/allogeneic bone grafting and the utilization of synthetic bone substitutes. Donor site morbidity and infection transmission can hinder the healing capacity of bones. The surge in demand for tissue-engineered bone grafts arises due to their ability to provide consistent composition, varied sources, and architecture. This study focused on the adaptability of Poly Lactic acid (PLA)/Nano- hydroxyapatite (nHAp) composite microspheres as a tissue engineering scaffold. nHAp (10%. 20%, and 30 %) were effectively embedded into PLA microspheres by emulsion solvent evaporation method, and there was no significant difference in mean diameters (29.86 ± 6.47 μm, 28.12 ± 5.48 μm and 29.81 ± 5.33 μm) concerning nHAp levels. Invitro cellular evaluation was conducted for rat mesenchymal stem cells(rMSCs) and was observed that both PLA microspheres and composite microspheres exhibited the ability to support cell adhesion. However, composite microspheres displayed superior adhesion and proliferation of rMSCs compared to PLA microspheres. The findings revealed that incorporating nHAp had a prominent impact on promoting the osteogenic differentiation of rMSCs. During the 7th and 14th day periods of cell culture, the PLA/nHAp sample exhibited a significantly increased positive staining for alkaline phosphatase (ALP) activity compared to the pure PLA sample. This enhancement suggests that nHAp facilitates the osteogenic differentiation process of rMSCs in the composite microspheres. The mineralized nodules exhibited positive staining for alizarin red on day 14, indicating the presence of calcium deposits and affirming the osteogenic differentiation of the cells which substantiates the osteoinductivity effect of nHAp on the cellular phenotype. Scanning electron microscopy (SEM) provided detailed insights into cell adhesion and the formation of mineralized nodules. The study highlights enhanced bone regeneration capability in the composite material, emphasizing its potential in addressing osteology challenges.

Keywords: Bone repair, nHAp, Osteogenic differentiation, PLA

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Prevalence of Albuminuria and Its Association with Demographic Factors in Type 2 Diabetes Mellitus Patients Attending Teaching Hospital Karapitiya

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Abstract

Diabetes mellitus (DM) poses a significant health risk, contributing to a range of macro and microvascular diseases that increase morbidity and mortality. Among these, diabetic nephropathy (DN) is a common microvascular disease leading to renal replacement therapy in approximately one-third of chronic kidney disease patients. Albuminuria is an early marker of kidney damage and indicates DN. Therefore, this study will highlight the importance of early screening and intervention strategies. The objective was to determine the prevalence and associated demographic factors of albuminuria among type 2 DM patients visiting Teaching Hospital Karapitiya. A descriptive cross-sectional study was conducted among 448 type 2 DM patients attending the Diabetic and Endocrine clinic at Teaching Hospital Karapitiya, and they were selected applying inclusion (type 2 DM with albumin-creatinine (ACR) ratio) and exclusion criteria (with renal failure, heart failure, and acute febrile illness). Patients with ACR below 30mg/g were categorized as normoalbuminuria, between 30-300mg/g as microalbuminuria and above 300mg/g as macroalbuminuria. Data was collected using a pre-tested interviewer-administered questionnaire and laboratory management information system (LIMS) of the Chemical Pathology Laboratory. Statistical analysis was performed using SPSS (version 25), and descriptive statistics was applied to calculate the prevalence. Pearson's correlation and chi-square were applied to assess the association. The majority of participants were female (86.1%), aged >54 years (65.8%), and the duration of DM was 5-10 years (44.7%). The study revealed an overall albuminuria prevalence of 33.3%, with microalbuminuria and macroalbuminuria prevalence of 31.7% and 1.6%, respectively. However, no significant association was found between albuminuria and age, gender, or duration of diabetes. The study found a significant prevalence of albuminuria, which can lead to complications such as DN. Early screening strategies would be helpful to prevent and or delay the disease's progression to end-stage renal disease and to reduce the associated morbidity and mortality.

Keywords: Albuminuria, associated demographic factors, prevalence, type 2 diabetes mellitus

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Effectiveness and Residual Effect *of Bacillus thuringiensis israelensis* for the Control of *Aedes* Species (Diptera: Culicidae) under Laboratory Condition

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Abstract

Bacillus thuringiensis subspecies *israelensis* (Bti) is regarded as the most promising microbial control agent against dengue vectors. Commercially, Bti is available in several formulations, and in Sri Lanka, it is designated as a larvicide for generalized and domestic use. So, this laboratory experiment was designed to evaluate the effectiveness and residual effect of solid formulation of Bti for the control of *Aedes* species. The study was conducted from July to December 2023. For this study, commercially available Bti H-14 mosquito dunks were used. *Aedes* eggs were collected by placing ovitraps in Panadura and Bulathsinhala areas in Kalutara district. Those eggs were reared, and 3rd and 4th instar larvae were used for the experiment. Three replicates were prepared for both treatment and control. A hundred larvae were transferred to each treated and untreated tray, and 24-hour mortality was recorded. An experiment was carried out for up to 22 weeks to detect the residual effect. Every week, 100 3rd or 4th instar larvae were added to each tray without adding Bti dunk. One-way ANOVA test was used to determine the significant difference in larval mortality between treatment and control. According to that, there was a significant difference ($p < 0.05$) between the mortality of treatment and control up to the 14th week. Within the first week of post-treatment, larval mortality was $94 \pm 2\%$. After that, 100% larval mortality was observed from the 2nd to 5th week of post-treatment. During this period, both *Ae. aegypti* and *Ae. albopictus* larvae collected from Panadura area and *Ae. albopictus* larvae collected from Bulathsinhala area showed 100% mortality. So, this study indicates that commercially available solid formulation of Bti can be used as an effective bio-larvicide to control *Aedes* mosquito vectors in Kalutara district. Nevertheless, further studies should be done at different concentrations lower than the recommended dose and under different field conditions to get more information on the effectiveness and residual effect of Bti.

Keywords: Aedes species, *Bacillus thuringiensis israelensis*, Effectiveness, Laboratory condition, Residual effect

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Differentiation of Glioma Tumour Types Using Texture Feature Analysis in MRI

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Abstract

Glioma is the most common and aggressive kind of primary brain tumour, representing 16% of all neoplasms in the brain and central nervous system (CNS). Gliomas are categorized into four grades (I, II, III, and IV) by the World Health Organization (WHO) based on the tumors' aggressiveness. Gliomas in grades I and II are categorized as low-grade, and grades III and IV are high-grade. Glioblastoma (grade IV) is the most aggressive and dangerous of all the others. The method of magnetic resonance imaging (MRI) is commonly utilized for tumour diagnosis and categorization. Classifying MR images manually is time-consuming and difficult. Automatic or semiautomatic classification methods are necessary to differentiate between different types of tumors because human observations may lead to errors in classification. In this study, low-grade gliomas (LGG) and glioblastomas (GBM) were differentiated using MRI, and their textural properties were examined using the Gray Level Co-occurrence Matrix (GLCM). Axial images were selected using the MicroDicom viewer T2-FLAIR (fluid-attenuated inversion recovery). The active, oedema, and full tumour (with oedema) regions of ROI (Region of Interest) were drawn for selected image slices using MATLAB. The texture features that are based on normalized GLCM are contrast, correlation, energy, and homogeneity. Each ROI's feature values were obtained independently. The t-test was used to compare the LGG feature values with the GBM feature values for the differentiation of tumour types. Feature values for the oedema and the entire tumour region were statistically insignificant due to p-values being higher than 0.05, but for the active region, the p-values corresponding to contrast, correlation, and homogeneity were 0.0092, 0.0217, and 0.0092, respectively. Hence, these feature values were statistically significant. According to this study, it was possible to distinguish GBM (Glioblastoma) from LGG (Low-Grade Gliomas) using contrast, correlation, and homogeneity in the active region.

Keywords: GLCM features, Gliomas, MRI, Region of Interest, Tumor

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Economics, Finance and Management

Relationship between the factors affecting on Green Purchasing Behaviour and Green Purchasing Intention: A study of Online Shoppers at Keells Supermarkets in Sri Lanka

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Abstract

Currently, global awareness of environmental issues has heightened, prompting widespread concern for embracing green practices. The effects of eco-friendly choices are increasingly evident, motivating the focus of this study on green product purchase intentions within the context of Sri Lanka. The primary aim is to investigate the factors influencing the green product purchase intention of online shoppers. In this study, Green Product Purchase Intention is the dependent variable, with Supporting Environmental Protection, Drive for Environmental Responsibility, Green Product Experience, Environmental Friendliness of Companies, and Social Appeal identified as the independent variables. The study targets online shoppers at Keells Supermarket across the country, and a convenient sample of 150 customers from Keells Supermarkets in Galle and Matara were surveyed using a questionnaire using a Google® form. The collected data underwent both descriptive analysis and inferential statistics. The study's findings reveal a significant and positive correlation between the five variables: Supporting Environmental Protection, Drive for Environmental Responsibility, Green Product Experience, Environmental Friendliness of Companies, and Social Appeal with the Green product purchase intention. All stated objectives were successfully met, highlighting the need to encourage groups with lower emphasis on green purchasing intentions. Based on the study's results, the researcher recommends that marketing professionals devise targeted strategies to popularize green purchase intentions and attract more environmentally conscious customers. Additionally, future research on this concept should encompass a broader geographical scope, employ a trilingual questionnaire, and include supermarkets other than Keells. These enhancements will contribute to a more comprehensive understanding of green consumer behaviour in Sri Lanka.

Keywords: Drive for Environmental Responsibility, Environmental Friendliness, Environmental Protection, Green Product Experience, Green Purchase Intention, Social Appeal

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Digital Banking Practices on Customer Satisfaction: A Study of Digital Banking Practices in Bank of Ceylon in Southern Province in Sri Lanka

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Abstract

This paper aims to investigate the impact of digital banking practices on customer satisfaction in the Bank of Ceylon (BOC) in Southern Province, Sri Lanka., due to the lack of empirical consensus in the causal ordering of either antecedent or mediating variables. Additionally, the literature provides mixed results for the effects of some antecedent and mediating variables on customer satisfaction. Such empirical disagreement points to a need for further research in some areas. The data were collected through a convenient sampling technique by distributing 150 structured questionnaires among BOC customers in Southern Province, Sri Lanka. Both multiple regression and factor analysis were performed to explore the impact of four independent variables on customer satisfaction and to explore the significance of digital banking dimensions. Data collected from the questionnaire was analysed quantitatively using hypotheses testing methods with Smart PLS software. Meanwhile, demographic data was analysed using SPSS 23.0 software. The results of the regression analysis indicated that all digital banking variables have a positive impact on customer satisfaction. Meanwhile, trust fully mediates the mediating variable of banking customers in Sri Lanka. Moreover, it suggested that the speed of transaction variable was the most significant digital variable, while the adaptability and the exterior atmospheric variable were the less significant variables towards patronage intentions. This study did not address the legal and security aspects of digital banking that will significantly impact customer satisfaction and the Trust of the customer. The study unveiled that the management of the Bank determines the most appropriate digital Banking strategy, thereby encouraging customers to access BOC as the most trustworthy bank, as well as adopt and afford to use digital banking as a more convenient and innovative channel for digital transactions.

Keywords: Customer Satisfaction, Bank of Ceylon, Digital Banking, Regression analysis, and Trust

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Influencing Factors of Internet Banking Adoption: Reference to Customers from Rathnapura District

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Abstract

This paper investigates the impact of individuals' perceived factors in using Internet banking services due to the lack of consistent adoption of Internet banking. The data were collected through Google® mail intercept by randomly administering a structured question-nnaire to 111 respondents who used banking services in Ratnapura District, Sri Lanka. The research format has been built up depending on the technology acceptance modal (TAM), including six independent variables such as Perceived usefulness (PU), Perceived Ease of Use, Subject Norms (SN), Perceived Security (PS), Perceived Behavioural Control (PBC) and establishing of quality internet connection while the dependent variable is using of the internet banking services, while multiple regression and factor analysis was performed to explore the impact of six influencing factors on internet banking adoption. The regression analysis results indicated that perceived ease of use and perceived security were the most significant influencing factors, while the R^2 value on the dependent variable was 59%. The subjective norms variable was reported to have a negative impact on Internet banking adoption. The study illustrated that perceived usefulness does not have a significant impact on customer adoption of Internet banking. It is a challenging reveal to the TAM model. Therefore, extending the studies to examine the conceptualization of perceived usefulness and Internet banking adoption is important. The fact that subject norms (SN) did not support positive impact implies that policymakers may need to reconsider the emphasis on social impact in policies to promote Internet banking. Even though most of the researchers have conducted their research based on Internet banking adoption, the lack of support for the positive effect of perceived behavioural control (PBC) indicates the need for further exploration. It is imperative that future researchers investigate additional factors that contribute to perceived behavioural control in the context of Internet banking.

Keywords: Perceived Ease of Use, Subject Norms, Perceived Security, TAM, regression analysis.

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Consumer Awareness and Attitudes Towards Fishery By-Products

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Abstract

Consumers are one of the major stakeholders in the market economy. The mindset, perception, and desire of consumers toward a product will substantially affect the sales volume of the item. The present study aims to investigate the consumers' awareness of fishery by-products, identifying and examining possible linkages between consumer characteristics and consumer awareness. The phrases "value-added products" and "co-products" could be used in place of the phrase "by-products". The survey was carried out in Matugama area in Kaluthara district, Sri Lanka for one month. An extensive survey was carried out among 150 fish consumers. The convenient method was used to collect the data. The sample consisted of 54% female and 46% male consumers. Most consumers (70%) stated that fish is an important part of their diet. The overall findings explained that the consumers are aware of a fishery by-product as the mean value (3.17) is above the midpoint of three.

Also, the results revealed that consumers have positive attitudes towards fishery by-products, as the mean is 3.21. According to the Beta coefficient value of 0.289 in multiple regression, consumer awareness positively impacts consumer attitude. According to the chi-square results, education level has a significant association with consumer awareness of fishery by-products (p<0.05), and there is no significant association between gender and income level with consumer awareness (p=0.778 and p=0.424, respectively). To develop consumer awareness and attitudes, public awareness projects must be carried out, and the government should set up a system to certify the quality and safety of value-added products. This approach accommodates scientists, governors, and policy-makers to identify consumer behaviour on future implications.

Keywords: Consumer attitudes, consumer awareness, consumer experiences, fishery by-products

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The Status of E-Government Adoption: A Bibliometric Analysis

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Abstract

A notable shift away from conventional governance to the concept of electronic government (e-government) has reaped significant interest and popularity. However, the issue of inadequate levels of user adoption of e-government services is widely acknowledged, and governmental expenditures in implementing e-government services remain unworthy and fail to yield satisfying returns on investment. Thus, the objectives of the study are (1) to reflect the contemporary state of the e-government adoption research field and (2) to identify the knowledge gaps that require more attention to promote e-government adoption. The study employed Bibliometrics, performance analysis, and science mapping analysis, followed by preferred reporting items for systematic reviews and meta-analyses (PRISMA). Biblioshiny and VOSviewer were used in the study to visualize data, and the analysis is based on the Scopus database, which has 862 research articles from 324 journals published between 2001 and 2022. The study finds the most pertinent sources, the country-wise distribution in single-country publications and multiple-country publications, and the most prominent academics whose contribution is the most productive in time. Moreover, the underlying factors for adopting e-government, the driving of information and communication technologies, the established research models, and the access pathways for e-services have been identified as the areas of high activity in the field. Furthermore, the results indicate that further investigations are required concerning factors affecting e-government adoption, digital divide, social media, mobile government, cloud computing, and developing nations in terms of the adoption of e-government. The findings help to improve academic knowledge of e-government adoption research and to understand the trends in the field better and can be used to conduct empirical research, such as content analysis, to fully understand what factors accelerated the growth of e-government adoption research.

Keywords: Bibliometric analysis, E-government adoption, Performance analysis, Science mapping

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Engineering, Technology and Applied Sciences

Effect of Aqua-Thermally Treated Rubber Aggregate and Waste Tyre Steel Fibre on the Mechanical Properties of Rubberized Concrete

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Abstract

The depletion of finite mineral aggregate and the detrimental impacts stemming from the accumulation of numerous waste materials emphasize the urgent need for manufacturing alternative recycled aggregate. The partial replacement of natural aggregate in concrete with these materials promotes the sustainability of construction materials. As a result, rubber aggregate derived from discarded tyres has emerged as a viable option for fine aggregate substitution, particularly at lower replacement levels. Generally, rubber inclusion diminishes the strength of the Rubberized Concrete (RuC). However, it transforms the concrete's brittleness into a ductile behaviour. Identifying the poor bond strength at the rubber/cement interphase as the main reason for strength losses, several physical and chemical treatment methods have been suggested to enhance the performance of RuC. Water-based and thermal treatment have emerged as cost-effective and straightforward approaches among the various treatment methods. However, recent investigations into RuC underscore that recovering entire strength losses is not achievable solely by employing treated rubber particles. On the other hand, integrating steel fibres derived from waste tyres into concrete has been currently distinguished as a promising way to augment mechanical properties. Considering the interaction between these matters, water-base and thermal treatment were combined to produce Aqua-Thermally Treated Rubber Aggregate (ATT-RA) to produce RuC reinforced with Waste Tire Steel Fibers (WTSF) as a novel approach. The experimental results revealed that the combination of ATT-RA and WTSF notably improved the performance of RuC, achieving 100% compressive and flexural strength recovery up to 5% rubber replacement levels compared to plain concrete due to the stiff surface texture of ATT-RA and the crack bridging effect of WTSF. Besides, design strength was recovered up to 10% rubber content, highlighting the potential of utilizing RuC reinforced with WTSF in structural applications.

Keywords: Rubberized concrete, Strength recovery, Water-based treatment, Thermal treatment, Waste tyre steel fibre

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Soil and Water Assessment Tool Applications for Hydro-environmental Assessments in Sri Lanka: A Review

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Abstract

Soil and Water Assessment Tool (SWAT) is a distributed hydrologic model that considers the spatial variability of physical properties of a catchment. SWAT is a public domain model which has been applied to address a wide range of hydrological and environmental issues worldwide. Compared to the global applications of SWAT, only a limited number of applications are touched on in the Sri Lankan context, and more potential applications in the hydro-environmental field have yet to be explored. Being a distributed model, SWAT requires a lot of model input data but has the best structure representing a catchment with hydrological response units, resulting in accurate model output. Therefore, SWAT applications for Sri Lankan catchments are encouraged. Thus, based on the literature, this study delves into the existing applications of SWAT in the Sri Lankan context and explores its potential applications for soil, water and land management in Sri Lanka compared to the global context. According to the SWAT applications in the Sri Lankan context, most of the studies focused on runoff simulations. Moreover, several studies have been conducted to understand the effects of sediment loads and estimate parameters for ungauged catchments. Some studies focused on water availability assessments in catchments under climate change impacts. However, in comparison to the global context, some important hydro-environmental impact assessments were not conducted to a satisfactory level in Sri Lanka, such as soil erosion estimates, land-use change impact analysis, best management practices identification for improved irrigation efficiency, water quality assessments including point and non-point source pollutant estimates, nutrient cycling and transport simulations, and predicting the impacts of agricultural practices. As per the aforementioned research gap, a need exists to expand SWAT fields of applications that received limited attention in Sri Lanka. As such, this review is a dedicated call for hydro-environmental researchers urging further exploration.

Keywords: Hydro-environmental Assessments, Soil and Water Assessment Tool (SWAT), SWAT Applications.

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Simplified Macro Modelling Approaches Simulating In-plane and Out-of-plane Interaction of Masonry-infilled Frames: A Review

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Abstract

The construction of masonry-infilled frame structures is a common practice globally, and they exhibit higher seismic vulnerability due to their complicated non-linear behaviour. The brittle behaviour displayed by the masonry infill walls can enhance the seismic vulnerability of the structure globally and locally, leading to damages, casualties, and economic losses. Earlier, the masonry infill walls were considered as non-structural elements, and their contribution to the structural response was neglected. However, numerous researchers are currently conducting experimental and numerical investigations to simulate the in-plane and out-of-plane interaction of the masonry infill walls against seismic actions. In this matter, it is crucial to identify the most appropriate numerical modelling method to simulate the cyclic response of the masonry infills with their interaction with the surrounding frame. Hence, this paper reviews the recently developed simplified macro-modelling approaches simulating in-plane and out-of-plane interaction of masonry infilled frames. Ten available equivalent strut models in the literature are selected as representative simplified macro-modelling approaches, and each model's key features are discussed with a comparison of their accuracy and level of complexity. Most of these macro-modelling approaches can provide proper estimations for stiffness and strength degradations under both in-plane and out-of-plane responses, considering the arching mechanism and the element removal mechanism of the masonry infill panel. At the same time, there are some drawbacks and opportunities for future modifications in these modelling approaches. The major limitation is that the developed strut modelling approaches can only be applied to solid masonry infills, replicating in-plane and out-of-plane interactions. Additionally, multiple studies reveal that the available data is limited for complete model validations. Hence, further investigations on both the numerical and experimental sides are suggested.

Keywords: Masonry infilled frames, In-plane/ out-of-plane interaction, Simplified macro-modelling

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Pervious Concrete Pavements for Sustainable Stormwater Management: A Review

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Abstract

Flash flooding poses a significant threat, necessitating stringent stormwater management strategies. Pervious concrete pavements have gained traction as a sustainable solution to mitigate runoff, promote water infiltration, and mitigate flash flood risks. This paper comprehensively synthesizes various research endeavours to provide an in-depth understanding of pervious concrete pavements. The increasing adoption of permeable pavements reflects a global shift towards eco-conscious practices. However, the escalating use of pervious concrete underscores the imperative to address concerns regarding its strength and durability. This study meticulously examines crucial aspects such as mix designs, testing protocols, material characterization, and applications. It explores innovative approaches, including the utilization of additives and waste materials, to enhance sustainability and performance while minimizing the environmental footprint of conventional concrete production. By scrutinizing scientific databases, focusing on terms like pervious concrete and permeable pavement, the research underscores the significance of aggregate qualities, cement paste thickness, and other components in influencing mechanical and hydrological properties. Site-specific factors such as subgrade soil conditions and precipitation patterns significantly impact pavement performance. Challenges like inadequate strength, cracking, and ravelling are being tackled by integrating fibres and nano additives. The conclusion underscores the critical role of optimizing various components in pervious concrete for effective stormwater management. Data-driven recommendations for mix design, site-specific considerations, and additive usage are provided to practitioners. Despite advancements, unresolved issues persist in stormwater management through pervious concrete. Key findings highlight the need for continued research to address concerns related to strength, durability, and optimal performance under varying environmental conditions. By addressing these challenges, pervious concrete can further its role in environmentally sustainable stormwater management systems.

Keywords: Pervious Concrete Pavements, Stormwater Management, Sustainable Infrastructure, Environmental Resilience

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Benchmarking of Dam Safety Guidelines for Sri Lanka

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Abstract

Sri Lanka's dam network is pivotal in water resources management for irrigated agriculture and hydropower generation. Irrespective of the existence of an extensive dam network, Sri Lanka lacks well-established safety protocols for the operation of dams, assuring the protection of these assets and the safety of downstream communities and the environment. Having identified the need, the Irrigation Department has recently compiled a set of dam safety guidelines. This research was conducted with the aim of benchmarking the compiled safety guidelines against international standards. Following a thorough review of the guidelines, consultation of eighteen experts at seven earthen embankment dams in Polonnaruwa and Matara regions was conducted to collect necessary data for the research. The consultants comprised two parties: (1) On-site dam engineers and (2) Experts involved in preparing guidelines. The targeted aspects of the expert questionnaire comprised geotechnical, structural, hydro-technical, seismic, risk assessment and emergency management. Collected data was analysed by constructing a "Maturity Matrix" for Sri Lankan guidelines and for each dam site operation. The results revealed that Sri Lankan guidelines compare well with international guidelines in most aspects, while there is a notable deficiency when addressing seismic considerations. Overall, the guidelines can be taken as aiming at enforcing 'good practice' while much improvement is needed in present field practice to reach the expectations of guidelines with further improvement to receive a rating of 'very good practice' compared to international norms. The qualitative analysis emphasized that regular monitoring of dams is vital; many experts highlighted that guidelines should be 'implemented' and identified instrumentation and documentation as needing critical attention within current practice. Looking forward, the study recommends using advanced technology such as GIS based software tools for a positive change in how we manage dams and aspires to lay the groundwork for an integrated dam safety management framework in the country.

Keywords: Benchmarking, Dam safety guidelines, Expert survey, Maturity matrix method

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Interaction of Digital Twin Technology to the Safety of the Construction Industry: A Review

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Abstract

The construction industry faces several challenges, including accidents, hazards, low productivity and poor technological advancements. Digital Twin (DT) technology has been utilised to a greater extent in digitally advanced industries, including automotive and manufacturing. DT modelling is a faithful reflection of the physical object fed with sensor-based real-time data for processing. With the exponential growth of data sciences, digital systems are also becoming more intelligent with the potential of collecting, processing and storing incremental amounts of data. However, connecting data effectively with DT technology has presented solutions to a certain level and opened up new directions. The aim of this study was to review the current developments of DT in the safety monitoring of the construction industry. The articles with keywords of worker tracking, hazard identifications, warning, localization, decision making and hazard prediction areas combined with mathematical algorithms and machine learning models, published after 2015, were selected for this review study. The review found that DT technology has significantly enhanced construction safety through advancements in tracking, real-time monitoring, safety training and early warning systems with productivity, cost and time-saving. Real-time monitoring and early warning technologies have converged more prominently than other domains in recent years. Among the review articles published from 2021 to 2023, 45% and 36% of articles were based on early warning and real-time monitoring, respectively. Programmable tools, algorithms and machine learning technologies are merging with DT technology with higher effectiveness. It was found that less focus has been given to environmental parameter-based safety prediction and precise real-time visualization and warning.

Keywords: Construction safety, Digital Twin, Internet of Things, Safety monitoring, Sensor-based safety monitoring.

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Poster Session - 01

"GradesGo" - A Comprehensive Practical Framework for Calculating Grade One Admission Marks

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Abstract

"GradesGO" is a comprehensive approach to the grade 1 admission mark calculation process in government schools. It aims to streamline operations, reduce paperwork, and enhance transparency. Initially tailored for the Galle district due to the absence of a digitalized solution, our platform seeks to address the island-wide need for a reliable, robust system. To achieve this, we developed a user-friendly website accessible to the public, leveraging latest MERN stack. We prioritized accurate proximity calculations to schools, utilizing Google Maps® API for precise distance measurement. Additionally, we compiled a comprehensive digital database specific to the Galle district containing school coordinates. Our platform generates printable PDF documents that reflect final marks aligned with government circulars. Each document includes a unique hash for verification via our platform, ensuring accuracy and transparency. Feedback from educators and parents in Galle district, collected through administrative channels, highlights a 98% satisfaction rate, validating our platform's success. The feedback mechanism, involving individuals with over 90% computer literacy, proves efficient and cost-effective, empowering parents in their decision-making process. Despite current limitations, our future roadmap includes expanding island-wide and integrating with existing educational systems, fostering greater connectivity and efficiency.

Keywords: Automated grading, Digitalized solution, Grade 1 admission, Parental Empowerment, User-friendly

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පහතරට නර්තන සම්ප්‍රදායේ කපු පත්තිනිවරයෙකු ලෙස මඩු බෑසීමේදී සිදු කරන වාරිත්‍ර විධි පිළිබඳ විමර්ශනාත්මක අධ්‍යයනයක්

ජනීකා ද සිල්වා සහ එස්.එම්.ඒ.පී රත්නසිරි

ඉතිහාසය හා පුරාවිද්‍යා අධ්‍යයනාංශය, රුහුණ විශ්වවිද්‍යාලය, මාතර.

සාරසංක්ෂේපය

ශ්‍රී ලංකේය සංස්කෘතියේ විචිත්‍රත්වයට නර්තන කලාවෙන් සාධාරණ දායකත්වයක් ලැබේ. අස්පර්ශනීය සංස්කෘතික උරුම යටතට ගැනෙන නර්තන කලාව උඩරට, පහතරට, සබරගමු, වශයෙන් ත්‍රිත්ව සම්ප්‍රදායන් ඔස්සේ විහිදී යයි. මාතර, බෙන්තර, ගාල්ල ආදී ප්‍රදේශවල ව්‍යාප්ත පහතරට සම්ප්‍රදායේ නර්තන ශිල්පියකු ලෙසින් සමාජගත කරවීමට තීරණය කර එම කටයුතු ඉටු කිරීම වෙනුවෙන් කරනු ලබන සිරිත් ක්‍රියාදාමය කලඑළි බෑසීම හෙවත් මඩු බෑසීම ලෙසින් හඳුන්වයි. මඩුබෑසීමේ මංගල්‍යායේදී කපු පත්තිනිවරයෙකු ලෙස මඩු බෑසීමේදී වාරිත්‍ර රැසියක් පවතින අතර ඒවා දාමයක් ලෙස විහිදී පවතී. මෙම සම්ප්‍රදායේ නර්තනාංග පිළිබඳව පර්යේෂණ සිදු කර ඇතත් කලඑළි බෑසීමේදී සිදු කරන වාරිත්‍ර විධි පිළිබඳව සියුම් ප්‍රාමාණික පර්යේෂණ සිදු කර නොමැති අතර එය පර්යේෂණ හිඩැසකි. පහතරට නර්තන සම්ප්‍රදායේ කපු පත්තිනිවරයෙකු ලෙස මඩු බෑසීමේදී සිදු කරනු ලබන වාරිත්‍ර විධි කෙබඳු ද? යන අධ්‍යයන ගැටලුව විමර්ශනය කිරීමට මෙමගින් උත්සාහ ගෙන ඇත. මෙලෙස කපු පත්තිනිවරයෙක් ලෙස මඩු බෑසීමේදී සිදු කරන පූර්ව වාරිත්‍ර පිළිබඳ ගවේෂණය කිරීම, ආධුනික නර්තන ශිල්පියා, ගුරුවරයා හා දෙමව්පියන් විසින් කරනු ලබන වාරිත්‍ර විමර්ශනය කිරීම, විවිධ සම්ප්‍රදායන් අනුව සිදු කරනු ලබන වාරිත්‍ර හා ඒවා විචල්‍යතාවයන්ට පත්වන අයුරු ගවේෂණය කිරීම මෙන් ම වර්තමානයේ එම වාරිත්‍රවල සිදු වී ඇති විචල්‍යතාවයන් විමර්ශනය කිරීම මෙහි අධ්‍යයන අරමුණු ලෙස පෙන්වා දිය හැකිය. මෙම පර්යේෂණය ගුණාත්මක පර්යේෂණ ක්‍රමවේදය මත පදනම්ව සිදු කරන ලදී. ඒ සඳහා පුස්තකාල අධ්‍යයන ක්‍රමවේදය හා ක්ෂේත්‍ර අධ්‍යයන ක්‍රමවේද යන පර්යේෂණ ක්‍රමවේද භාවිත කරන ලදී. ලබාගත් ප්‍රාථමික හා ද්විතියික දත්ත ගුණාත්මකව විවරණය කරමින් තේමාත්මක (Thematic) හා කථනාත්මක (Narrative) යන විශ්ලේෂණ ක්‍රම භාවිතයෙන් අවසන් නිගමනවලට පැමිණ ඇත. ගුරු ගෙදර සංකල්පයේදී රාත්‍රී කාලයේ ශිල්ප පුහුණුව හා බෙර නැටවීම වර්තමානයේ සිදු නොකරන බවත්, සියනෑ හා රයිගම ගුරුකුලවල වාරිත්‍ර තරමක් සමාන බවත්, මඩු බෑසීමේදී වාහල නටනු ලබන්නේ ආධුනික නර්තකයා නොව කපු පත්තිනිවරයා බවත් මෙමගින් නිගමනය කළ හැකිය. මෙම පාරම්පරික ඥාන සංරක්ෂණය කිරීම, නිවැරදි වාරිත්‍ර නවක නර්තන ශිල්පීන්ගේ අවධානයට නතු කිරීම යෝජනා ලෙස ඉදිරිපත් කළ හැකිය.

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Enhancing Disaster Resilience: A Systematic Review and Integrated Framework for Sustainable Disaster Risk Reduction

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Abstract

In the context of soaring challenges emanating from climate change and rising global exposure to disasters, this research aims to thoroughly review Disaster Risk Reduction (DRR) strategies. For review purposes, we used the PRISMA approach; our article conducts a systematic review of the preceding literature on various DRR interventions. The general aim is to provide a consolidated framework highlighting sustainable development, community engagement, and innovative technologies. To conduct this systematic review, the research examined 21 articles (2020-2023) selected in accordance with the keywords of "DRR", "Community Resilience", "Sustainable Development", and "Innovative Technologies". Studies met initial selection criteria undergo an assessment of quality and relevancy, which eases retrieving the needed data for meta-analysis or thematic synthesis. The study classifies interventions according to type and location and addresses the qualitative dimensions of community resilience. This study has diverse implications. Firstly, a conclusive systematic review article that provides an overview of the available literature and pinpoints major lacunae for future research. Secondly, research leads to formulating a unifying framework for DRR strategies that policymakers and practitioners can use as a practical reference. This framework highlights the importance of community participation and technological advances in strengthening communities against disaster risks. The research draws up a collection of case studies involving effective DRR measures highlighting innovative technologies. These case studies are examples of practical results, with specific lessons for communities addressing issues. This study's transparency through reporting clearly represents the selection procedure, which aims to benefit stakeholders involved in disaster preparedness processes. This review advances the debate about DRR while trying to connect theory and practice. In advocating for holistic sustainability, for a future whereby communities are no longer passive bystanders to disasters.

Keywords: Community Resilience, Disaster Risk Reduction (DRR), Innovative Technologies, PRISMA Methodology, Sustainable Development

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Morphological Variations and Biochemical Properties of Mandarin (*Citrus reticulata*) Varieties in Sri Lanka

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Abstract

Mandarin (*Citrus reticulata*) is one of the underutilized fruit crops in Sri Lanka and belongs to the family Rutaceae. Seven Mandarin varieties are available in Sri Lanka: Indu, *Madhu, Juicy, Rahangala, Horana ehemi* 1, *Horana ehemi* 2 *and Horana ehemi* 3. The study aimed to examine the morphological variations and biochemical properties of these Mandarin varieties. A total of 35 quantitative and qualitative morphological characters were scored for the morphological analysis. Ascorbic acid content, Total Soluble Solids (TSS), and pH were determined for the fruit juice. In addition, the essential oil content of the leaves and the antioxidants of the peel were also determined. The hydro-distillation method was employed to distil essential oil, and the chemical compounds of the oils were analyzed through gas chromatography. DPPH radical scavenging assay determined Antioxidant activity, and Total Phenolic Content (TPC) was determined by the Folin- Ciocalteu method. Qualitative and quantitative morphological data were subjected to IBM SPSS 22 statistical software, and a hierarchical dendrogram was created using Ward's method. According to the dendrogram, morphological similarities showed among the varieties Horana ehemi 1, 2 and 3, whereas among the varieties of *Indu, Madhu, Juicy and Rahangala.* Laboratory evaluation was carried out following a completely randomized design. Four replicates from each variety were used to analyze biochemical properties, and data were subjected to Minitab 21 statistical software. To compare several groups, an analysis of variance was performed by the Tukey mean comparison method at a 95% significance level. P-value was used to determine the significance of the study. The significantly highest and the lowest TSS were obtained in *Madhu* (10.4) and *Rahangala* (7.4), respectively. *Madhu* (3.37) and *Horana ehemi 3* (2.29) had the significantly highest and the lowest pH values respectively. *Horana ehemi* 3 had significantly the highest Ascorbic acid content (37.50 mg/mL). The essential oil content of leaves varied from 0.34% to 1.87%. The highest oil content was obtained in *Indu* (1.87%). The DPPH scavenging activity was significantly highest in *Horana ehemi* 2 (31.35%), and TPC was significantly highest in *Horana ehemi* 1 (82 mg GA/g of extract). It can be concluded that *Madhu, Juicy* and *Ehemi* varieties are better for the production of novel beverages in the food industry because of their highest Ascorbic acid content, TSS, high volume of fruit juice and highest l*, a*, b* values for juice colour. In addition, the varieties *Indu* and *Juicy* had the highest essential oil content, while the Ehemi varieties are rich in antioxidants, and these varieties are well-suited for use in the pharmaceutical and cosmetics industries.

Keywords: Citrus reticulata, hydro-distillation, mandarin antioxidants, morphology

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Comparative Identification of Morphological Variation of Locally Available Selected Leafy Vegetables in Low Country Intermediate Zone

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Abstract

The study was conducted using 20 different leafy vegetables that are locally available, most of which belong to the underutilized category in Sri Lanka. The 20 species have nutritional and medicinal advantages. However, information on variations in morphological traits, nutritional content and geographical distribution is limited to these species. Otherwise, people are not very aware of the traits of those leafy vegetables for identification. An online survey was conducted to obtain primary data regarding consumer comprehension of certain leafy vegetables. It indicates that, compared to other leafy vegetables, underutilized leafy vegetables are less conscious. The main objective of the study was to identify the morphological variation of species and analyse the chlorophyll content and leaf colour values. The leafy vegetable was planted in potting media that contained cow dung, sand, and topsoil at a 2:1:1 ratio. The weather conditions and soil conditions of the growing area were observed during the four-month period. Using a completely randomized design, pots were arranged randomly with three replications. Using the samples collected from the field, characterization was carried out using visual observations and laboratory methods. The shape, margin, apex, base, and venation of the leaf were used to categorize species. The traits of the leaves and their chlorophyll content and leaf colour value determine how different species differ from one another. The data obtained from experiments were used to perform one-way ANOVA. Mean separation was done by using the turkey test. The statistical analysis was done using the MINITAB software version 19. A statistically significant difference was stated at $p < 0.05$. The total chlorophyll content ranged between 0.091mg/g and 0.312mg/g, while the leaf colour L and b ranged between 18.6 – 48.13 and 11.93 – 41.88, respectively. Using these morphological traits of leafy vegetables, a dichotomous key was prepared for deep identification among variations. The information gathered in this study will be useful to researchers, horticulturists, botanists, consumers, and plant breeders who are interested in these leafy vegetables.

Keywords: Characterization, Leafy vegetables, Nutrition Content, Underutilize, Variation

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Designing a Semi-Automated Mushroom poly bag filling Machine

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Abstract

Mushroom cultivation holds significant potential for usage as a high-nutritional food around the globe and in Sri Lanka. Sawdust is the primary substrate for growing mushrooms artificially. However, the manual preparation of the substrate and its insertion into poly bags is a time-consuming and labour-intensive task. This study addresses these challenges by proposing a mechanized solution for preparing and filling sawdust growing media into poly bags. The appropriate ratio of the main substrate of sawdust and the essential nutrition ingredient should be well mixed with the water. The design comprises a pneumatically actuated programmmable logic controller (PLC) controller-operated semi-automated machine featuring four main units: the substrate mixing chamber unit, pot filling unit, compressing unit, and the specially designed flexible knob attaching unit. In the traditional method, planting seeds uses a piece of plastic tubing on top of the pot; instead, here, we used a Flexible knob for seed planting. The most outstanding novelty of the machine is the specially designed flexible knob and attaching system for the mushroom seed planting. In addition, the system's optimized pasteurization processes lead to a faster turnaround time. We think this a creative solution with enormous potential to empower small-scale growers through cooperative usage agreements and increase output and profitability in large-scale mushroom farms.

Keywords: Agricultural machinery, Mechanized filling and compression, Pneumatic PLC control, Semi-Automated machine, Sustainable mushroom farming.

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Deep Learning-Based Optimization of Dietary Plans for Effective Weight Loss Management

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Abstract

Overweight and obesity, as identified by the World Health Organization (WHO), have emerged as prevalent global health concerns, affecting over 1.9 billion individuals classified as overweight and more than 650 million falling into the obese category. These conditions significantly contribute to various health complications, including heart disease, diabetes, and several forms of cancer, necessitating urgent attention from the public health sector. In response to these challenges, this study employs convolutional neural networks (CNNs) to analyze diverse factors such as weight, height, body mass index (BMI), basal metabolic rate (BMR), body shape, and gender extracted from single photographs of human subjects. By leveraging this data, the primary objective is to estimate BMR and devise personalized nutritional meal plans for weight reduction. The research aims to demonstrate the feasibility of BMI measurement, body shape analysis, gender determination, BMR estimation, and target weight definition directly from photographic inputs. Additionally, factors such as age, dietary restrictions, water intake, sleep duration, and exercise habits are considered in the formulation of tailored dietary plans for overweight and obese individuals. The study proposes an optimized solution to mitigate health risks associated with excess weight by developing a system that delivers personalized dietary recommendations while integrating various CNN models. The accuracy of the proposed approach is evaluated against alternative CNN architectures, such as ResNet152 and VGG16, as well as professional nutritionist assessments. The framework presents a practical and scalable solution that can be seamlessly integrated into healthcare systems and wellness initiatives, thereby enhancing public health outcomes on a global scale.

Keywords: BMI, CNN, Dietary Planner, Human Body Photographs, Weight Loss

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Deep Learning-Based Virtual Assistant for Sinhala Speakers

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Abstract

Virtual assistance has become increasingly popular and used in various applications in recent years. The evolution of deep learning and natural language processing has introduced new techniques to surpass the limitations of the traditional virtual assistant, making it more productive for human life. While virtual assistants have gained popularity globally, they often fall short of accommodating non-English speakers. This challenge is evident in Sri Lanka, where Sinhala and Tamil languages predominate. In response to this problem, our solution aims to make virtual assistants accessible to those lacking English proficiency by providing a Sinhala-based virtual assistant that incorporates recent advancements in natural language processing and deep learning. The virtual assistant system introduced here operates through a comprehensive architecture involving key components. Data input and preprocessing, involving tasks such as data cleaning and formatting for deep learning model usage. A rule-based intelligent system guides decision-making, incorporating both deep learning and predefined rules to ensure accurate responses to diverse user queries. The General Transformer-based deep learning model addresses general user questions by understanding contextual nuances. Specialised hierarchical deep learning models tailor responses for specific domains like finance or healthcare, building upon the general model's output. The solution integrates a user interface facilitated through a web application and mobile assistant, which enables users to improve their day-to-day activities with the usage of the application.

Keywords: AI, Deep Learning, Machine Learning, NLP, Transformer Model

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Poster Session - 02

Mechanical Characterization of Partially Bio-degradable Coir Fiber-Reinforced Polyester Composites

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Abstract

As a response to the increasing demand for sustainable engineered materials, this research has undertaken to aim at exploring the mechanical potential of highly available, less expensive coir fibres derived from coconut husks in a polyester matrix as the reinforcement agent of polymer matrix composites to be applied in the engineering applications like automotive, construction, packaging, marine and consumer goods industries as a replacement for the conventional synthetic composites. The mechanical behaviour of partially bio-degradable coir fibre-reinforced composites made from the hand lay-up method is thoroughly evaluated through a comprehensive, experimental approach to appraise the material's viability. At a 40% fibre volume fraction in polyester resin, impact energy, hardness and wear resistance are rigorously evaluated, focusing on providing valuable insights in the context of environmentally friendly alternatives as replacements for conventional, synthetic composite materials. Test results have been compared with the existing synthetic E-glass fibre-reinforced composites and S-glass fibre-reinforced composites to assess the potential of the developed material. Obtained results illustrate that the developed material comes up with an average 17.6% increase in hardness, 26.7% reduction in impact resistance, and 30% reduction in wear resistance compared to the most common E-glass fibre-reinforced polyester composites. According to the results, it can be noted that higher hardness occurs due to the enhancement of rigidity by the coir fibre due to its chemical composition. However, the reasons for the reduction in wear resistance and impact resistance can be the fibre matrix adhesion and processing conditions. Those mechanical characteristics can be further improved by varying the fibre volume fraction, composition, and processing method and by adding suitable filler materials that improve the considered properties, enhancing the potential of developed material to be applied in the considered industries.

Keywords: Coir fibre, composites, mechanical properties, sustainable

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Design and Development of Water Absorptivity Measuring Instrument

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Abstract

In pursuit of enhancing the efficiency and precision of water absorptivity measurements for paper materials, a novel instrument is conceived and developed in this work. This innovation seeks to streamline the testing process for both sized and unsized papers, categorically addressing their distinct surface properties. Conventionally, the Cobb testing method is employed for sized papers, optimizing surface characteristics to reduce water absorbency, while the Klemm method is utilized for unsized papers, which inherently exhibit higher water absorbency and are not recommended for material having a capillary rise of less than 5mm. This instrument integrates both testing methodologies into a singular apparatus, minimizing the need for separate equipment and human intervention. The primary challenge lies in reconciling the conflicting attributes of sized and unsized papers within a unified design. Three conceptual designs were considered to achieve this, with the final selection prioritizing versatility and accuracy. Noteworthy innovations in the selected design include combining Cobb and Klemm methods, ensuring comprehensive testing capabilities for a diverse range of paper materials. The traditional brushing or wiping methods for excess water removal have been replaced by a rolling process, further refining the accuracy of measurements. The overarching goal of this instrument is to mechanize the manual testing procedures, significantly reducing the time required for measurement while elevating the precision of results. This report elucidates the evolution of the design process to propel the field of water absorptivity testing for paper materials into a new era of efficiency and reliability.

Keywords: *Water Absorptivity, Sized and unsized paper, Cobb test, Klemm method*

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Application of VSLAM to a Robot Arm

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Abstract

This research explores the application of visual simultaneous localisation and mapping to a stationary robot arm used in online lab sessions to observe control panels and perform similar tasks. This arm does not include encoders to reduce the hardware costs of the robot arm; hence, VSLAM is used to localise the arm's end. The primary camera is connected to the arm's end, and a second camera is connected to another joint on the same horizontal plane as the arm's end, which moves on a horizontal plane. Both cameras are connected to the same VSLAM algorithm in which the primary camera initialises the local map. Then, both cameras localise the camera position independently, acting on each other's backup.

Two independent cameras needed to be connected to the same VSLAM algorithm and share their position derived from VSLAM; thus, modifications were needed to the VSLAM algorithm. The initiation phase only uses the primary camera to generate the 3D map, moving the entire robot arm 360º around the vertical axis. The next phase is localisation, using both cameras independently and the generated map.

Simulations were carried out in 3 DoF. First, the entire robot arm was rotated towards the observable direction around the vertical axis, followed by the adjustments given sufficient map points are inside the view range. Results show that significant errors were observed in the initial state with mapping, which was corrected considerably after loop closing. In the localisation, both cameras give reasonably acceptable results. However, designing a loop-closing algorithm in the localisation phase is a considerable upgrade. Installing the camera in the radial direction to the vertical will give more accurate results than in the tangential direction. According to the results, the localisation error was under 0.15 meters, given that the camera velocity was under the value the algorithm allowed.

Keywords: Mono-camera VSLAM, VSLAM in a robot arm, VSLAM with two cameras

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Development of a Fast-Time Flight Plan Simulation Tool

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Abstract

The 'Fast-Time Flight Plan Simulator' is a web application designed to simulate and analyze flight plans by allowing users to upload pre-defined flight data. The application facilitates real-time simulations based on specified time parameters. A key feature of this simulator is the collision detection system, which promptly identifies potential risks and provides users with vital information regarding the collision, collision time, location, and involved flights. The application graphically pinpoints the exact locations of potential flight collisions on the map, which is a process facilitated by using the spherical law of cosines with the Geometric library of Google Maps. The system considers a collision not as an exact impact between two flights but as a critical range (5 nautical miles). Also, by selecting specific flights, the users can obtain data such as departure time, arrival time, departure airport, etc. The graphical representation of flight parameters, such as speeds and altitudes against pre-defined waypoints, enhances the analytical capabilities. Furthermore, the simulator introduces a proactive approach to flight safety by enabling users to mark specific regions as no-fly zones. In response, the application dynamically reroutes flights to circumvent these designated areas, contributing to heightened situational awareness and risk mitigation. This simulation tool can be used in research as a platform to simulate optimized or predefined flight plans by facilitating potential collisions or abnormalities in scheduling them.

Keywords: Collision Detection, Flight Simulator, Fast Time Flight Plan Simulator, Graphical Representation, Simulation

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Development of a Low-Cost Vehicular Communication Testbed

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Abstract

Recently, a lot of focus has been put on making self-driving vehicles safer by improving communication between vehicles. Vehicle to Everything (V2X) communication is a new technology that helps vehicles to understand their surroundings, which is essential in autonomous driving. However, most of the V2X research is conducted based on computer simulations due to the lack of hardware testbeds. The existing hardware is very costly and still in the experimental stages. On the other hand, simulation-based experiments do not provide realistic results for validating V2X services and applications. This research presents a new low-cost V2X testbed made from commodity hardware that produces a realistic V2X experience. The testbed mainly consists of On Board Units (OBUs) and Road Side Units (RSUs). These units have been implemented using GPS modules, processing devices, Wi-Fi modules, antennas, and accelerometers. The proposed testbed is unique because it meets the academic needs, providing students with an easy-to-use platform to study V2X applications and services. It reliably delivers quick communication with minimal data loss, making it a valuable for both V2X research and education. The proposed testbed is tested with a few safety-related V2X applications, such as Blind Spot Detection and Collision Avoidance. Innovative solutions like Parking Spot Finding and Smart Traffic Light Systems have been deployed to address urban congestion and improve parking processes. The evaluation of these V2X applications produced realistic results with acceptable minimum data losses and latencies in real-world scenarios. Therefore, this V2X testbed is crucial in educating the next generation of researchers and practitioners by effortlessly merging theoretical insights with practical applications. This innovative approach ensures a comprehensive learning experience while contributing to the evolution of theoretical concepts and their practical application in the dynamic field of vehicular communication.

Keywords: Autonomous driving, V2X Communication, Vehicular Networks, VANET

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Design and Fabrication of Maize on cob Tray Dryer

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Abstract

Maize (corn) is an important staple crop in Sri Lanka, and preserving it for storage and further processing is crucial for food security and income generation for small-scale farmers. Maize is grown in many regions of the country and is harvested twice a year. But nowadays, farmers cultivate maize several times yearly with water and fertilizers. Sri Lanka produces about 250,000 metric tonnes of maize and has a national requirement of 600,000 MT. Drying maize-on-cob is one of the most important steps in preserving the crop, as it removes excess moisture, which can cause mould growth and spoilage. However, traditional drying methods, such as natural air-drying and sun-drying on rooftops or other elevated surfaces, can take several days to a week and highly depend on weather conditions. In this project, we design and fabricate a maize-on-cob tray dryer, a type of drying equipment that can dry maize quickly and efficiently by reducing moisture content through proper air circulation. The dryer is designed to be simple, inexpensive and easy to use for small-scale farmers. With an extensive review of existing drying techniques, the design specifications were finalized for design, and conceptual strategies were generated. The best method with all the compatibilities among the functions was selected using a morphological chart according to the weighted object matrix. Then, the CAD models were designed. After validating all the designs, the fabrications were started, and testing was conducted to verify the functionality of the results. Fabricated dryer reduces moisture content from 32% to 12% of 750g of maize within 15 minutes. The total cost of production of the dryer was LKR 500000.

Keywords: Design, Dryer, Fabrication, Moisture, Maize

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Performance of Rubberized Concrete When Replacing Coarse Aggregate with Chip Rubber at Lower Replacement Levels

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Abstract

The disposal of end-of-life tyres (ELTs) poses a significant environmental challenge due to their non-biodegradable composition and the potential release of harmful chemicals. Simultaneously, concrete stands as the second most consumed material in the world after water while contributing to the depletion of natural aggregate (NA) on a global scale. In light of these challenges, recent studies have investigated the use of rubber aggregate (RA) as a partial substitute for NA in concrete. Although numerous studies have indicated that rubberized concrete (RuC) diminishes mechanical properties, identification of the optimum RA replacement ratio (RR) that can be replaced for coarse aggregate in concrete is still discoverable due to conflicting findings in the literature. Consequently, in this study, chip rubber (CH) ranging in size from 5-20 mm was employed to partially replace the coarse aggregate in concrete with RRs of 2.5%, 5%, 7.5%, 10%, 12.5%, and 15% by the coarse aggregate volume. The study assessed the impact of CH replacement on both the fresh (wet density and workability) and the hardened concrete properties (uniaxial compressive strength and flexural strength). The results reveal a gradual reduction in both wet density and workability as the CH content increases. However, the reduction in wet density remains below 5%, even with a 15% replacement of CH. As a consequence of inadequate bonding between rubber particles and the cement matrix, compressive and flexural strength decreased as the CH content increased. Besides, the reduction in 28-day compressive strength and flexural strength was only 24% and 11%, respectively, compared to plain concrete with up to a 5% as-received CH content. In conclusion, recommending the use of this size of CH in as-received conditions to replace coarse aggregate in concrete is still challenging due to the observed strength reduction. However, it can be suggested for non-structural applications without additional modifications.

Keywords: Chip rubber, Compressive strength, Flexural strength, Rubberized concrete, Sustainability

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A Smart Scheduler for Combining Wi-Fi and Mobile Data for Improved Internet Speed

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Abstract

The traditional Transmission Control Protocol (TCP) has been the dominant protocol for data transmission over single network links for a long time. However, modern applications have higher bandwidth requirements and benefit from using multiple connections simultaneously instead of depending on a single link. Multipath TCP (MPTCP) is a suitable solution to satisfy these requirements. In this work, we demonstrate how we developed an MPTCP-based router that enhances the user's bandwidth experience by combining the speeds of two or more access links. MPTCP has great potential to improve data transmission, but we observed that its bandwidth performance deteriorated when the network was congested. Several factors influence MPTCP's performance, and one of them is the scheduler's design. Therefore, we devised a new scheduler algorithm called "Redundant at Congestion" (RaC) and implemented it within a Programmable MultiPath (ProgMP) kernel framework. This algorithm can distribute segments by considering the congestion window of each sub-flow and adjusting to the network's dynamic behaviour. Our method focuses on optimizing the segment distribution process through the RaC algorithm. This research conducts an extensive evaluation to assess the effectiveness of the RaC scheduler and directly compares its performance against established schedulers in terms of data rate and latency. Through these evaluations, we aim to assess the efficacy of RaC, especially in high-traffic scenarios. As a result, we achieved better performance than other schedulers, with lower latency and higher bandwidth.

Keywords: Access Link, Bandwidth, MPTCP-based Router, Multipath TCP, Transmission Control Protocol (TCP).

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User-centric Security Monitoring for IoT Devices

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Abstract

The Internet of Things (IoT) has rapidly expanded in the last five years, bringing numerous benefits along with increasing security concerns. The simplification of human interaction to different tasks brought IoT closer to humans. User-centric security monitoring for home network systems is a user-friendly tool and interface that can effectively manage and monitor the security of IoT devices. This approach empowers users to make informed decisions about device anomalies. There are many network security monitoring tools available at the enterprise level. Nevertheless, many homeowners lack advanced technical knowledge about networking and information security. Most of which are plug-and-play (PnP) devices that lack regular updates and security patching. Therefore, a user-centric approach should be designed with simplicity in mind to ensure that anyone can use it effectively. In this work, we propose a software platform that can automatically identify the IoT devices in a network and analyze security-related issues. Device fingerprinting is a crucial step in IoT threat analysis. Because each IoT device's network traffic is different to find the advanced vulnerabilities of each IoT device. Once devices are identified, it is easier to identify vulnerabilities based on the device type in the identification of weak credentials and potentially vulnerable ports. The system will keep monitoring the incoming traffic with a predefined threshold. If the incoming traffic crosses the predefined threshold, it will raise alerts for DoS (Denial of Service) attacks. It further identifies the connected services for each IoT device through reverse DNS (Domain Name System) traffic analysis and presents them in a user-friendly manner.

Keywords: DoS, IDS, IoT, PnP

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