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Recent Published Book: Biodeterioration of Cultural Property and Research on Conservation of Heritage Buildings



Prof Dr Mandana Barkeshli is currently the Head of Research at the De' Institute of Creative Arts and Design at UCSI in Malaysia. She also holds the position of Honorary Principal Fellow at the Grimwade Centre for Cultural Materials Conservation, affiliated with Melbourne University. Professionally, she is a conservation scientist specialising in the materials technology of manuscripts and miniature paintings.

Recognised internationally for her discoveries in traditional preventive measures for Persian medieval manuscripts, Prof Dr Barkeshli has identified innovative approaches such as the use of saffron stigmas to inhibit the destructive effects of green verdigris pigment in Persian miniature paintings. Additionally, her research highlights the use of henna dye as a fungicide in Persian paper dyeing processes from the 16th to the 19th centuries.

Her significant contributions to the field have been acknowledged through numerous fellowships and awards. These include the Petra Kappert Fellowship from the Centre for the Study of Manuscript Cultures at the University of Hamburg, the Barakat Trust Fellowship from the United Kingdom and the MacGeorge Fellowship from Melbourne University, Australia.

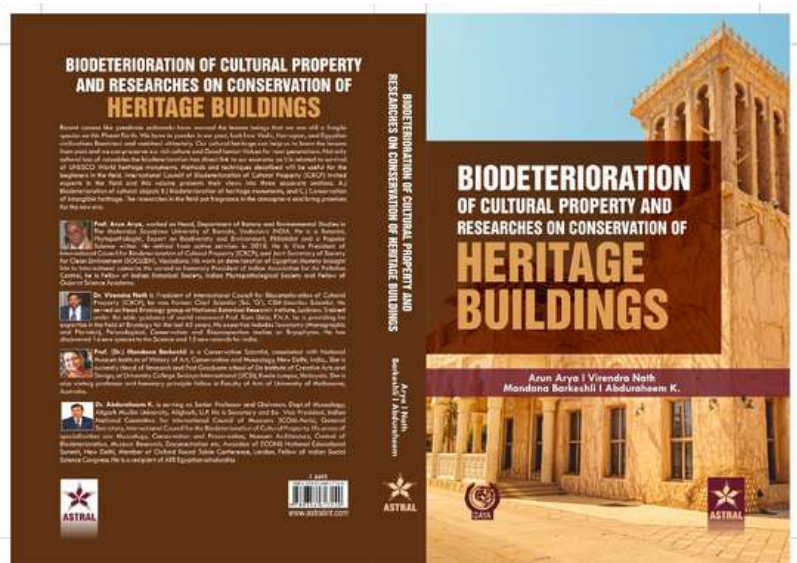
Brief Summary of the Book

The recent pandemic outbreaks, reminiscent of the challenges faced by humanity, serve as a stark reminder of our fragility on Planet Earth. Reflecting on the demise of ancient civilizations such as the Vedic, Harappan and Egyptian, we find valuable lessons in our cultural heritage. This heritage not only allows us to learn from the past but also empowers us to preserve our rich culture and ethical values for future generations.

Beyond the loss of cultural treasures, biodeterioration poses a direct threat to our economy, particularly in relation to the survival of UNESCO World Heritage monuments. This book provides essential methods and techniques beneficial for newcomers to the field. The International Council of Biodeterioration of Cultural

Property (ICBCP) convened experts, whose insights are presented in three distinct sections: A. Biodeterioration of Cultural Objects (ten articles), B. Biodeterioration of Heritage Monuments (fourteen articles), and C. Conservation of Intangible Heritage (two articles). The book comprises a total of twenty-six articles distributed across these three chapters.

The researchers in this field contribute to the intellectual atmosphere, promising a new era of understanding and preservation. Dedicated to the loving memory of Padma Shri Dr O. P. Agrawal, a pioneer in the field of conservation science in India, this book features messages from editors (Prof Arun Arya, Dr Virendra Nath, Prof Dr Mandana Barkeshli, and Prof Dr Abduraheem K.) in the preface. Additionally, two essays by Dr Neeta Das, titled "Pioneer in the Field of Conservation Science: Padma Shri Dr O. P. Agrawal – As I knew him," and by Dr Virendra Nath and Prof Arun Arya, titled "Life and Works of Padma Shri O. P. Agrawal," enrich the book's introductory content.



Book Editors

- **Prof Arun Arya**

Dr Arun Arya served as the Head of the Department of Botany and Environmental Studies at The Maharaja Sayajirao University of Baroda. A distinguished botanist, phytopathologist, philatelist and popular science writer, he is renowned as a plant doctor. Currently, he holds positions as the Joint Secretary of SOCLEEN, Vadodara and Vice President of the International Council for Biodeterioration of Cultural Property. Dr Arya is a recipient of the Young Scientist award by DST, Govt. of India and served as Vice President of the Indian Botanical Society in 2013. His areas of specialisation include aerobiology, biodeterioration and plant-beneficial fungi. His contributions extend internationally, with engagements like co-chairing the session on Ecoregions in the 12th World Forestry Congress held at Quebec City, Canada, in 2003. He has presented scientific findings in conferences across Japan, Canada, Italy, Morocco and Singapore. Dr Arya has published 17 books and guided 12 Ph.D. scholars from the M.S. University of Baroda and one from Pacific University Udaipur. His philatelic collection on medicinal plants has won prizes at the national level, and he has been honoured with the Gorakh Prashad Prize by Vigyan Parishad, Prayagraj and the prestigious Prof V Puri Gold Medal by the Indian Botanical Society in 2019. Beyond his academic achievements, Dr Arya actively promotes science teaching in various schools of Vadodara, recognised by the Lions Club of Baroda.

- **Dr Virendra Nath**

Dr Virendra Nath, former Chief Scientist (Sci. 'G') and currently a CSIR-Emeritus Scientist, was the Head of the Bryology group at the National Botanical Research Institute in Lucknow. With a rich academic background under the guidance of Prof Ram Udar, F.N.A., he has dedicated 45 years to advancing the field of Bryology. His major contributions encompass a wide range of activities, including Taxonomy (Monographic and Floristics), Palynological studies, as well as Conservation and Bioprospection studies of Bryophytes. Over the course of his career, Dr Nath has made remarkable discoveries, identifying 14 species new to science and documenting 15 new records in India. In 1986, he participated in the CSIR-PAS exchange programme, visiting Poland. Additionally, in 1988, he had the privilege of working at the Royal Botanic Gardens in Kew, London. Notably, Dr Nath attended the World Conference of Bryology in Malaysia in 2007, further enriching his international engagements. His outstanding contributions to the field were recognised with the prestigious Ram Udar Medal by the Association of Plant Taxonomists of India in 2012. Dr Nath holds fellowships in several esteemed organisations, including the Association of Angiosperm Taxonomy (F.A.P.T.), Indian Botanical Society (F.B.S), Society of Ethnobotanists (F.E.S), Palaeobotanical Society (F.Pb.S.) and the Society of Plant Reproductive Biologists (F.S.P.R.B.). In addition to his memberships, Dr Nath serves as the Regional Secretary for the South Asian Region of the International Association of Bryologists (IAB) and is the designated contact person for India. He actively contributes to the academic community by being a member of editorial boards and a reviewer for various journals. Furthermore, Dr Nath lends his expertise to assessment and selection committees of various academic and scientific institutions. As a respected academic figure, he guides Ph.D. candidates and serves as an examiner for several universities.

- **Prof Dr Mandana Barkeshli**

Prof Dr Mandana Barkeshli is a Conservation Scientist affiliated with the National Museum Institute of History of Art, Conservation and Museology in Kuala Lumpur, Malaysia. Specialising in materials technology of Persian medieval manuscripts and miniature paintings, she currently serves as a visiting professor and honorary principal fellow at the University of Melbourne, Australia. Throughout her career, Dr Barkeshli has held senior academic and museum positions, including faculty roles at Art University in Tehran and Isfahan, the International Islamic University in Malaysia as well as the first Head Curator of the Islamic Arts Museum Malaysia. She has also contributed significantly as the Chairman and Board Member of Directors of The Islamic Manuscript Association in Cambridge, UK, and serves as an Editorial Board Member for the esteemed International Journal for the Preservation of Library and Archival Material (Restaurator). Beyond her academic and professional endeavours, Dr Barkeshli is a passionate textile design artist, showcasing her personal creations in various exhibitions. Her involvement extends to being a member of the Piala Seri Endon Batik competition and serving as one of the judges on the panel for nearly two decades in Malaysia. Recognition for her research work has been substantial, with numerous fellowships and awards, including the Petra Kappert Fellowship from the Centre for the Study of Manuscript Cultures at the University of Hamburg, the Barakat Trust Fellowship from the United Kingdom and the Mac George Fellowship from the University of Melbourne. Dr Barkeshli has conducted workshops globally, including at the Bodleian Library in Oxford University, the Grimwade Centre for Cultural Materials Conservation at Melbourne University, the Qatar Museum of Islamic Art, Qatar Library, Alzahra University in Tehran, Iran and the Malay Manuscript Centre at the University Kebangsaan Malaysia (UKM). Notably, Dr Barkeshli received the Gold Award from the IIUM Research, Invention and Innovation Exhibition 2013 (IRIIE) for her scientific analysis on traditional preventive measures using garlic and vinegar as a wood fungicide in Malaysia.

Book Editors (cont.)

• **Prof Abduraheem K.**

Prof Abduraheem K. is a distinguished senior professor and Chairman of the Department of Museology at Aligarh Muslim University, Aligarh. His extensive contributions to the field include serving as the Secretary and Ex-Vice President of the Indian National Committee for the International Council of Museums (ICOM-Paris) and as the General Secretary of the International Council for the Biodeterioration of Cultural Property. Recognised for his outstanding contributions, Prof Abduraheem K. received the ECONS National Educational Summit award in New Delhi and participated as a member of the Oxford Round Table Conference in London in 2008. He holds the distinction of being a Fellow of the Indian Social Science Congress and has presented 65 research papers in National and International Conferences. His expertise extends to serving as an Expert Committee member, Board of Studies member, Examiner and member of Juries for various institutions, including Baroda University, BHU, Cochin University, National Museum Institute New Delhi, National Research Laboratory for Conservation Lucknow, INTACH Lucknow, National Museum of Natural History New Delhi and AITC New Delhi. Continuing to play a pivotal role in shaping the academic and research landscape in his field, Prof Abduraheem K. remains an influential figure in the area of Museology.

Celebrating Unity in Diversity: Pavilion Bukit Jalil's 'Sweet Diwali Peacock Kolam' Illuminates Minds and Hearts

As the radiant festival of Deepavali approaches, Pavilion Bukit Jalil emerges as a beacon of cultural splendor, captivating not just the eyes but also the very essence of the onlookers. Under the visionary guidance of Asst Prof Ts Lucas Lim, Pavilion Bukit Jalil has harmoniously collaborated with Sekolah Sri UCSI and KB Colour Image to unveil a grand spectacle named 'Sweet Diwali Peacock Kolam,' a celebration that transcends the boundaries of tradition and modernity.



Asst Prof Lucas Lim,
De' Institute of Creative Arts and Design,
UCSI University



At the heart of this mesmerising project stands a majestic Peacock Kolam, soaring an impressive 13 feet high. This magnificent artwork serves as the nucleus of a vibrant celebration, symbolising much more than mere aesthetics. Adorned with 108 meticulously crafted DIYA Light Arts, the peacock radiates not just light but also the profound values of harmony, love and enlightenment - the very essence of the Festival of Lights.

What elevates this display to a level of unparalleled significance is the deep involvement of 108 children from Sekolah Sri UCSI. Their hands meticulously shaped traditional clay diyas, each representing a unique facet of creativity and tradition. These diyas, delicately placed on the peacock's tail feathers, carry not just the weight of tradition but also the promise of a harmonious future. The theme of "unity in diversity" is further enriched by the addition of exquisite henna art floor stickers, masterfully applied by KB Colour Image, enhancing the overall splendor of the Kolam.

Beyond its artistic brilliance, the 'Sweet Diwali Peacock Kolam' embodies the very essence of togetherness. It stands tall as a beacon of hope, a testament to the limitless potential residing within the younger generation, who are undeniably the hope and future of Malaysia. This project serves as a proud testament to Malaysia's rich tapestry of cultures and traditions, showcasing the nation's strength in embracing diversity and unity as its guiding principles.





The vibrant hues of the Kolam blend seamlessly with the artistic expressions of the children and the intricate henna art, creating a living canvas that vividly portrays Malaysia's unity in diversity. This display not only commemorates the spirit of Deepavali but also acts as a poignant reminder of the vibrant and harmonious tomorrow that Malaysia envisions.

Pavilion Bukit Jalil's 'Sweet Diwali Peacock Kolam' stands not just as an artistic marvel but as a heartfelt tribute to the spirit of unity, love and togetherness. It invites visitors not merely to witness its beauty but to immerse themselves in the rich cultural tapestry that defines Malaysia. Here, traditions blend seamlessly with innovation, and diversity paves the way for a brighter future. Come, be a part of this celebration and witness the brilliance of tradition and the promise of tomorrow, showcased in this splendid display of artistry and unity. It illuminates not only the surroundings but the very soul of our nation.

The Autopsy Of Pain And Violence In Prison



DR SAEID MOTEVALLI is a highly accomplished individual with a wealth of experience spanning over 18 years in the field of Psychology. He has earned Bachelors, Masters and Doctoral degrees in Psychology, showcasing his dedication to academic excellence and continuous learning. Throughout his career, Dr Motevalli has been actively engaged with various prestigious universities. Notably, he was associated with Islamic Azad University in Iran from 2014 to 2019, followed by his tenure at Universiti Pendidikan Sultan Idris from 2019 to 2021 and Universiti Putra Malaysia in 2020 to 2021. Since 2021, he has taken on the role of Head of Child Psychology Programme in the Department of Psychology, Faculty of Social Sciences and Liberal Arts at UCSI University. His contributions to the field are both practical and scholarly. Dr Motevalli has published several books and journal articles, showcasing his commitment to advancing psychological knowledge and sharing his insights with the academic community.



SAMANTHA TIAN XIN EE is currently pursuing a Masters Degree in Clinical Psychology at UCSI University. Alongside her academic pursuits, she has demonstrated her dedication as a behavioural therapist, providing therapy sessions to children and teenagers with special needs. This experience took place during her undergraduate studies in Psychology at Tunku Abdul Rahman University College, where she graduated in 2017. Samantha is known for her strong sense of responsibility and commitment to expanding her knowledge across diverse fields of study. Her research interests encompass a wide range of topics, including well-being, psychoeducation, pain management techniques and stress-related subjects. Integrating her academic pursuits with practical experience, she aims to contribute significantly to the field of psychology and make a positive impact on the lives of individuals facing psychological challenges.



PREETHI KAUR SANDHU is currently undertaking a Masters Degree in Clinical Psychology at UCSI University. During her pursuit of a Bachelors Degree in Psychology at York St John's University, she worked as an educator, showcasing her commitment to both academics and professional endeavours. The process of writing this book has been a challenging yet rewarding journey for Preethi. She expresses her willingness to embark on this path once more, driven by her passion to contribute to the field of psychological research. Her dedication and enthusiasm highlight her desire to make meaningful contributions that can positively impact the field of psychology.

The book *"Pain and Violence in Correctional Settings"* serves as a vital resource for professionals working in correctional settings such as prisons, jails and rehabilitation centres. The authors aim to explore and conceptualise the complex relationship between pain and violence within these environments, offering a distinct and introductory contribution to the field of correctional psychology.

Here, we emphasise the importance of this book for individuals in the correctional setting and provide an overview of the key concepts presented in the book.

1. Addressing a Novel and Multifaceted Topic:

The book delves into a relatively novel and multifaceted subject - the relationship between pain and violence within correctional settings. By doing so, it brings attention to an area that has been underexplored but is of utmost relevance to those working with incarcerated individuals.

2. Accessibility and Relevance for a Broad Audience:

While the primary target audience includes students and practitioners, the authors have made the book accessible to anyone interested in gaining insights into this topic. This inclusivity ensures that not only professionals but also policymakers, researchers and individuals concerned with inmate well-being can benefit from the book's content.

3. Focusing on Enduring Psychological Principles:

The authors have wisely chosen to emphasise fundamental psychological principles rather than specific studies, recognising the evolving nature of this field. This approach ensures that the knowledge presented in the book remains relevant over time, providing a solid foundation for understanding the intricate connections between pain and violence in correctional settings.

4. A Comprehensive Introduction:

For newcomers to the field of correctional psychology, this book offers a comprehensive introduction. It provides a foundational understanding of the complex issues surrounding pain and violence within correctional settings. This knowledge is essential for professionals working with inmates as it equips them with the insights needed to improve their practices.

5. Encouraging Deeper Engagement:

The authors encourage readers to explore the references provided in the book for more detailed information and examples related to specific areas of interest. This not only fosters a deeper engagement with the subject matter but also promotes further exploration and research in the field of correctional psychology.

The book discusses various essential concepts and their significance for professionals in correctional settings, such as:

- **Pain in Correctional Settings:**

The book highlights the universal experience of pain, from acute to chronic, and the diverse manifestations and responses it can have. Understanding the multifaceted dimensions of pain, including psychological suffering, is crucial for addressing the well-being of inmates in these settings.

- **Prison Evolution and "Institutionalisation":**

It explores how prisons have evolved from inflicting physical pain to emphasising rehabilitation. However, it also points out the shortcomings in the system that lead to psychological distress for inmates. The concept of "institutionalisation" and its impact on prisoners' mental well-being are examined.

- **Violence Prevention and Risk Assessment:**

The book acknowledges the challenges of violence within correctional settings and the importance of violence prevention. It discusses models, risk factors and assessment tools for identifying high-risk inmates and developing effective management programmes.

- **Psychological Pain Management:**

In addressing pain and violence, the book underscores the significance of psychological pain management techniques, including therapies, mindfulness, relaxation and lifestyle changes.

In summary, "Pain and Violence in Correctional Settings" is a crucial resource for individuals working in correctional settings, as it explores the often-overlooked psychological dimensions of pain and violence in incarcerated populations. By providing an accessible and enduring foundation of knowledge, this book equips professionals to better understand and address the unique challenges faced by inmates, contributing to safer and more effective rehabilitation efforts and ultimately promoting a more humane and secure correctional environment.

Building a Greener Tomorrow: Innovating Biodegradable Single-Use Plastics with Enhanced Oxidation-Reduction Potential (ORP) for a Sustainable Solution to Plastic Waste Crisis



Dr Vahid Khosravi currently holds the position of Post-Doctoral Research Fellow at the Chemical and Petroleum Department within the Faculty of Engineering, Technology and Built Environment at UCSI University. His research focuses on a wide range of topics, including wettability alteration, Smart Water technology, molecular dynamics simulation, surface complexity studies, predictive models, artificial intelligence and machine learning, smart materials and low-carbon technology. Dr Khosravi is actively involved in various professional organisations. For instance, he serves as a committee member of the UCSI-Cheras Low Carbon Innovation Hub Research Consortium and is a member of the Malaysia Board of Technologists (MBOT) as well as the Institution of Engineering and Technology (IET) in the UK. In recent years, Dr Khosravi has contributed significantly to the field through the publication of remarkable papers in prestigious peer-reviewed journals. His research primarily focuses on elucidating the wettability alteration mechanism and investigating surface complexity studies by employing various methods, including experimental activities and simulation tools. Moreover, he has extended his research in the field of eco-friendly technologies in accordance with Sustainable Development Goals (SDG) policies, such as low-carbon technology and waste management.

Introduction

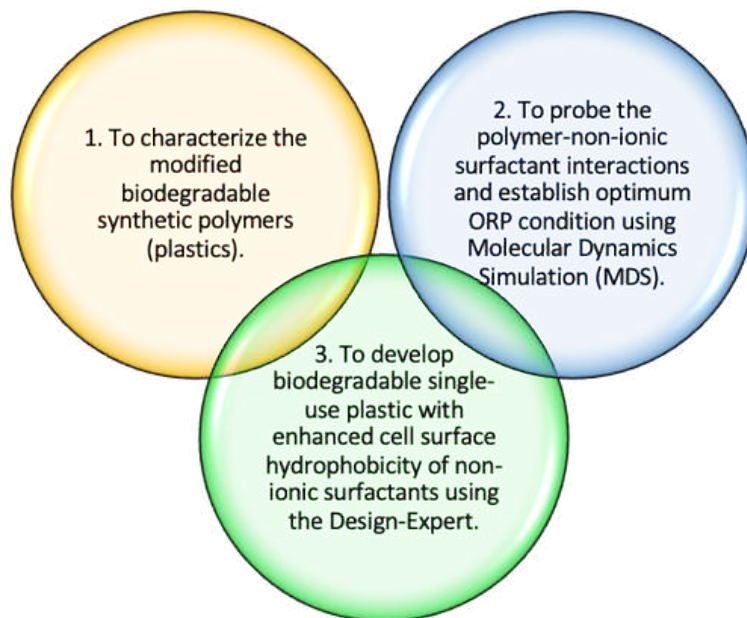
There is substantial evidence that plastics have a detrimental impact on aquatic habitats and their inhabitants (Akhtar et al., 2022; Hale et al., 2020; Hild, 2020; Nawab et al., 2023; Ramesh & Nagalakshmi, 2022). Similarly, evidence for terrestrial ecosystems is growing (Qi et al., 2020; Wang et al., 2020). Malaysia, with over 1,300 plastic manufacturers, is a significant contributor to plastic production, particularly single-use plastics, and ranks second in Asia for per capita plastic consumption. Malaysian households generate varying amounts of waste, ranging from 0.85 kg to 1.5 kg per person per day. This amount is higher than other developing countries like Indonesia and the Philippines, which generate 0.22 kg and 0.4 kg of waste per person per day, respectively (Chen et al., 2021). Despite efforts to address this issue, sustainable solutions for plastic waste management remain elusive. Therefore, there is a need to develop biodegradable single-use plastics with enhanced cell surface hydrophobicity to promote efficient biofilm formation and degradation, leading to the optimum oxidation-reduction potential (ORP) condition. ORP measures the marine environment's ability to self-cleanse or break down waste products, including contaminants and organic matter. In general, if present patterns in plastic use continue, it is anticipated that Earth would have 12,000 million metric tonnes of plastic trash by 2050 (Malaysia's Plastic Problem Everyone Forgot – What You Can Do About It). Such a situation would disrupt the ORP and places the marine life in great danger.

Importance of Research

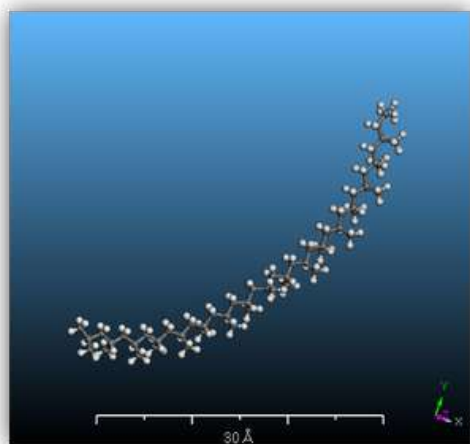
The aim of this project is to establish sustainable plastic waste management practices in Malaysia. This initiative aims to create a healthier environment, reducing the risks associated with cardiovascular diseases, reproductive problems and obesity in humans. By addressing the plastic waste problem in Malaysia, this project serves as a model/guideline for other countries facing similar challenges and offers a potential solution for a more sustainable future. This project aligns with several Malaysia policies including Malaysia's Roadmap Towards Zero Single-Use Plastics 2018-2030, National Strategic Plan (NSP) for Plastic Waste Management adopted in 2005, Solid Waste and Public Cleansing Management Act (SWMA 2007-Act 673) and Malaysia Plastics Sustainability Roadmap 2021-2030.

Objectives

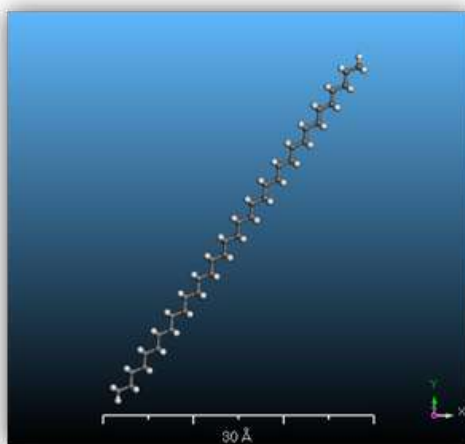
The focus of the biodegradation process is on the commonly utilised polymers for safe plastic waste disposal (i.e., polyethylene, polypropylene and polystyrene). These polymers, however, are also the most durable. Accordingly, a number of actions should be completed in order to ensure safe garbage disposal as below:



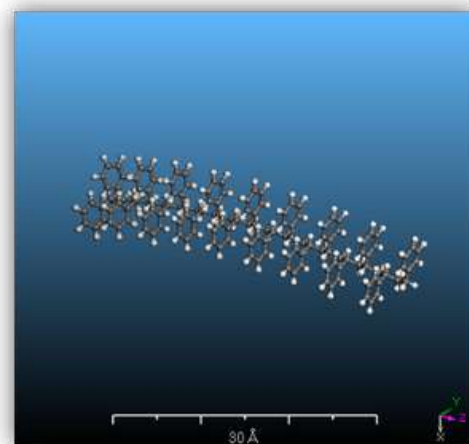
Methodology



Optimised Polypropylene



Optimised Polyethylene



Optimised Polystyrene

The first and third objectives involve experimental activities, while the second objective relies on simulation runs. For the first objective, the initial focus is on modifying a biodegradable polymer by incorporating a non-ionic surfactant through the surface coating. The second objective's methodology involves employing molecular dynamic simulations (MDS) using materials studio software. The compatibility between the MDS calculations and experimental outcomes is validated using the R2 value. As for the third objective, the Design Expert software is utilised to design experiments.

Applicability

Prevention, reuse, recycling, recovery and disposal are all part of a complex plan to address the worldwide plastic problem. Biodegradable plastics are most commonly used in packaging, such as food packaging and single-use plastics. Hence, our systematic research aims to:

1. Develop an optimised biodegradable single-use plastic that possesses significant advantages and environmental benefits, making it a promising alternative to non-biodegradable plastics. The ultimate objective is to create a plastic material that not only offers superior properties but also meets the favourable conditions of ORP, ensuring its suitability for various applications. By achieving this, we aim to contribute to the reduction of plastic waste and mitigate environmental impacts.
2. Generate predictive empirical/mathematical model(s) to effectively address the issue of plastic waste by accurately predicting the biodegradable performance of polymer-surfactant systems.

Impact on Nation

We envisage that the technology developed in this project brings impact on the national's waste management direction, whereby the production of biodegradable plastics reduces the reliance on traditional single-use plastics and their negative impact on the environment.

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2023 ASEAN Talented Young Scientists Programme (ATYSP) of Guangxi

Artificial Intelligence (AI) Game Design and Development: Fashion Design on Practical Skills Mastery



Assoc Prof Dr Ts Tan Wee Hoe is currently the Deputy Director of International Institute of Science Diplomacy and Sustainability at UCSI University in Malaysia. He holds positions as an Honorary Lecturer at Universiti Sains Malaysia, an Adjunct Professor at UNITAR International University and a Visiting Professor at Sichuan University of Culture and Art since April 2023. By profession, he is a multimedia designer specialising in serious games for education and health. He is recognised internationally for his inventive problem-solving skills related to gamification and serious game design within education. His expertise includes unique approaches such as learning through cardology, diceology, narratology and ludology. In recognition of both his creative contributions and research endeavours, he has been honoured with numerous awards and fellowships including Hubert H. Humphrey Fellowship awarded by the U.S. Department of States with Pennsylvania State University. He also served as a Visiting Research Scientist at the Play2PREVENT Lab at the Yale Center for Health and Learning Games in the United States of America.

UCSI University proudly announces that Assoc Prof Ts Dr Tan Wee Hoe, the esteemed Deputy Director of the International Institute of Science Diplomacy and Sustainability, has been honoured with the prestigious 2023 ASEAN Talented Young Scientist Programme (Guangxi) Award, commonly known by its acronym, ATYSP. This notable achievement underlines the university's commitment to innovation and excellence in scientific research and education.

The ATYSP, an integral part of China's Belt Road Initiative (BRI), aims to foster and cultivate future leading scientists in the ASEAN region. This initiative aligns with an ASEAN-oriented mobility scheme, enhancing cooperation among universities and enterprises across China and ASEAN countries. Each year, up to 100 promising scientists, scholars and researchers under the age of 45 are chosen for their remarkable contributions. Dr Tan's selection as one of the few representatives from Malaysia for the 2023 ATYSP is a testament to his outstanding work and the high regard in which he is held in the scientific community.

Dr Tan's award-winning project, titled "Artificial Intelligence (AI) Game Design and Development: Fashion Design on Practical Skills Mastery", stands as a cutting-edge exploration at the intersection of AI and game design. Co-led by his PhD (Education) student, Assoc Prof Huang Yanmei, this project showcases UCSI University's innovative approach to merging technology and education.

Designing games using AI is a rapidly evolving field that combines diverse disciplines such as computer science, game design, graphics and artificial intelligence. Dr Tan's project focuses on several key aspects of AI in game design:

- Content Generation
- Non-Player Character Behaviour
- Personalised Player Experience
- Player Behaviour Analysis
- Graphics and Animation
- Voice and Text Interaction
- Testing and Debugging

This project not only highlights UCSI University's pioneering spirit in integrating AI with education but also underscores the institution's role in shaping the future of technology and game design. Congratulations to Dr Tan Wee Hoe and Assoc Prof Huang Yanmei for their remarkable achievement and for bringing honour to UCSI University.



Figure 1: A sample AI-generated imagery for a fashion design game within this project.

Video Data Transmission using Multi-Sensory Alerting System with 5G Enabled Internet of Things



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Introduction

The implementation of Fifth Generation (5G) communication technology aims to optimise video data streaming in telemedicine applications, ensuring both reliability and efficiency. In conjunction with the Internet of Things (IoT) advancements, the 5G network is fortified to support intelligent healthcare services. While previous research focused solely on utilising the Lagrangian Encoder (LE) in conjunction with the H.265 Protocol for video data transmission in 5G networks within telemedicine, this paper introduces a pioneering approach. The proposed method involves employing a KNN classifier-based H.265 protocol alongside a single buffer model integrated with multiple sensors strategically positioned at both transmitter and receiver base stations. These sensors facilitate seamless and precise data exchange between devices, thereby enhancing transmission efficiency. Evaluation metrics including collision error, propagation error, sensing error and visual security encryption are employed to gauge the performance of both existing and proposed methodologies. Comparative analysis reveals that the proposed KNN classifier-based single buffer technique, augmented by multiple sensors, outperforms the existing LE-based single buffer method in terms of efficacy and accuracy in telemedicine applications within 5G networks.

Multi-Sensory Data Transmission-5G Technique (MS-KNN):

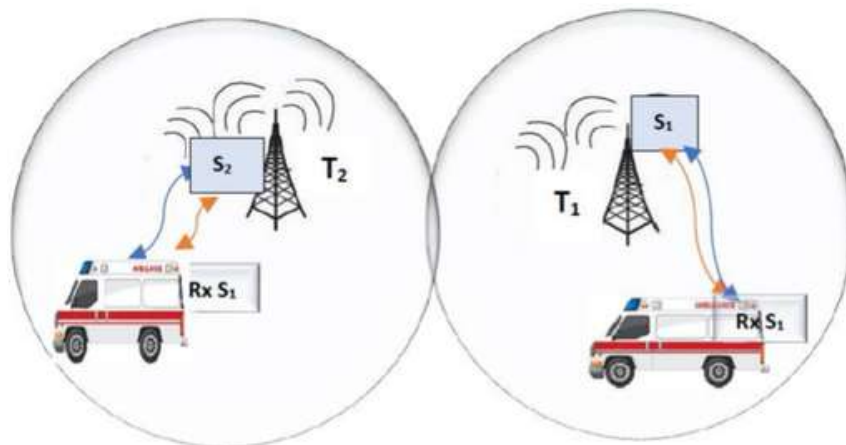


Figure 1: Single buffer system for 5G data transmission network

To enhance the efficiency of packet compression and extraction, a KNN classifier is employed to expedite processing speeds. In Fig. 1, there are two microcellular zones comprising transmitting antennas T1 and T2. A sensor-equipped buffer is positioned at the receiver device to monitor data availability by assessing energy consumption levels. When the energy consumption drops below a specified threshold, or reaches half of the threshold, the sensor transmits a request signal to the Transmitter sensor. RxS1 represents the receiver sensor, and each ambulance vehicle is equipped with such a sensor. Upon receiving a request command from RXS1, the transmitter sensor prompts the transmitters (T1 and T2) to continue transmitting additional packets of information. Wireless Application Protocol (WAP) is utilised to facilitate communication between mobile devices and transmitting stations for establishing requests within mobile networks.

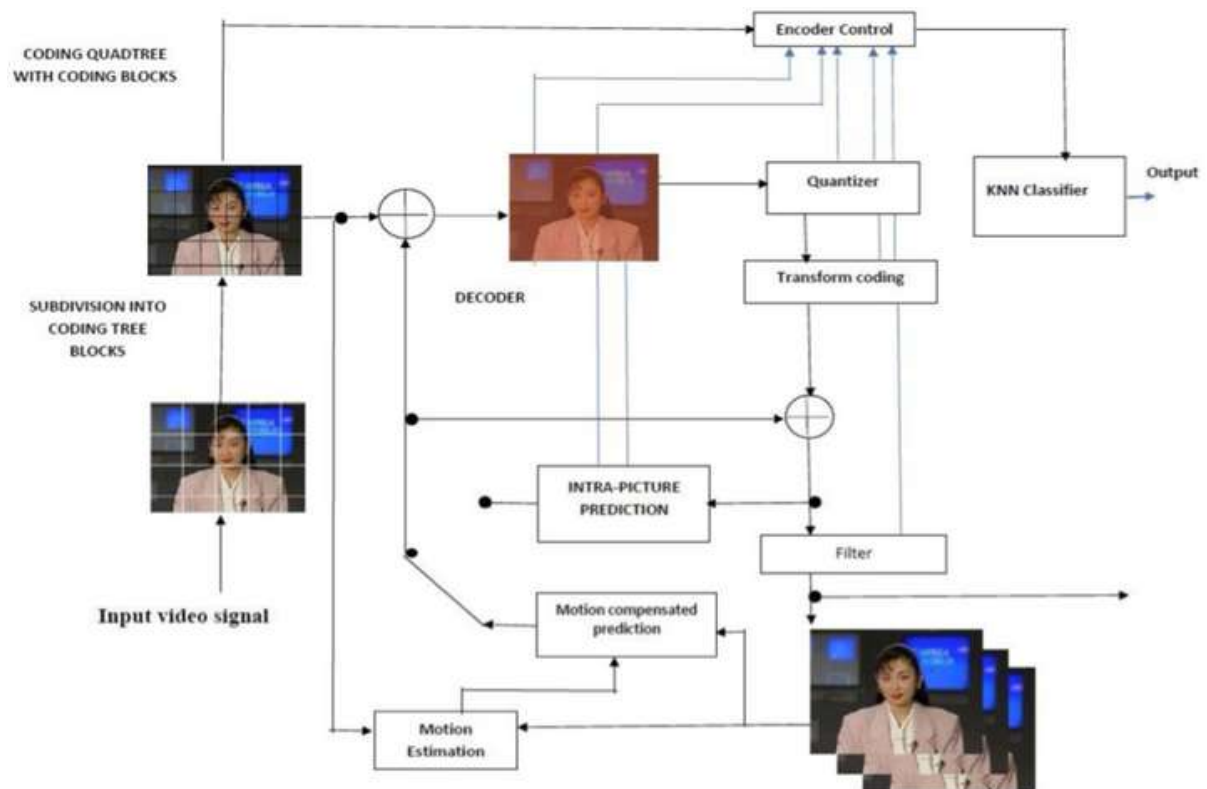


Figure 2: KNN classifier-based H.265 protocol

Over the 5G network bandwidth, double packets are being transmitted instead of a single packet due to certain limitations. In this study, the authors suggest an alternative approach where the KNN classifier is utilised for video data compression within the H.265 protocol, replacing the conventional LE method. This modification allows for the transmission of double packets over the available bandwidth. Given scenarios such as emergency situations in ambulances or other telemedicine contexts, a continuous and uninterrupted video stream is crucial for effective treatment. However, at the receiving end, the presence of double packets leads to a lack of memory space to store multiple packets, resulting in the automatic discarding of the second packet, rendering it irretrievable. To address this, the authors propose the incorporation of a buffer element at the receiving end to store additional information packets. Typically, packets are transmitted over time intervals in a network. Signal loss during data transmission causes the non-receipt of certain packets, potentially leading to incorrect treatment in emergency vehicles or healthcare systems. To mitigate this issue, the authors introduce a multisensory mechanism at both the 5G cellular base station and the receiver device. The receiver device sensor, linked to the buffer, monitors memory consumption levels based on energy usage. If the consumption falls below a certain threshold, or reaches half of it, the sensor signals the transmitting antenna sensor to expedite the transmission of successive packets. Upon receiving the request, the 5G transmitter promptly initiates the compression of successive packets using the KNN classifier-based H.265 protocol, as depicted in Fig. 2. To meet the rapid transmission speed of 5G, an Artificial Intelligence-based classifier like KNN is proposed, outperforming the existing LE method. The performance assessment of this proposed MS-KNN single buffer technique involves evaluating parameters such as sensing error, collision error, propagation error, busy receiver error, confusion degree, visual security and speedup.

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