

ICEEI

The 8th International Conference on
Electrical Engineering and Informatics

2021

12 - 13 OCTOBER 2021
www.ftsm.ukm.my/iceei2021

PROGRAM & ABSTRACT BOOK

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Innovation in Sustaining Digital Society

THE 8th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS (ICEEI2021)

12 – 13 OCTOBER 2021

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Foreword

Message from the Vice-Chancellor



Assalamualaikum wbt. and Greetings.

The time has come for Universiti Kebangsaan Malaysia and Institut Teknologi Bandung, Indonesia, to co-host the biannual International Conference on Electrical Engineering and Informatics, the 8th of its series. With great pleasure, I humbly welcome all of you to the conference which will be conducted online due to the Covid-19 pandemic.

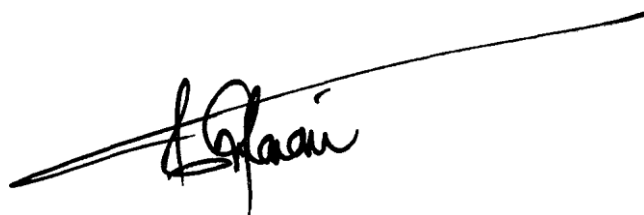
We are facing a great challenge during this time of pandemic. The pandemic brought changes to our lives that we are unable to carry out our routine as usual. The restrictions imposed by the pandemic force us to search for and consider new ways of doing things, which will almost certainly become the new norms. Informatics, Electrical and Electronic Engineering are now a bigger part in our lives as face-to-face interaction will significantly decrease. These disciplines provide the infrastructure and technology necessary to deliver content, as well as to facilitate learning and teaching, and much more — all with the goal of enabling society to function effectively and efficiently.

I am confident that ICEEI2021 could be the platform for participants to share and discuss the local and global issues, as well as to address solutions to the current challenges.

I would like to thank the Organizing Committee and Technical Program Committee of ICEEI2021 for their efforts in organizing this conference. Without their efforts and dedication, we would not have been able to host such a successful conference.

Finally, I would like to thank all conference committees, participants, researchers, practitioners, and students who take part in this wonderful conference. I wish you a great experience at ICEEI2021.

Thank you.



Prof. Dato' Ts. Dr. Mohd Ekhwan Hj Toriman
Vice-Chancellor
Universiti Kebangsaan Malaysia

Foreword

Message from the General Chair



Assalamualaikum wbt and Salam Sejahtera. On behalf of the faculty, I would like to welcome all participants to the 8th International Conference on Electrical Engineering and Informatics 2021 (ICEEI 2021). First and foremost, I humbly apologize that the conference cannot be conducted in the beautiful location of Terengganu, Malaysia as we have previously planned. With the current Covid-19 pandemic situation, unfortunately, the conference needs to be held virtually. With that, I thank everyone for their kind understanding on the virtual conference arrangement.

ICEEI series of conferences was established through joint effort between the Faculty of Information Science and Technology and the Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, as well as the School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia. Since its inception in 2006, ICEEI conferences have proven to be a very useful platform and forum where researchers can come together to share their ideas and experiences and to discuss on research advancements in the fields of electrical and engineering, as well as information technology and computer science.

The theme for ICEEI 2021 is “Innovations in Sustaining Digital Society”. I believe that the theme which we have chosen for the conference is timely given the Covid-19 situation that has forced all nations to embrace digital technologies in communication, teaching and learning, businesses, telemedicine, social welfare, infotainment, entertainment and many other aspects of our lives. We have seen many innovations such as applications which were created for the purpose of enabling the society to request for and deliver aid efficiently, and to receive updates on vaccinations, just to name a few. With the diminishing resources of the world that we are living in, creativity and innovations are truly essential for mankind to sustainably live in today’s digital societies.

I hope that this conference and the discussions it entails will be the basis for further enhancements in digital innovation in the relevant areas, thus benefitting societies at large in terms of social, health, economic, environmental, humanity and many other aspects. Conferences present valuable opportunities for networking and collaborations. It is hoped that all participants will take this opportunity to get to know one another and establish meaningful collaborations that will lead to further joint researches in the future.

A conference will not be a success without the dedication of all members of the conference committees, keynote speakers, invited speakers, and track chairs who have contributed their time to make this conference a success. Special thanks to all of them and also to all of the sponsors who have generously sponsored this conference.



Prof. Dr. Salwani Abdullah
Dean
Faculty of Information Science and Technology
Universiti Kebangsaan Malaysia

Foreword



Message from the Local Program Chair

Assalamualaikum wbt and Salam Sejahtera,

Welcome. I am pleased to welcome you virtually to the 8th International Conference on Electrical Engineering and Informatics 2021 (ICEEI2021). For your information, our first plan is to have this conference at Terengganu, Malaysia, but due to the pandemic COVID-19, we have decided to organize it as a virtual conference. The conference theme '*Innovation in Sustaining Digital Society*' is especially suitable to address the challenges that need to be immediately embraced by all walks of life because of this pandemic. We hope that our researchers can create more innovation in all aspects to sustain digitalization

in society while at the same time maintaining an excellent work-life balance.

We are very grateful to the IEEE Computer Society and IEEE CAS for their tremendous support as co-technical sponsors. We must convey our special thanks to the Conference Organizing Committee, particularly Prof. Dr. Salwani Abdullah (Dean, FTSM), Prof. Dato' Ir. Dr. Wan Hamidon Wan Badaruzzaman (Dean, FKAB), and Assoc. Prof. Dr. Tutun Juhana (Dean, STEI, ITB) as General Chairs, Assoc. Prof. Dr. Jamaiah Haji Yahaya (FTSM), Assoc. Prof. Dr. Sawal Hamid Md Ali (FKAB), Dr. Achmad Munir (STEI, ITB) as Program chairs, and all committee members that work together and engaging the program.

We are glad to have YAB Dato' Seri Dr. Ahmad Samsuri bin Mokhtar, Chief Minister of Terengganu, officiate our conference. The State Government of Terengganu has also made a monetary contribution to this conference. Also, we would like to thank our keynote speakers, Prof Dr. Magne Jorgensen from Simula Metropolitan Center for Digital Engineering, University of Oslo, and Oslo Metropolitan University, and our invited speakers from academia and industries.

At this conference, we have received more than 100 papers with a 20% rejection rate. The final submission consists of 75 conference papers for three tracks: Informatics, Applied Informatics, and Engineering. We are happy to have participants from various countries such as Malaysia, Indonesia, Syria, Sri Lanka, Libya, Iraq, and Iran. We hope that their findings can provide some ideas for further enhancing digital innovation in the relevant areas in our daily lives.

Lastly, I sincerely hope you will enjoy today and the following days of academic discussion and networking. Thank you for your participation.



Associate Professor Ts. Dr. Zulkefli Mansor
Local Program Chair

THE 8th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS (ICEEI2021)

General Program Schedule

Day 1, Tuesday, October 12, 2021

Time	Event
08.45 am	Welcome address & program schedule Room: Puncak Gamelan
	Invited speaker 1 Speaker: Prof. Dr. Andriyan Bayu Suksmono Institut Teknologi Bandung, Indonesia Title: A Brief on Quantum Information and New Quantum Technology Chairperson: Assoc. Prof. Dr. Elankovan A. Sundararajan Room: Puncak Gamelan
09.30 am	Parallel session 1 Rooms: Gamelan I, Gamelan II, Gamelan III
10.30 am	Keynote speech Speaker: Prof. Dr. Magne Jorgensen University of Oslo & Oslo Metropolitan University, Norway Title: It's All About the Benefits! The Benefits from Integrating Benefits Management Practices in Digitalization Work Chairperson: Prof. Dr. Mohd. Juzaidin Ab. Aziz Room: Puncak Gamelan
11.00 am	ICEEI2021 Opening & Launching of The 8th International Conference On Electrical Engineering and Informatics (ICEEI 2021) YAB Dato' Seri Dr. Ahmad Samsuri bin Mokhtar Chief Minister of Terengganu Room: Puncak Gamelan
01.00 pm	Break
02.30 pm	Parallel session 2 Rooms: Gamelan I, Gamelan II, Gamelan III
04.00 pm	Parallel session 3 Rooms: Gamelan I, Gamelan II, Gamelan III
05.30 pm	Conference adjourns

THE 8th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS (ICEEI2021)

General Program Schedule

Day 2, Wednesday, October 13, 2021

Time	Event
08.45 am	Welcome address & program schedule Room: Puncak Gamelan
	Invited speaker 2 Speaker: Assoc. Prof. Ir. Dr. Rosdiadee Nordin Universiti Kebangsaan Malaysia, Malaysia
09.00 am	Title: The Challenges and Solutions for the Internet of Things Deployment in Rural Locations Chairperson: Assoc. Prof. Ir. Dr. Nasharuddin Bin Zainal Room: Puncak Gamelan
09.30 am	Invited speaker 3 Speaker: Dr. Abdullah Mohd Zin (formerly Professor of Computer Science) Universiti Kebangsaan Malaysia, Malaysia Title: Challenges in Providing Manpower to support Digital Innovation Chairperson: Assoc. Prof. Dr. Nurhizam Safie Mohd Satar Room: Puncak Gamelan
10.00 am	Parallel session 4 Rooms: Gamelan I, Gamelan II, Gamelan III
11.30 am	Parallel session 5 Rooms: Gamelan I, Gamelan II, Gamelan III
12.30 pm	Invited speaker 4 Speaker: Ts. Noor Mohd Helmi Nong Hadzmi Chief Executive Officer of IX Telecom Title: Disruptions Recreating Our Future Chairperson: Assoc. Prof. Dr. Nor Fadzillah binti Abdullah Room: Puncak Gamelan
01.00 pm	Closing Ceremony
01.30 pm	Conference end

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Virtual Conference



officiated by:

**YAB Dato' Seri Dr.
Ahmad Samsuri bin
Mokhtar**

Chief Minister of Terengganu

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Faculty of Information
Science and Technology

co-organized by



Faculty of Engineering
and Built Environment

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THE 8th INTERNATIONAL CONFERENCE ON ELECTRICAL ENGINEERING AND INFORMATICS (ICEEI2021)

Opening Ceremony

Tuesday, October 12, 2021
Room: Puncak Gamelan

Time	Event
11.00 am	Arrival of guests and participants
11.10 am	Arrival of Deans and VIPs
11.15 am	National Anthem (NegaraKu) and Varsiti Kita Doa Recitation
	Welcoming speech by Local Program Chair Assoc. Prof. Ts. Dr. Zulkefli Mansor Welcoming speech by General Co-Chair Prof. Dr. Salwani Abdullah
	Speech by Deputy Vice Chancellor Research & Innovation Universiti Kebangsaan Malaysia Prof. Dato' Ir. Dr. Abdul Wahab bin Mohammad Opening Speech & Launching of The 8th International Conference On Electrical Engineering and Informatics (ICEEI 2021) YAB Dato' Seri Dr. Ahmad Samsuri bin Mokhtar Chief Minister of Terengganu
12.10 pm	ICEEI 2021 Multimedia Presentation
12.15 pm	Group photo and break

THE 8th INTERNATIONAL CONFERENCE ON ELECTRICAL
ENGINEERING AND INFORMATICS (ICEEI2021)

Closing Ceremony

Wednesday, October 13, 2021
Room: Puncak Gamelan

Time	Event
01.00 pm	Arrival of guests and participants
	Best paper and best presenter announcement
01.10 pm	9 best paper awards
	3 best presenter awards
01.20 pm	Closing Speech by Program Chair Assoc. Prof. Dr. Jamaiah Haji Yahaya
01.25 pm	ICEEI 2023 Speech Assoc. Prof. Dr. Tutun Juhana
01.30 pm	Conference end

KEYNOTE SPEAKER



PROF. DR. MAGNE JØRGENSEN
University of Oslo & Oslo Metropolitan University, Norway

It's all about the benefits! The benefits from integrating benefits management practices in digitalization work.

Abstract: Traditionally, and even today, successful software projects or digitalization work tend to be considered achieved when the deliveries are on time, within budget, and meet the specified requirements. A software project with considerable cost or time overruns but providing substantial benefits (user value, profit, cost savings, etc.) is, on the other hand, often considered as an example of a failed or non-successful project. In this keynote, I argue for a much stronger emphasis on benefits management (value management) in digitalization work and present results from a series of empirical studies on processes and factors contributing to the successful realization of benefits. Included in the results are findings on how different types of contracts affect the success in realizing benefits, why and how to specify the planned benefits, the importance of and how to carry out benefits management during the project execution, and the importance of including a person in the role as benefits responsible in the development teams. We see clear evidence that proper use of benefits management processes increases the likelihood of completing digitalization work with high benefits for its stakeholders.

Biodata: Magne Jørgensen is a chief research scientist at Simula Metropolitan and a professor of software engineering at the University of Oslo and at Oslo Metropolitan University. He has extensive industry experience as a consultant and manager and currently serves at the Norwegian digitalization board, where he advises governmental software projects. His research interests include project management, benefits management, empirical software engineering, and expert judgment. He is one of the founders of evidence-based software engineering.

INVITED SPEAKER 1



PROF. DR. ANDRIYAN BAYU SUKSMONO
Institut Teknologi Bandung, Indonesia

A Brief on Quantum Information and New Quantum Technology

Abstract: Information has been around since the beginning of time. When universe cooled down, its entropy decreases, the matter experiences a phase transition from chaos to order. Matter becomes more organized, the self-organization emerges into life, that beginning from a simple to complex one. The code of life imprinted in DNA is inherited through generations, evolving from simple to a more complex and adaptive life. In the prehistoric era, early human proclaims their existence in a form, among others, as drawing in caves; a form of simple form of man-made information storage. The forming of civilization needs language, including numbers, to exchange the information. Initially, simple information processing in the form of calculation is conducted done mechanically using an abacus. Then the device is developed into a mechanical calculator and later into an electronics calculator. A more powerful computing can be achieved when the processors capable to manipulate huge information in a fast manner. Miniaturization cannot be avoided; which is achieved when vacuum tubes are replaced by transistors. More circuit can be packed into a small device by using IC (Integrated Circuit) technology. Modern computers even employ multi-processor/multicore and specialized processors such as the graphic or AI (Artificial Intelligent) processors. Meanwhile, the knowledge on the essence of information also grows. An important milestone happened when Claude Shannon formulated the mathematical theory of communications, among other by quantifying information into bits. Most of present days computers and processors work under the same principle, which uses Turing Machine (TM) as a computational model. The essence is formulated as the Church-Turing thesis, which states that all realistic computation can be modeled as a (probabilistic) TM. Although most of daily problems can be handled by present days TM-based computers, a particular class of problems, which are called hard problems, cannot be solved in a reasonable time. Example of such problems are the TSP (Travelling Salesman Problem), simulation of quantum systems, and integer factoring. The latter case is useful in encrypting messages, employed by RSA cryptography. Regarding the quantum simulation, Richard Feynman suggests a solution to solve the problem quantum mechanically. To address this issue, quantum computers in which the role of bits in the classical computers are replaced by qubits, are developed. Whereas the classical bit has a definitive "0" or "1" state, the qubits can be in the superposition of "0" and "1" states. When such computers can be built, quantum simulations can be done more efficiently, and so are hard problems can be solved faster. Peter Shor proposed a quantum algorithm to factor an integer, which theoretically much

faster than classical algorithm. When a perfect quantum computer, i.e., the one with sufficient number of qubits and low error rate, are available, classical integer factoring-based cryptosystem will be in danger, and postquantum cryptography is urgently needed. A milestone that a quantum computer is superior to its classical counterparts; called as Quantum Supremacy, happens in 2019 when Google's research team announce that the 53 qubits Sycamore quantum processor capable to do a particular calculation in only 200 seconds, while today's most powerful supercomputer needs about 10,000 years to finish. The quantum computers still need time to become a practically usable, due to limited number of qubits that can be manufactured and noise induced error it suffered from. Nevertheless, some company has released commercial quantum computers while others attract public to access theirs. Mainly, there are two kind of quantum computers available, which are quantum annealer and universal quantum computers. In this talk, some applications of the quantum computers to solve optimization problem are presented. The promise of computing capabilities in solving hard problems makes worldwide IT companies and some countries allocate a large budget for investigating and developing this technology. Possibly after 2030 the quantum computers come to a fruition. At that time, we can easily solve hard problems that are used in, among others, discovering drugs and designing new materials.

Biodata: Prof. Dr. Andriyan B. Suksmono, is a Professor of Imaging and Signal Processing in the School of Electrical Engineering and Informatics, ITB (Institut Teknologi Bandung), Indonesia. He received Sarjana (BSc.) in Physics and Magister (M.S.) in Electrical Engineering from ITB and a PhD degree from Faculty of Engineering, The University of Tokyo, Japan. His main research interests are Compressive Sampling, Imaging, and Quantum Computing. Dr Suksmono is a Senior Member of the IEEE, Professional Member of the ACM, and a Distinguished Lecturer of the IEEE Indonesia Section.

INVITED SPEAKER 2



ASSOC. PROF. IR. DR. ROSDIADEE NORDIN
UNIVERSITI KEBANGSAAN MALAYSIA, MALAYSIA

The Challenges and Solutions for the Internet of Things Deployment in Rural Locations

Abstract: The Internet of Things (IoT) deployment seems to be making way gracefully in Malaysia and other South East Asia regions for the past few years. With the rapid growth of devices, a higher number of Internet subscriptions and advancement in data analytics, IoT adoption seems to be following the initial prediction of the market research. Unfortunately, this statement is not applicable in rural locations, where the small population and lack of network infrastructure hinder the deployment of IoT applications focusing on the natural resources, environment and biodiversity. This talk aims to present the challenges and opportunities of IoT deployment in a remote area in Malaysia based on a research project that involves academia, industry, and international collaboration. The focus is specifically on the deployment of Long Range (LoRa) and Wireless Smart Utility Network (WiSUN) communications, together with a helium-powered balloon that forms the Low Altitude Platform (LAP) system as the potential solutions for rural IoT deployments.

Biodata: Assoc. Prof. Ir. Dr. Rosdiadee Nordin is a researcher in wireless communications from the Universiti Kebangsaan Malaysia. His specific focus is on the performance and characterization of machine-type wireless communications for various Internet of Things (IoT) applications, low altitude platform (LAP) and drone communications. He is the recipient of Top Research Scientists Malaysia (TRSM) in 2020, a prestigious award under the ASM, and was recently appointed as Research Associate by The Abdus Salam International Centre for Theoretical Physics (ICTP), Italy, a renowned international research center.

INVITED SPEAKER 3



DR. ABDULLAH MOHD. ZIN
(FORMERLY PROFESSOR OF COMPUTER SCIENCE)
UNIVERSITI KEBANGSAAN MALAYSIA, MALAYSIA
Challenges in Providing Manpower to support Digital Innovation

Abstract: We are now living in the sixth wave of innovation since the industrial revolution. This era is known as the era of hyper innovation. The primary drivers of hyper innovation are increasing intellectual capital and advancement in digital technologies. In order to face the challenge of hyper innovation, organizations must adopt digital transformation, that is, leveraging digital technologies to create values and services for various stakeholders, to innovate and acquire new capabilities, and to rapidly adapt to changing circumstances. Universities is responsible for providing manpower needed to support digital transformation. This talk will discuss challenges that will be faced by universities in order to carry out this responsibility.

Biodata: Dr. Abdullah Bin Mohd. Zin was a professor of Computer Science, Faculty of Information Science and Technology, Universiti Kebangsaan Malaysia. He received his Bachelor of Mathematics with Computer Science from University of Southampton, Master of Computing from University of Wales and Doctor of Philosophy from University of Nottingham, United Kingdom. His area of specialization includes Programming Education, Use of Formal Methods in Software Development and Platform Technology. Throughout his career he has supervised more than 40 PhD and Master students and has published more than 100 papers. Dr. Abdullah has been invited speakers for a number of national and international conferences and seminars. He was the dean of the faculty from 2012 until 2020. Currently, he is the General Secretary, Academy of Professors Malaysia.

INVITED SPEAKER 4



TS. NOOR MOHD HELMI BIN NONG HADZMI
CEO & FOUNDER OF IX TELECOM

Disruptions Recreating Our Future

Abstract: What is the value of virtual networks in the telecommunications industry?

As an evangelist, one of the most exciting telco innovations is the ability to provide internet access with ZERO infrastructure. It's like the Uber of telco! We'll discuss how IX Telecom is built around this disruptive technology and digitalization. Digitalization has opened the door to elevate the human experience through constant innovation. Let's take for example the 4th Industrial Revolution (4IR) which is a mix of big data, artificial intelligence (AI), blockchain, cyber security and the Internet of Things (IoT), in a bid to combine the digital, physical and biological worlds. Imagine that. A world where people wear clothes connected to the internet, or self-driving cars operate our entire transport ecosystems. Zero human intervention. It's already happening. During my session, I will address the latest trends in telecommunications, the global internet and entrepreneurship. No matter what field of study you are in, these topics concern you in one way or another. See ya!

Biodata: Ts. NOOR MOHD HELMI BIN NONG HADZMI, a top-tier entrepreneur, technologist and engineer by profession, holds a bachelor degree in Telecommunication Engineering from Multimedia University, Malaysia. He has received Executive Education in Entrepreneurship from Stanford University and Big Data & Business Analytics from Harvard Business School. He is a Senior Member of IEEE. He was the winner of Malaysia Talent Corp Life at Work CEO Champion for two consecutive years 2018 & 2019 and the Top Nominee in the Technology Category Ernst & Young Entrepreneur of the Year 2017 and was awarded the BrandLaureate CEO Leadership Excellence Award 2018. Despite the Covid 19 pandemic, he was awarded CEO of the Year at the Asia Communication Awards in 2020 and the recent ASEAN Entrepreneur Award in 2021. Aside from entrepreneurship, he is in the industrial advisory panel for the Department of Electrical Engineering at the University Malaya, Adjunct Professor in the Faculty of Engineering and Built Environment of the Universiti Kebangsaan Malaysia and was an adjunct lecturer in the Universiti Teknologi PETRONAS. He is also one of the Board of Directors of the Multimedia University. Furthermore, he has made major contributions to the Startup ecosystem in Malaysia by promoting entrepreneurship and is also an Independent Director at Runcloud International Berhad. Via IX Ventures, he has invested in SnappEd, IX Health, Boneybone Studios and a few other startups.

Parallel Session 1

Parallel Session 1.1

Tuesday, 12 October 2021

Venue: Gamelan I

Track name: Informatics

Chairperson: Azryna Azlen Mohd Nordin

09.30 am	Paper ID 2	<p>Software Development Productivity Model: Validation through Expert Review</p> <p>Azryna Azlen Mohd Nordin, Rodziah Latih, Noorazean Mohd Ali</p> <p>Presenter: Azryna Azlen Mohd Nordin</p>
09.45 am	Paper ID 13	<p>The Green Software Measurement Structure Based on Sustainability Perspective</p> <p>Komeil Raisian, Jamaiah Yahaya, Siti Rohana Ahmad Ibrahim, Aziz Deraman, Tumen Yunos</p> <p>Presenter: Siti Rohana Ahmad Ibrahim</p>
10.00 am	Paper ID 39	<p>Factors That Discourage Knowledge Management Practices in the Malaysian Public Sector Using Rasch Model</p> <p>Subashini A/P Ganapathy, Zulkefli Mansor, Kamsuriah Ahmad, Mohd Zali Mohd Nor</p> <p>Presenter: Subashini A/P Ganapathy</p>
10.15 am	Paper ID 31	<p>Impact of Various IBM Quantum Architectures with Different Properties on Grover's Algorithm</p> <p>Mohd Harith Akmal Zulfaizal Fadillah, Bahari Idrus, Mohammad Khatim Hasan, Siti Munirah Mohd</p> <p>Presenter: Mohd Harith Akmal Zulfaizal Fadillah</p>

Parallel Session 1.2

Tuesday, 12 October 2021

Venue: Gamelan II

Track name: Applied Informatics

Chairperson: Siti Norliza Awang Noh

09.30 am	Paper ID 3	<p>The Effects of Serious Games on Students' Higher-Order Thinking Skills in Science Education</p> <p>Siti Norliza Awang Noh, Hazura Mohamed, Nor Azan Mat Zin</p> <p>Presenter: Siti Norliza Awang Noh</p>
09.45 am	Paper ID 7	<p>Designing Storyboard for Climate Change Game</p> <p>Nurlieda Ellyanna Munirrah Razali, Fadhilah Rosdi, Hazura Mohamed, Nor Azan Mat Zin, Ratna Zuarni Ramli, Norizan Mat Diah</p> <p>Presenter: Nurlieda Ellyanna Munirrah Razali</p>
10.00 am	Paper ID 21	<p>Low-Fidelity Testing of Gamification Application for Low Cognitive Users</p> <p>Nur Rahmah Zulkifli, Noraidah Sahari @ Ashaari, Nor Azan Mat Zin</p> <p>Presenter: Nur Rahmah Zulkifli</p>
10.15 am	Paper ID 25	<p>Analysis of Behaviour and Learning Style on Education 4.0 in Virtual Mentoring using Gamification</p> <p>Intan Yusrina Zairon, Tengku Siti Meriam Tengku Wook, Syahanim Mohd Salleh, Hadi Affendy Dahlan, Masura Rahmat</p> <p>Presenter: Intan Yusrina Zairon</p>

Parallel Session 1.3

Tuesday, 12 October 2021

Venue: Gamelan III

Track name: Electrical and Electronics Engineering

Chairperson: Saidatul Shema Saad

09.30 am	Paper ID 8	<p>Setting up Pi-Attenuator Circuit to Improve Performance of Partial Discharge Detector</p> <p>Naufal Hilmi Fauzan, Umar Khayam</p> <p>Presenter: Naufal Hilmi Fauzan</p>
09.45 am	Paper ID 22	<p>Open Switch Fault-Tolerant VOC-PI Controller based Vienna Rectifier for EV Charging Stations</p> <p>Gowthamraj Rajendran, Chockalingam Aravind Vaithilingam, Kanendra Naidu, Md Rishad Ahmed</p> <p>Presenter: Gowthamraj Rajendran</p>
10.00 am	Paper ID 44	<p>Self-Charging Technique for DC-Link Capacitor Voltage Control: A Review</p> <p>Nurul Farhana Abdul Hamid, Muhammad Ammirul Atiqi Mohd Zainuri, Aini Hussain</p> <p>Presenter: Nurul Farhana Abdul Hamid</p>
10.15 am	Paper ID 49	<p>Implementation of Maximum Power Point Tracking Techniques for PV-Wind Hybrid Energy System: A Review</p> <p>Saidatul Shema Saad, Muhammad Ammirul Atiqi Mohd Zainuri, Aini Hussain</p> <p>Presenter: Saidatul Shema Saad</p>

Parallel Session 2

Parallel Session 2.1

Tuesday, 12 October 2021

Venue: Gamelan I

Track name: Informatics

Chairperson: Sofian Ahmad Ali Kassaymeh

02.30 pm	Paper ID 4	<p>Study on Artificial Intelligence Approaches for Power Transformer Health Index Assessment</p> <p>Dhanu Rediansyah, Rahman Azis Prasajo, Suwarno</p> <p>Presenter: Dhanu Rediansyah</p>
02.45 pm	Paper ID 9	<p>Improvement of Application Cognitive Artificial Intelligence based on Doernenburg Ratio Method for Dissolved Gas Analysis Interpretation</p> <p>Elko Nurul Yaqin, Umar Khayam</p> <p>Presenter: Elko Nurul Yaqin</p>
03.00 pm	Paper ID 72	<p>Homomorphic Denoising Filtering for 3D Face Recognition</p> <p>Mat Kamil Awang, Nurul Kamilah Mat Kamil, Muhammad Hakimi Zamri</p> <p>Presenter: Mat Kamil Awang</p>
03.15 pm	Paper ID 54	<p>Age Estimation Using Shortcut Identity Connection of ResNet50 Based on Convolutional Neural Network</p> <p>Shohel Pramanik, Hadi Affendy Dahlan</p> <p>Presenter: Shohel Pramanik</p>
03.30 pm	Paper ID 77	<p>A Hybrid Salp Swarm Algorithm with Artificial Neural Network Model for Predicting the Team Size Required for Software Testing Phase</p> <p>Sofian Kassaymeh, Salwani Abdullah, Mohammed Alweshah, Abdelaziz Hammouri</p> <p>Presenter: Sofian Ahmad Ali Kassaymeh</p>

Parallel Session 2.2

Tuesday, 12 October 2021

Venue: Gamelan II

Track name: Applied Informatics

Chairperson: Eliza Annis Thangaiah

02.30 pm	Paper ID 23	<p>Determining the Values and Attributes in E-Learning from Vocational Teacher's Perspectives</p> <p>Eliza Annis Thangaiah, Ruzzakiah Jenal, Jamaiah Yahaya Presenter: Eliza Annis Thangaiah</p>
02.45 pm	Paper ID 28	<p>Conceptual Framework of Value in Use and E-Learning Success</p> <p>Kinn Abass Bakon, Nur Fazidah Elias, Ruzzakiah Jenal Presenter: Kinn Abass Bakon</p>
03.00 pm	Paper ID 32	<p>Enhance Motivation and Engagement in Blended e-Learning for TVET Using Gamification</p> <p>Laily Abu Samah, Amirah Ismail Presenter: Laily Abu Samah</p>
03.15 pm	Paper ID 34	<p>The Motivational Factors in the Learning Management System</p> <p>Nor Azlan Ahmad, Nur Fazidah Elias, Noraidah Shaari @ Ashaari Presenter: Nor Azlan Ahmad</p>
03.30 pm	Paper ID 59	<p>Adaptive Navigation Design Model for Education Learning System</p> <p>Wan Nur Liyana Wan Husain, Azrul Hazri Jantan Presenter: Wan Nur Liyana Wan Husain</p>

Parallel Session 2.3

Tuesday, 12 October 2021

Venue: Gamelan III

Track name: Electrical and Electronics Engineering

Chairperson: Muhammad Afiq Nurudin bin Hamzah

02.30 pm	Paper ID 27	<p>Respiratory Rate Estimations using Three Respiratory-Induced Variations on Photoplethysmogram</p> <p>Nurafifah Fikriastuti, Habibur Muhaimin</p> <p>Presenter: Nurafifah Fikriastuti</p>
02.45 pm	Paper ID 43	<p>FPGA Based Hardware Accelerator Design for Convolution Process in Convolutional Neural Network</p> <p>Ardian Dwi C, T.Adiono, Nana Sutisna</p> <p>Presenter: Ardian Dwi Cahyo</p>
03.00 pm	Paper ID 56	<p>Design of Low Power Gain-Cell eDRAM for 4Kb Cache Memory Array using 130nm Standard CMOS Technology</p> <p>Shi Rong Soo, Afiq Hamzah, N. Ezaila Alias, Izam Kamisian, Michael Loong Peng Tan, Suhaila Isaak, Zaharah Johari</p> <p>Presenter: Muhammad Afiq Nurudin bin Hamzah</p>
03.15 pm	Paper ID 63	<p>Design and Implementation of Low Cost IoT Sensor System for Urban Heat Island Observation</p> <p>Fachri Ilman Fauzandi, Yulia Retnowati, Josua Dion Tamba, Emir Mauludi Husni, Rahadian Yusuf, Bernardo Nugroho Yahya</p> <p>Presenter: Fachri Ilman Fauzandi</p>

Parallel Session 3

Parallel Session 3.1

Tuesday, 12 October 2021

Venue: Gamelan I

Track name: Informatics

Chairperson: Firas Layth Khaleel

04.00 pm	Paper ID 30	<p>Change Management Framework for Managing Information Systems Post Adoption in Public Sector</p> <p>Zaidatul Akhmar Kamarudzaman, Dian Indrayani Jambari</p> <p>Presenter: Dian Indrayani Jambari</p>
04.15 pm	Paper ID 40	<p>Identifying Wastes for the Development of Lean Postal Services</p> <p>Nur Niswah Hasina Mohammad Amin, Nur Fazidah Elias, Amelia Natasya Abdul Wahab</p> <p>Presenter: Nur Niswah Hasina Mohammad Amin</p>
04.30 pm	Paper ID 35	<p>An overview on Multimedia Big Data Analytics</p> <p>Firas Layth Khaleel</p> <p>Presenter: Firas Layth Khaleel</p>

Parallel Session 3.2

Tuesday, 12 October 2021

Venue: Gamelan II

Track name: Applied Informatics

Chairperson: Nelson Budin Sana

04.00 pm	Paper ID 36	<p>User Interface/User Experience (UI/UX) Analysis & Design of Mobile Banking App for Senior Citizens: A Case Study in Sarawak, Malaysia</p> <p>Elizabeth Ubam, Irwandi Hipiny, Hamimah Ujir</p> <p>Presenter: Elizabeth Ubam</p>
04.15 pm	Paper ID 41	<p>Usability Experience on Tourism Website using the USE Questionnaire Approach</p> <p>Tirza Madah Pratidina, Djoko Budiyanto Setyohadi</p> <p>Presenter: Tirza Madah Pratidina</p>
04.30 pm	Paper ID 75	<p>Gamifying Drug Abuse Screening Test: A Proof of Concept</p> <p>Nelson Budin Sana, Siti Norul Huda Sheikh Abdullah, Tengku Siti Meriam Tengku Wook, Lam Meng Chun, Rozmi Ismail, Mahadzir Elias</p> <p>Presenter: Nelson Budin Sana</p>
04.45 pm	Paper ID 33	<p>The Design of a Mobile Application for Managing Stress, DailyCalm</p> <p>Raja Nur Natasha Raja Ahmad Anuar, Nur Fazidah Elias, Nur Hamidatur Rohmah Nurahim, Siti Fadzilah Mat Noor, Noor Azimah Muhammad, Roseliza Murni Abd Rahman</p> <p>Presenter: Raja Nur Natasha Raja Ahmad Anuar</p>

Parallel Session 3.3

Tuesday, 12 October 2021

Venue: Gamelan III

Track name: Electrical and Electronics Engineering

Chairperson: Mohd. Faisal Ibrahim

04.00 pm	Paper ID 24	<p>An Oil Palm Loose Fruits Image Detection System using Faster R-CNN and Jetson TX2</p> <p>Ang Jin Xiang, Aqilah Baseri Huddin, Mohd Faisal Ibrahim, Fazida Hanim Hashim</p> <p>Presenter: Mohd. Faisal Ibrahim</p>
04.15 pm	Paper ID 47	<p>A DT-Neural Parametric Violin Synthesizer</p> <p>Muhammad Nizami, Dessi Puji Lestari</p> <p>Presenter: Muhammad Nizami</p>
04.30 pm	Paper ID 50	<p>Dimensional Optimization of 4-DOF Robot Manipulator Using Artificial Bee Colony Algorithm</p> <p>Mohd Hairi Mohd Zaman, Mohd Faisal Ibrahim, Asraf Mohamed Moubark</p> <p>Presenter: Mohd Hairi Mohd Zaman</p>
04.45 pm	Paper ID 60	<p>Frequency and Phase Drift in Scanning Trajectory for Endoscopic Imaging System</p> <p>Yang Sing Leong, Ahmad Ashrif A Bakar, Mohd Saiful Dzulkefly Zan, Norhana Arsad, Mamun Bin Ibne Reaz, Mohd Hadri Hafiz Mokhtar</p> <p>Presenter: Leong Yang Sing</p>

Parallel Session 4

Parallel Session 4.1

Wednesday, 13 October 2021

Venue: Gamelan I

Track name: Informatics

Chairperson: Kamsuriah Ahmad

10.00 am	Paper ID 18	<p>An Integrated Indexing Approach to Improve Query Processing</p> <p>Abdulghafor Abbas, Kamsuriah Ahmad</p> <p>Presenter: Kamsuriah Ahmad</p>
10.15 am	Paper ID 37	<p>Empirical Comparision on Boosted Cascade of Haar-like Features to Histogram of Oriented Gradients for Person Detection</p> <p>Azizi Abdullah, Dheeb Albashish</p> <p>Presenter: Azizi Abdullah</p>
10.30 am	Paper ID 53	<p>Heart Disease Prediction Using K-Nearest Neighbor</p> <p>Dadi Rahmat, Hamrin, Andika A. Putra, Agung W. Setiawan</p> <p>Presenter: Dadi Rahmat</p>
10.45 am	Paper ID 71	<p>Resource Selection Mechanism for Brokering Services in Multi-Cloud Environment</p> <p>Mohd Hairy Mohamaddiah, Mazuhan Mohamad Nor, Azizol Abdullah, Shamala K Subramaniam, Masnida Hussin</p> <p>Presenter: Mohd Hairy Mohamaddiah</p>

Parallel Session 4.2

Wednesday, 13 October 2021

Venue: Gamelan II

Track name: Applied Informatics

Chairperson: Yuli Rohmiyati

10.00 am	Paper ID 5	<p>The Validation of an E-Voting Adoption Model using Focus Group</p> <p>Mohammed Chalabi, Hazura Mohamed, Muriati Mukhtar</p> <p>Presenter: Mohammed Chalabi</p>
10.15 am	Paper ID 12	<p>The Usage of Electronic Resources in Libraries</p> <p>Yuli Rohmiyati, Tengku Siti Meriam Tengku Wook, Noraidah Sahari</p> <p>Presenter: Yuli Rohmiyati</p>
10.30 am	Paper ID 38	<p>The Conceptual Framework of Megalithic Cultural Information Visualization</p> <p>Sri Yanti Mahadzir, Zurina Muda, Siti Aishah Hanawi, Zuliskandar Ramli</p> <p>Presenter: Sri Yanti Mahadzir</p>
10.45 am	Paper ID 76	<p>Health Monitoring Framework for Drug Addict Rehab in Cure & Care Service Centre Malaysia</p> <p>Abbas Salimi Zaini, Siti Norul Huda Sheikh Abdullah, Khairul Akram Zainol Ariffin, Meng Chun Lam, Rusdi Abd Rashid, Zainudin Muhamad</p> <p>Presenter: Abbas Salimi Zaini</p>

Parallel Session 4.3

Wednesday, 13 October 2021

Venue: Gamelan III

Track name: Electrical and Electronics Engineering

Chairperson: Trio Adiono

10.00 am	Paper ID 26	<p>Feasibility Study of Wind Energy Generation Systems in Masirah Island: Real Case Study</p> <p>Firas Basim Ismail, Mohammed Najah Mahdi, Ahmad A. Salah, Nizar F.O. Al-Muhsen, Mohammad M. Shalby, Yaqoub K. Al Nafie</p> <p>Presenter: Firas Basim Ismail</p>
10.15 am	Paper ID 45	<p>Low-Power Current-Starved Digitally-Controlled Oscillator for Phase-Locked Loop in Battery- Powered Devices</p> <p>Tengku Ahmad Madya Putra, Trio Adiono</p> <p>Presenter: Tengku Ahmad Madya Putra</p>
10.30 am	Paper ID 51	<p>Power Management Design for Floating Net Cages Water Quality Monitoring System</p> <p>Trio Adiono, Felicia Albertha, Rahmat Mulyawan, Eni Sumiarsih</p> <p>Presenter: Trio Adiono</p>
10.45 am	Paper ID 64	<p>Performance Measurement of Real-time FPGA based OFDM System Implementation</p> <p>Trio Adiono, Michael Jonathan, Erwin Setiawan, Nana Sutisna, Rahmat Mulyawan, Infall Syafalni</p> <p>Presenter: Michael Jonathan</p>
11.00 am	Paper ID 66	<p>Design of Centralized Oxygen Saturation and Heart Rate Patient Monitoring System using Li-Fi</p> <p>Trio Adiono, Ryan Dharma Chandra, Hillary Christine, Erson Rasyadan, Rahmat Mulyawan, Infall Syafalni, Nana Sutisna</p> <p>Presenter: Trio Adiono</p>

Parallel Session 5

Parallel Session 5.2

Wednesday, 13 October 2021

Venue: Gamelan II

Track name: Electrical and Electronics Engineering

Chairperson: Mohd. Saiful Dzulkefly Zan

11.30 am	Paper ID 65	<p>An Engine Abstraction for Smart Engineering Platform</p> <p>Kusprasapta Mutijarsa, Yoanes Bandung, Armein Z. R. Langi, Marco William Langi</p> <p>Presenter: Armein Z. R. Langi</p>
11.45 am	Paper ID 68	<p>Improvement of Ocean Thermal Energy Conversion (OTEC) Efficiency by Using Ammonia-Water Zeotropic Mixture Working Fluid</p> <p>Burhanuddin Halimi, Ariel Generanta I.K.</p> <p>Presenter: Burhanuddin Halimi</p>
12.00 pm	Paper ID 70	<p>Hybrid WDM-TDM Fiber Bragg Grating Sensor Based on Wavelength Slicing</p> <p>Mohamed M. Elgaud, Mohd Saiful Dzulkefly Zan, Abdulfatah A. G. Abushagur, Norhana Arsad, Mohd Hadri Hafiz Mokhtar, Ahmad Ashrif A. Bakar</p> <p>Presenter: Mohd. Saiful Dzulkefly Zan</p>

Parallel Session 5.3

Wednesday, 13 October 2021

Venue: Gamelan III

Track name: Electrical and Electronics Engineering

Chairperson: Rami Ahmad

11.30 am	Paper ID 10	<p>New Framework for Authentication and key Establishment to Secure 6LoWPAN Networks</p> <p>Fatma Foad Alshrif, Elankovan A. Sundararajan, Rami Ahmad, Yousef Alkhatib</p> <p>Presenter: Fatma Foad Alshrif</p>
11.45 am	Paper ID 19	<p>Wearable Optical Sensor for Low Back Pain Monitoring</p> <p>E.B. Ahmad Tamizi, M. A. Zawawi, R. Adzemin</p> <p>Presenter: Erna Bistari Ahmad Tamizi</p>
12.00 pm	Paper ID 46	<p>Mobility and Queue Length Aware Routing Approach for Network Stability and Load Balancing in MANET</p> <p>Valmik Tilwari, MHD Nour Hindia, Alaa Bani-Bakr, Dushantha Nalin K. Jayakody, Faizan Qamar, Rosilah Hassan</p> <p>Presenter: Faizan Qamar</p>
12.15 pm	Paper ID 48	<p>Analysis on the Effect of Clustering and Lightweight Encryption Approaches on WSNs Lifetime</p> <p>Rami Ahmad, Elankovan A Sundararajan, Tarik Abu-Ain</p> <p>Presenter: Rami Ahmad</p>

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77	A Hybrid Salp Swarm Algorithm with Artificial Neural Network Model for Predicting the Team Size Required for Software Testing Phase	Sofian Kassaymeh, Salwani Abdullah, Abdelaziz, Mohammed Alweshah, Abdelaziz Hammouri

Paper ID 2

Software Development Productivity Model: Validation through Expert Review

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Abstract— Today's competitive environment in the software market requires organizations to increase their quality and reduce production costs. The best way to reduce costs in software development is by increasing productivity. In the meantime, there are some constraints in software development to increase productivity, such as writing source code too complex, duplication of source code, difficulty to share source code, ineffective communication, and other resource constraints. Therefore, cloud computing and SaaS can help in increasing the productivity of software development efficiently and effectively. The literature study identified 19 factors influencing productivities. We later group these factors into three main factors; process, development environment, and product or services that help maintain a good and improve software development performance. This paper aims to report the validation process results of identified productivity factors using an expert review approach. The expert review process consists of two steps; identify the expert and conduct the evaluation process. Consequently, the experts agree on three main factors with 17 sub-factors. This study contributes to enhancing software development productivity and increasing the company's performance as the Software Development Productivity Model emphasizes the engagement platform. Further research on improving software developer satisfaction level as obtaining the satisfaction will interpret the level of comfort and acceptability towards the SaaS usage.

Keywords— cloud computing, developer's satisfaction, productivity factors, SaaS, software developer

Paper ID 4

Study on Artificial Intelligence Approaches for Power Transformer Health Index Assessment

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Abstract— The power transformer is a critical and expensive asset in electrical transmission and distribution network systems. It is highly important to estimate its condition precisely to avoid unwanted outages. The health index (HI) is a tool to aid such decisions which allow for a quick and efficient way to assess, evaluate and compare the overall condition of the transformers population. The Artificial Intelligence-based HI is proposed to predict the condition of transformers. This is done to simplify, speed up, and reduce the uncertainty. A HI approach is to assess the power transformer from its oil quality, dissolved gas analysis (DGA), and paper condition. In this study, the total of 504 transformer assessment data (with voltage of 150kV) was used to classify HI. Seven AI methods were investigated, such as k-Nearest Neighbor (kNN), Support Vector Machine (SVM), Adaptive Boosting (AdaBoost), Random Forest (RF), Naïve Bayes (NB), Artificial Neural Network (ANN), and Decision Tree (Tree). At the end of the discussion, a comparison of various was carried out and evaluated using the accuracy of the actual HI category as a reference. Random forest model was chosen as the best performing AI method to predict HI categories, with the accuracy of 97.3%.

Keywords— artificial intelligence, health index, machine learning, power transformer, random forest

Paper ID 9

Improvement of Application Cognitive Artificial Intelligence based on Doernenburg Ratio Method for Dissolved Gas Analysis Interpretation

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Abstract — Cognitive Artificial Intelligence (CAI) is a new method in Artificial Intelligence (AI) that is able to emulate the human brain's ability for doing Knowledge Growing Systems (KGS). Previous research has presented the application of CAI based on Doernenburg Ratio Method (DRM) for Dissolved Gas Analysis (DGA) interpretation. This paper improves the previous research, there are correcting errors in data input and improving the "not significant" conditions in the grouping process. The data used in this paper is using the previous research, that is IEC TC 10 dataset labeled. This paper also adds a comparison with several methods, there are Fuzzy Inference System (FIS), Duval Triangle, Roger's Ratio Method (RRM), and Doernenburg Ratio Method (DRM). The results showed that the accuracy of CAI decreased by 3.43% from the previous research. Previous research resulted in 98.3% while this research resulted in 94.87%. The biggest contribution to decrease the accuracy is due to errors in the data input by 1.71%. While the proposed improvement, namely improving the "not significant" conditions, only reduces 0.85%. Based on the comparison of several methods, CAI still provides the highest accuracy.

Keywords— Cognitive Artificial Intelligence (CAI), Dissolved Gas Analysis (DGA) interpretation, Information Fusion, Knowledge Growing System (KGS)

Paper ID 13

The Green Software Measurement Structure Based on Sustainability Perspective

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Abstract— Green software and its products are crucial in solving the problems associated with the long-term use of software, especially from a sustainability point of view. A few studies have proposed green software but are still limited and lack balance measurements to attain green products. At the same time, without a mechanism for measuring the green ability of a particular software product executed in a specific environment, the mentioned benefits will not be guaranteed. Although sustainability and green can be accomplished when all dimensions are in balance, there is still a lack of balance measurements to achieve green products as needed by the industries and societies. The contributions of this study revolve around the works on green software measurements to attain a green software product from a sustainability's perspective. It provides a green measure structure consisting of the element, measurements, sub measurement, and metric. The study presented in this paper was conducted through theoretical review and contributed to the initial green software measurements investigation.

Keywords— Green Measurements, Green Software Product, Software Product, Sustainability Elements

Paper ID 18

An Integrated Indexing Approach to Improve Query Processing

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Abstract— Database management systems have become the most important process since millions and billions of data transactions taking place every second. It comes as surprise that database optimization and tuning has become the main key research. If the database processes are not handled properly, it will lead to a slow system and it might cause a lot of errors and there is a possibility for the system to crash. Since database main task is storing and accessing the data according to the user needs through SQL operations, therefore there is a need to optimize the database operations by reducing their response times. There are many ways to optimize database operations, but among those; database tuning seems the most challenging area. There are many studies done on the improvement of database tuning approach however they are still suffer from a slow query processing time. Factors causing slow processing time normally are due to small-shared pool size and improper execution plans used during queries. This study focused on improving database indexing to overcome these two factors. A combination of clustered index, non-clustered index and bitmap is proposed as an integrated approach in query processing. These combinations of indexes are tested using complex and simple queries. The results of this experiment are being compared with the result from the existing indexing approaches when using the same datasets. The result shows that these combinations are able to optimize the database systems. The proposed solution able to provide a database system that is fast in data retrieval and an improved performance percentage of 10% to 20% depending on the query, and the dataset used. Indirectly, this proposed solution enables companies' database systems to achieve its highest potential with maximum performance.

Keywords— clustered index, database tuning, non-clustered index, query processing

Paper ID 30**Change Management Framework for Managing Information Systems
Post Adoption in Public Sector**

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Abstract— Organization continues to invest in information systems (IS) for competitive advantage gain, cost reduction, profit and productivity gain, and accurate decision making. However, high failure rate in IS post adoptions is reportedly due to critical organizational changes in aspects consisting technology, cost, process, environment and people. Organization is challenged by people resistance towards the IS due to lack of awareness on the IS values, and poorly knowledgeable and skilled users. The challenges must be addressed properly by the management through effective change management for a successful IS post adoption. However, existing approaches are ineffective due to unclear references and support specifically for managing changes by IS implementation. Therefore, this study proposes a change management framework for IS post adoption which defines the critical success factors (CSFs) according to the change management phases. Expert review method is applied for the framework verification while its validation is carried out through a single case study in a selected public sector agency. The study establishes 19 CSFs in three change management phases for the IS post adoption. The findings contribute to improve the change management approach in IS management. In practice, organization can apply the framework to develop change management strategy for their IS post adoption.

Keywords—change management, critical success factors, information systems implementation, post adoption

Paper ID 31

Impact of Various IBM Quantum Architectures with Different Properties on Grover's Algorithm

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Abstract—Quantum computing and quantum algorithms have been said to be able to provide significant speed-up over classical computation with classical algorithms by exploiting the nature of quantum mechanical systems. In this work, we will study the qubit architecture of quantum systems available at IBM Quantum (IBM-Q) such as the properties of the qubit system, the qubit layout and connectivity as well as the transpilation process of circuits and its effects to the circuits. We investigate the correspondence between limited and sparse connectivity and connected physical qubits to Grover's algorithm implementation of 2 and 3 qubits. We will also test Grover's algorithm on the different connectivity available on four IBM-Q systems for 2, 3, 4 and 5 qubits using optimization level of 0, 1, 2 and 3 to compare the circuit depth of the transpiled circuits as well as their execution times. This work will provide guidance for researchers on the important factors to consider before implementing a quantum algorithm on a real quantum system.

Keywords— Grover's algorithm, IBM Quantum, Qiskit, quantum algorithm, quantum computing

Paper ID 35

An overview on Multimedia Big Data Analytics

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Abstract—Today, multimedia database management is the most important for the new generation and specifically in big data issues for instant saving, calling and modifying operations for many types of documents as text, video and audio. A huge number of previous researches have been done in the multimedia subject, such as index and storage of multimedia data. However, very few resources on this research work that how to manage a large size of data, as future work. In this paper, suggestion of new method that describes the general model of any kinds of the multimedia database management system, that's lead to a decrease of seeking time/ increase speed time when we have to find for particular data type such as portable data format (PDF). Finally, this study concludes with potential future work for applying the current model to improve the result of usability, management the accessibility and effectiveness of multimedia in big data

Keywords— application, big data database management system, DBMS, multimedia

Paper ID 37**Empirical Comparison on Boosted Cascade of Haar-like Features to Histogram of Oriented Gradients for Person Detection**

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Abstract— Person Detection can be used for various applications and consider one of the most challenging problems in computer vision. Many methods have been proposed to perform person detection, and two of the most popular form are Haar-Like features and Histogram of Oriented Gradients. Knowing which techniques work well is very important when making an application that uses person recognition and localization. This paper examines these two algorithms to determine which algorithm works best in a proposed dataset. In contrast to the default configuration, this study identifies and performs several essential characteristics of the algorithm pipeline to achieve an accurate comparison of the approaches. Then the classifier models are evaluated and compared for person detection. The result shows that Histograms of Oriented Gradients to be much more precise than Haar-like features. However, the Haar-like Features technique works much faster.

Keywords—Haar-like features, histogram of oriented gradients (HOG), person detection, support vector machine (SVM)

Paper ID 39

Factors That Discourage Knowledge Management Practices in the Malaysian Public Sector Using Rasch Model

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Abstract— Knowledge management (KM) is the strategy for determining, organizing, retaining, and sharing an organization's employees' knowledge and experience. The primary goal of KM is to promote organizational efficiency while simultaneously storing knowledge. The significance of KM grows year after year. As the KM platform becomes more competitive, it's necessary to identify the most recent KM problems in terms of practices. As a result, one of the best ways to stay up with this KM trend is to build a smarter, more regulated organization with appropriate evaluation criteria. Many public sectors continue to have trouble in effectively carrying out KM practices when compared to the private sector. The primary goal of this study was to elicit perspectives from IT practitioners, such as the employees, to identify the discourage factors driving the current KM practices collectively in the public sector of Malaysia. This study used hybrid approaches, such as a quantitative approach, and delivered a total of 272 questionnaires to IT practitioners in public organizations. A qualitative approach was also used to gather an opinion from the IT practitioners to certain KM operations in the organization. A total of 256 returned responses were examined using the Rasch Measurement Model. The current study's findings revealed that KPA People were not encouraged in terms of Human Resources, followed by KPA Technology with a lack of use of IT tools, on the other hand, information sharing, and knowledge dissemination in terms of KPA Processes need specific attention, and finally, in terms of KPA Strategy, monitoring of KM activities, and employee skill retention discourage the overall KM practices in the organization.

Keywords—influencing factors, knowledge management, practices, public sector, Rasch analysis

Paper ID 40

Identifying Wastes for the Development of Lean Postal Services

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Abstract—Lean is implemented in services aimed at improving the efficiency and quality of services. However, waste in the services industry is difficult to identify compared to the manufacturing industry. This study explores the type of waste in lean service. Finding from this study is expected to help lean managers and service managers identify the waste that can be eliminated or reduced in lean service.

Keywords—lean service, lean thinking, waste

Paper ID 53

Heart Disease Prediction Using K-Nearest Neighbor

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Abstract—Heart disease is a Non-Communicable Disease (NCDs) on cardiovascular system. It has long-term impact that can turn to death, but it has no symptoms that make it hard to recognize. The heart disease prediction believed to detect the presence of heart disease. Recent developments use various approach with machine learning, one of those is K-Nearest Neighbor (KNN). It will become a computer aid system to diagnose the heart disease. A drawback of using KNN is still achieve low accuracy that make the prediction is not helpful. The aim of this study is to improve the performance of heart disease prediction using standardization dataset and feature selection for KNN. We perform method to prepare data such as KNN imputation and standardization, also feature selection with SelectKBest. The performance is validated by 10-Fold Cross Validation. This paper present better precision of 95.50%, recall of 84.16%, and accuracy 89.28% for 0.59 ms. This study provides alternative method for processed data on heart disease prediction. We compare latest study to discover better solution in this field. The result will evolve the knowledge of machine learning in medical purpose.

Keywords— feature selection, heart disease prediction, KNN, 10-fold cross validation

Paper ID 54

Age Estimation Using Shortcut Identity Connection of ResNet50 Based on Convolutional Neural Network

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Abstract—Age estimation plays a vital role in real-life applications. Such as age-based facial classification, surveillance, the search for missing people, entertainment like age cameras, and determining how the human face changes with growing age. Current deep learning-based approaches have shown encouraging performance in age estimation. Estimating age through automated analysis with facial images is still a challenging issue. Automatic age estimation is still ongoing research. Most existing algorithms require a large amount of face data. To accurate age estimation from facial images requires a large amount of image data in the training period. The face outlook and the neck changes with age. Thinning skin and increase or loss of muscle tone give the face a different appearance. For that, all existing methods require a large amount of face-aging subjects. This paper proposed an age estimation using shortcut identity connection of ResNet50 architecture. The proposed architecture is 50 layers of Residual Network (ResNet50) based on CNN. The proposed algorithm can solve a few face-aging subject's problems using the shortcut identity connection of residual blocks. The proposed algorithm has used the ImageNet database as the primary face aging database of the proposed gateway. The experimental results of the proposed model are close to the experimental results of other models. The experimental results have shown that using Convolutional Neural Network (CNN) containing ImageNet facial images information with 35 layers of residual network with a Mean Absolute Error (MAE) of 1.38.

Keywords—age estimation, convolutional neural network, residual block, residual network, shortcut identity connection

Paper ID 71

Resource Selection Mechanism for Brokering Services in Multi-Cloud Environment

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Abstract—Job scheduling plays a vital role as for resource management in cloud computing which will allocate the resources and schedule the jobs for execution. The resources' selection is a crucial part in resource broker for scheduling the incoming jobs. However, in the process of selecting the resources, there are scenarios which may occur such as overutilized and underutilized resources when processing the jobs. In this paper, we proposed a resource selection mechanism for brokering services in multi-cloud environment by adopting one of the machine learning technique called classification technique. The proposed mechanism will select the `best resources that can be used to process the jobs to increase resource utilization. We perform our simulations using CloudSim Toolkit. Simulation results demonstrate that our mechanism outperformed other mechanisms in terms of utilization rate of the resources, therefore provide improvement in resource usage.

Keywords— classification, cloud computing, resource selection, scheduling

Paper ID 72

Homomorphic Denoising Filtering for 3D Face Recognition

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Abstract— Image denoising is a crucial method in image processing in many sectors including Medicine, Engineering, Statistics, Physics, Chemistry, and Information Science that require a clear image for examination. Image denoising is a procedure to remove noise that shows up on images caused by interference. Each Image denoising method has its own advantages and constraints in its respective algorithms. The principal objective of this work is to modify existing algorithms to be applied in facial recognition for future reconnaissance frameworks. The improved algorithm produces a superior outcome in image denoising and also creates a better quality of 3D images in terms of MSE, PSNR, and SNR measures.

Keywords—image denoising, improved algorithm

Paper ID 77

A Hybrid Salp Swarm Algorithm with Artificial Neural Network Model for Predicting the Team Size Required for Software Testing Phase

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Abstract— The software project director has to keep estimating the required resources and planning the schedule for deliverables. Unfortunately, such estimation and planning are not accurate unless careful monitoring and control plan is maintained because software development is risky. In this paper, an investigation was carried out by integrating a promising metaheuristic algorithm with an artificial neural network to optimize the network parameters to address predicting the size of a software test team. The target of this integration was to enhance the accuracy of network prediction. The proposed method has been evaluated on two datasets. These datasets have different characteristics and have been extracted from the industry repository. The comparative results proved the superiority of the proposed method over the other methods.

Keywords— backpropagation neural network, metaheuristic, optimization, salp swarm optimizer, software testing, team size prediction



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Paper ID 8

Setting up Pi-Attenuator Circuit to Improve Performance of Partial Discharge Detector

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Abstract— Partial discharge is a localized electrical discharge that only partially bridges the insulation between conductors and can or cannot occur adjacent to a conductor. One of the ways to detect partial discharge with the direct voltage method is to use a matching impedance circuit. Matching impedance can maximize the partial discharge current transfer by adjusting the impedance of the circuit with the impedance of the partial discharge measurement circuit. In addition to using a matching impedance circuit, a Microwave Monolithic Integrated Circuit (MMIC) ultra-wideband amplifier is also used. This research carried out simulation using the Advanced Design System (ADS) software and testing the circuit characteristics using Vector Network Analysis (VNA). Based on the simulation results, the circuit with the best characteristics is a series with an attenuation value of 1-6dB. Based on the circuit test results using VNA, it is found that the circuit with an attenuation value of 3dB is the best series with a minimum return loss value of -25dB, maximum gain is 11dB, and an impedance of 49 Ohm.

Keywords— attenuation, impedance matching, partial discharge, ultra-wideband

Paper ID 10

New Framework for Authentication and key Establishment to Secure 6LoWPAN Networks

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Abstract— This paper describes a design of a lightweight authentication solution for the 6LoWPAN based Wireless Sensor Network. 6LoWPAN nodes are classified as constrained devices with limited memory and computing power. Therefore, since confidential data is shared in various fields through a public channel, the underlying resources are vulnerable to security threats. Moreover, constrained devices make it impossible to secure information using traditional resource-intensive encryption algorithms such as biometric, username, and password. Therefore, a variety of symmetric cryptographic and public key-based authentication methods have been proposed to address such issues. Conversely, the solutions still suffer from large communication and computational overhead problems and do not resist some known attacks. Our proposed framework aims to reduce computing and communication costs by using lightweight authentication-based symmetric key management. It employs a hash-based method, pre-distribution key, track sequence, nonce, and symmetric Lici-2 algorithm in both phases (establishment and authentication). This proposal framework is expected to resist attacks as exemplified by to reply and man in the middle.

Keywords— key establishment, lightweight authentication, symmetric encryption, wireless sensor network, 6LoWPAN

Paper ID 19

Wearable Optical Sensor for Low Back Pain Monitoring

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Abstract— Low back pain (LBP) is one of the major issues related to health problems among adults especially people of working age range. Manual therapy is one of the approaches in treating LBP, aside from exercise, biofeedback, relaxation, massage, and rehabilitation. It is often conducted by physiotherapist or chiropractor to encourage joint mobilization of the spine under a controlled environment. To effectively monitor the progress of spine recovery in LBP treatment, certain device is required to assist the physiotherapist in collecting related static and dynamic spine data. Conventional ways to get the spine data are by using X-ray and MRI, but they are less preferable for repetitive use due to expensive and may cause skin irritation. Alternative devices for this application include goniometer, inclinometer, tape measure as well as spine mouse. Although these options are low cost, manual handling of the devices by inexperienced users will result in inaccurate spine data collection. The aim of this paper is to study and compare the performance of several spine monitoring devices that have been developed by past researchers and then to propose an alternative solution of spine monitoring sensor based on optical sensor that could provide continuous data of the spine kinematics. A sensor design using a microbending optical fibre technique could potentially give various advantages because of the small sensor size and low cost needed for sensor component assembly which will only use a visible wavelength LED and photodiode, and less affected to external signal interference.

Keywords—

Paper ID 22

Open Switch Fault-Tolerant VOC-PI Controller based Vienna Rectifier for EV Charging Stations

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Abstract— Power electronic converters are one of the key facets of modern electric vehicle charging applications. Recently it has been widely accepted in EV charging stations industries that the power converters should be robust and have good capability of fault tolerance, and fault tolerance methods need to be cost-effective and easy to implement. An open-switch fault-tolerant controller for the Vienna rectifier used in EV charging stations is introduced in this paper. The input current harmonic rises lead to a poorer power factor on the grid side when an open switch fault occurs. The controller gives better performance despite the open-switch fault occurring in any one phase. The VOC-PI controller for the Vienna rectifier can reduce input current THD to less than 5%, which satisfies the IEEE-519 standards. The proposed system is simulated using MATLAB/Simulink software.

Keywords— Vienna rectifier, voltage oriented controller, fault detection, electric vehicles, charging stations

Paper ID 24

An Oil Palm Loose Fruits Image Detection System using Faster R-CNN and Jetson TX2

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Abstract—Palm oil is an essential world vegetable oil. The oil palm is reported to have the highest oil yield compared to other major world crops. Palm oil can be extracted from two main sources that are fresh fruit bunches and loose fruits. Although the main focus of the oil producer is to collect fruit bunches, the loose fruit has relatively higher oil content. However, the condition of scattered loose fruits at the farm wastes the farmers' time and energy in the loose fruit collecting process, and it leads to the lower back pain and spine fatigue of the workers. The conventional methods for collecting loose fruit such as manual hand-picked or a roller-type fruit collector are still less efficient. Hence, this work proposes a system for oil palm loose fruits detection using Faster R-CNN, a deep learning algorithm and NVIDIA Jetson TX2 hardware. In this study, 500 images of loose fruits were collected from an oil palm farm at Bukit Bangkong, Selangor during the harvesting process. The data were pre-processed using few techniques such as image resizing, cropping, data augmentation and data labelling. Faster R-CNN, a deep learning algorithm is used to train the model of the detection system by using 400 images from the acquired sample. The trained model was validated and tested with the remaining 100 images from the sample. The model performance showed that the loose fruit detection system is built successfully when it achieved accuracy for about 94%, 94% and 91% for intersection-of-union thresholds equal to 0.5, 0.7 and 0.9, respectively. The result showed that the developed system is able to detect oil palm loose fruits accurately and has the potential in contributing to the development of oil palm loose fruit automatic harvesting system.

Keywords— deep learning, faster R-CNN, Jetson TX2 GPU, oil palm loose fruit, object detection

Paper ID 26

Feasibility Study of Wind Energy Generation Systems in Masirah Island: Real Case Study

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Abstract—Recently, the energy demand has significantly increased due to the rapid advancement of modern societies in the developed countries. Simultaneously, the environmental concerns have led to more interest in clean energy sources (e.g., wind

energy and Solar energy). Oman is one of the countries that had set a goal for long-term growth in the renewable energy sector. However, the feasibility assessment for

installing wind energy projects in Oman was not given much attention. This paper investigates wind energy generation at Masirah island. The electrical energy requirements for Masirah island are addressed and then investigated using a hybrid energy system to meet the electrical load demand. This hybrid power system will involve wind energy and diesel power. The wind speed data was continuously gathered for three years 10 meters above sea level. The wind data were analyzed annually and seasonally using the Weibull distribution and Rayleigh parameter. Several wind turbines of 20 kW were studied to determine the best power generation on the site. In addition, this paper focuses on off-season energy generation and energy storage. Hence, different generators were investigated to fulfil the requirement of the proposed settings.

Keywords— diesel generators, hybrid power system, Rayleigh parameter, renewable energy, Weibull distribution, wind energy

Paper ID 27

Respiratory Rate Estimations using Three Respiratory-Induced Variations on Photoplethysmogram

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Abstract—Other than SpO₂ and heart rate (HR), respiratory rate (RR) has become one of the baseline clinical characteristics as risk factors for Covid-19 mortality. Commonly measured using capnography and impedance pneumography (IP) in hospitals, respiratory rate is possibly incorporated in one portable device of pulse oximeter for home monitoring together with SpO₂ and HR. Photoplethysmogram (PPG) signals, recorded by pulse oximeters, are modulated by respiration due to physiological mechanisms. There are three respiratory-induced variations on PPG signals: baseline wander (BW), amplitude modulation (AM), and frequency modulation (FM). From these three modulating signals, we estimated an RR value by various data fusions. In addition to the artifact handling mechanism, we also presented the effects of signal lengths on the performance of RR estimation methods in terms of error metrics and their ability to detect sudden changes in RR values.

Keywords—data fusion, photoplethysmogram, respiratory-induced variation, respiratory rate estimation, window size

Paper ID 43

FPGA Based Hardware Accelerator Design for Convolution Process in Convolutional Neural Network

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Abstract—The development of hardware accelerators for deep learning has increased rapidly due to the demand for flexibility to be applied to various deep learning architectures. The architecture that is widely marketed in recent years is GPU-based architecture where developers encounter many difficulties for accelerators to be applied to many different architectures. In this paper, the author will design an FPGA-based accelerator that will be used to handle processes in the convolution layer of Convolutional Neural Network (CNN). The system is designed with a base clock of 10 ns capable of providing a throughput of 1Gbyte/sec. The test results using a kernel with a size of 3×3 completed with an iteration time of 2683.92 us with a latency of 7930 ns. Furthermore, testing using a 2×2 kernel was completed with an iteration time of 2643 us with a latency of 5930 ns.

Keywords—convolutional neural network, convolution layer, hardware accelerator

Paper ID 44

Self-Charging Technique for DC-Link Capacitor Voltage Control: A Review

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Abstract— DC-link capacitors are a crucial component of many electronic converters because they aid in reducing dc-link voltage ripple, absorbing harmonics, and controlling the instantaneous power imbalance between the converter's front-end and rear-end. The dc-link's primary purpose is to operate as a continuous DC storage for the converter's injection current in response supply current. Uncontrolled dc-link capacitor voltage control can cause over-voltage and under-voltage, damaging the dc-link capacitor and disoperation of injection current. Due to the advantages of giving good accuracy of DC voltage and producing a clean and smooth regulated voltage with nearly no ripple, noise, and spike; a dc-link capacitor voltage control with self-charging technique is introduced. This paper reviews the recent self-charging technique applied to regulate the voltage of dc-link capacitor, which is typically categorized into two forms; (1) proportional-integral technique; and (2) fuzzy logic control (FLC) technique. In addition, the working principle, advantages, and disadvantages of both methods are discussed.

Keywords— dc-link capacitor, self-charging technique, voltage control technique

Paper ID 45

Low-Power Current-Starved Digitally-Controlled Oscillator for Phase-Locked Loop in Battery- Powered Devices

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Abstract—The demand for IoT SoCs with low power and high precision internal oscillators is greatly increasing. This paper presents a design of digitally controlled oscillator which has low power consumption suitable for use in phase-locked loop inside battery-powered devices. The design incorporates current-starved logic buffers in ring configuration to produce oscillating logic signal as clock source. The circuit has been implemented and fabricated in 180-nm CMOS technology. The measured fabricated chip achieves frequency range from 1.1 MHz to 200 MHz. The power consumption is very low that only consumes 872 μW at maximum frequency and 59.4 μW at minimum frequency.

Keywords—current-starved, digitally-controlled oscillator, low power, ring oscillator



Paper ID 46

Mobility and Queue Length Aware Routing Approach for Network Stability and Load Balancing in MANET

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Abstract—Traffic congestion and link failure are the two main issues in mobile Ad-hoc networks (MANETs). The destination node should receive the desired message from the source node with maximum throughput and minimum end-to-end delay. The delay in transmission is due to the high traffic causing greater size of Queue Length (QL). Therefore, this paper proposed a mobility and QL aware multipath (MQAM) routing approach based on Multiple Criteria Decision Making (MCDM) metric. The outcome evidence that the proposed MQAM routing approach effectively improves the performance metrics like throughput, PDR, end-to-end delay, and packet drops as compared to the conventional Multipath-Optimized Link State Routing (MP-OLSR) routing approach.

Keywords— MANETs, queue length, MQAM, MCDM, MPOLSR

Paper ID 47

A DT-Neural Parametric Violin Synthesizer

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Abstract— In the field of musical sound synthesis, expressive synthesis is generally more preferred for many genres. One of highly demanded musical instrument synthesis is for bowed string instruments. Currently, there is no fully automated expressive synthesis for string instruments, only partially automated which needs expressive gestures as additional inputs. We present a model for expressive violin synthesis adapted from neural parametric singing synthesis technique. Using neural parametric technique allows the system to learn expressive gestures from dataset, without the need for expression labeling. We also modified the system to better match the domain of bowed string instruments. We use harmonic plus stochastic encoding as the output to better represent bowed instrument sound. We also use decision tree (DT) instead of neural network to generate the expressive timing deviations. We compare our system to existing RPM synthesis technique as our baseline, without expression as input, or represented by flat expression. Correlation coefficient metric shows that the proposed system is superior in learning expressive gesture patterns. However, listener's preference scores show that the baseline RPM technique is more preferred in terms of naturalness. Blind open-ended questions reveal that the proposed system is deemed more natural in terms of timing deviations, pitch deviations, dynamics variations, phrasing, and some other minor things. The listener's preference scores are highly inclined against the proposed system because the proposed system produces unrealistic timbre. Future works should be done to improve the timbre while maintaining superiority in timing, pitch, dynamics, and phrasing.

Keywords— conditional autoregressive models, deep learning, machine learning, violin synthesis

Paper ID 48

Analysis on the Effect of Clustering and Lightweight Encryption Approaches on WSNs Lifetime

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Abstract— The energy consumption and security efficiency are still main challenges in Wireless Sensor Networks (WSNs) due to their hardware resource-constrained nature. The 6LoWPAN protocol was developed to improve WSNs communication, security, and node management optimization. Hence the protocol energy efficiency and security can be improved. In this paper, we address the WSN nodes' power consumption by analyzing the Dynamic Cluster Head (DynCH) technique, which automates the process of selecting WSN Cluster Head (CH) nodes based on the WSN nodes' energy and nodes' distances among each other in mobile WSN nodes. Moreover, this analysis covers the complexity of DynCH in different environments to prove its efficiency compared to the steady CH mechanism. In addition, we present the performance analysis of different lightweight systematic block encryption algorithms along with DynCH scheme on WSNs lifetime. In particular, Speck128, FlexenTech, Tiny Encryption Algorithm (TEA), and Advanced Encryption Standard (AES) algorithms are used in order to determine the amount of energy consumed by the sensor nodes and their effect on the network lifetime. The Cooja simulator is used to evaluate our analysis. Finally, the outcome of the analysis has showed that DynCH improves the wireless network lifetime by 45% compared to steady clustering approach. Moreover, the analysis also shows that, Speck128 consumed 26%, FlexenTech consumed 52%, TEA consumed 65%, and AES consumed 78% of wireless network lifetime compared to unsecure wireless networks communication, respectively.

Keywords— lightweight encryption, symmetric encryption, WSNs, WSN security, WSN lifetime

Paper ID 49

Implementation of Maximum Power Point Tracking Techniques for PV-Wind Hybrid Energy System: A Review

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Abstract— A rising number of people are interested in using a PV-Wind hybrid system. This hybrid system is found to perform better compared by using a single source system. Regarding to the non-linearity of the photovoltaic (PV) and wind source output, and the changing environmental circumstances, the hybrid system requires the usage of maximum power point tracking (MPPT) controller. Various MPPT techniques for PV-Wind hybrid systems have been reported in several articles during the last few years. This paper reviews several MPPT techniques that have been implemented in the existing PV-Wind hybrid system. Those MPPT techniques have been classified into three groups which are classical, artificial intelligent (AI) and bio-inspired. The principal operation, advantages, and disadvantages of a few techniques of each group has been discussed. Also, a MPPT structures, types of DC-DC converter, and performance of the MPPT are being presented.

Keywords— artificial intelligent (AI), bio-inspired, classical, hybrid system, maximum power point tracking (MPPT), photovoltaic (PV)-Wind

Paper ID 50

Dimensional Optimization of 4-DOF Robot Manipulator Using Artificial Bee Colony Algorithm

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Abstract—Kinematic synthesis has become an essential issue in robot design, and as a result, much research in recent years has focused on the optimal dimensional synthesis of robot manipulators. However, for particular application area, such as robots in the agriculture field, the robot design is more challenging and need to consider the unstructured structure and working environment. For such an application, the robot manipulator with an open-source design has a high potential to be utilized and optimized. This paper uses an artificial bee colony algorithm (ABC) to optimize the structural dimensions of a four degrees-of-freedom robot manipulator. It was found that the robot manipulator with optimized dimensions effectively reaches the desired end-effector position. For example, for the target position of (1.5, 0.5, 2.0), the optimal link lengths generated an actual end-effector position of (1.4990, 0.4995, 2.000), with a mean position error of 0.62174 mm. This outcome shows that the optimal dimensions of the robot manipulator can be accurately obtained using the ABC algorithm.

Keywords— artificial bee colony, dimensional optimization, kinematic synthesis, robot manipulator, structural optimization

Paper ID 51

Power Management Design for Floating Net Cages Water Quality Monitoring System

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Abstract— Floating net cages are widely used by fishermen in Indonesian lakes. The water quality needs to be monitored by IoT devices to ensure the fish can live and grow well. However, the power sources are difficult to find in the lake area. In this paper, we propose a power management system to regulate and fulfill all system power requirements of water quality IoT monitoring system by using solar cell technology. The main component of this system is the polycrystalline solar panel and lithium-ion rechargeable battery installed using a combination of two series and parallel circuits. The system also has a power saving mode with 28 minutes OFF and 2 minutes ON in 30 minutes intervals to minimize power consumption. The proposed system has been tested to work properly in practical conditions for more than 120 hours.

Keywords— internet of things, power management, solar cell, water quality monitoring

Paper ID 56**Design of Low Power Gain-Cell eDRAM for 4Kb Cache Memory Array using 130nm Standard CMOS Technology**

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Abstract— Gain-cell (GC) embedded dynamic random-access memory (eDRAM) provides high density, low leakage power, small size, and two-port functionality. However, GC-eDRAM requires power-hungry periodic refresh cycles to maintain data compared to conventional SRAM, owing to its dynamic storage mechanism. In this work, low-power design techniques, which are single-supply three-transistor (3T) GC-eDRAM and 4T GC-eDRAM with internal feedback, are proposed to improve the power consumption by extending the data retention time (DRT). The topology of a single supply 3T GC consists of a transmission gate (TG) in the write port that has the self-dampening effect of charge injection (CI) and clock feedthrough (CF), which allows the transmission of a strong initial data level. The topology of the 4T GC with internal feedback consists of two additional transistors that provide an internal feedback mechanism to suppress the deterioration of the weaker data level. Both methods provide a lower data decay rate and a stronger initial data level that helps to prolong the DRT and subsequently reduce the periodic refresh cycles, resulting in lower power consumption.

Keywords—Data retention time, embedded DRAM, gain cell, low power design, SRAM

Paper ID 60

Frequency and Phase Drift in Scanning Trajectory for Endoscopic Imaging System

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Abstract— Optical fibre cantilever that is on Lissajous scanning systems are widely used for optical imaging. But, this type of system is vulnerable to frequency and phase shifts. We report the theory behind the shift in Lissajous scanning trajectories caused by dynamic discrepancies in the scanning system. The impact of phase mismatch between phase response of the scanning system and driving signal during the image reconstruction was demonstrated via simulation. As long as the scanning system's phase response is correctly monitored, new opportunities for enhanced Lissajous scanning systems can be explored.

Keywords—Lissajous Scan, Optical Imaging, Cantilever Vibration

Paper ID 63

Design and Implementation of Low Cost IoT Sensor System for Urban Heat Island Observation

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Abstract—Urban Heat Island (UHI) is a phenomenon that deserves some considerations because of the effect on humans living in a certain environment. It is characterized by higher temperatures in urban than in rural area. Generally, there are 2 typical identification methods for UHI: indirect measurement such as remote sensing, and direct measurement such as fixed stations and mobile traverses. Remote sensing is a common approach, especially in Indonesia. However, fixed stations are difficult to establish due to economic factors. A system that collects data from various point of observation to figure out the surrounding area, similar to and an alternative of fixed station, can be beneficial for Indonesia. Therefore, we propose a UHI monitoring system based on Internet of Things (IoT). In the design of low-cost IoT sensor node, sensor boards are encapsulated in enclosure and sensor point tip is covered by custom Stevenson screen to reduce solar radiation. Temperature and humidity data are collected every minute and sent through the internet using MQTT protocol every hour. Gathered and stored data are subscribed automatically using the Amazon Web Service, and an API is provided to access the data. Based on the implementation, we analyze the data and showed that there are distinctions in temperature and humidity between roadway and residential area. The result also showed that this system can retrieve data from a low-cost IoT sensor node that can be collected, stored, and accessed by a cloud service via API.

Keywords— IoT, low-cost sensor, UHI

Paper ID 64

Performance Measurement of Real-time FPGA based OFDM System Implementation

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Abstract— The actual performance of OFDM-based communication systems and the simulation results often have significant differences. This paper investigates the performance measurement of our FPGA based real-time OFDM system, which has features on flexible and scalable architecture. The measured performances are emphasized on the throughput and packet-error-rate (PER) against signal-to-noise-ratio (SNR) and received-signal-strength-indicator (RSSI). Two FPGA based RF Transceiver boards are employed as transceivers implementation platform. The transmission experiments are done in FDD using 241 MHz downlink and 261 MHz uplink with 3.5 MHz bandwidth. The performance measurement is taken in an indoor environment under line-of-sight (LOS) conditions using four quarter-wave antennas from 0.5 m to 8 m distance range. We also observed the fluctuations of SNR upon distance variations for each MCS. From experimental results, the designed system can achieve the maximum throughput at 4.76 Mbps when employing MCS 4, while the minimum throughput is 0.991 Mbps when employing MCS 0. In addition, we also found the RSSI limit of the designed system which can be used to assess the quality of the designed receiver system as well as determining several parameters during system deployments.

Keywords— real-time FPGA, OFDM, RSSI, SDR, SNR, throughput

Paper ID 65

An Engine Abstraction for Smart Engineering Platform

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Abstract—This paper outlines an engineering platform capable of engineering multi domain systems, with an emphasis on engine abstraction. Traditional engineering science approaches have succeeded in developing infrastructure, products and applications, but they are not enough to answer the complexity of the issues of living in the 21st century. We are developing Smart Engineering Platform (SEP), having five dimensions (i) hard, (ii) soft, (iii) liquid, (iv) vapor, and (v) the spatial engineering. These engineering dimensions have resulted in design and implementation of hardware, software, liquid-ware, vaporware, and spatial-ware as core engines. Combining these dimensions results in multi-domain systems, such as signal processing systems, competitive systems, as well as spiritual computing (immersive environments).

Keywords— competitive systems, engine abstraction, engineering, hard-soft-liquid vapor-spatial ware, spiritual computing

Paper ID 66

Design of Centralized Oxygen Saturation and Heart Rate Patient Monitoring System using Li-Fi

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Abstract— We propose a Patient Monitoring System (PMS) that employs networked optical wireless technology based on visible light (LiFi) to realize safe and secure wireless communication in hospital environments. The PMS is designed to transmit uplink patient data through On-Off Keying (OOK) modulation using off-the-shelf components (Arduino Nano). The system is able to monitor the heart rate and blood oxygen level with 96.75% and 98.87% accuracy, respectively. Experimental results show that the proposed PMS can offer accurate monitoring data transmission with minimal interference at 2.5 m distance between transmitter and receiver.

Keywords—Li-Fi, patient monitoring

Paper ID 68

Improvement of Ocean Thermal Energy Conversion (OTEC) Efficiency by Using Ammonia-Water Zeotropic Mixture Working Fluid

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Abstract— Nowadays, the energy demand is continuous increasing due to the growing population in the world. However, the major primary energy resources, fossil fuels, are inadequate. Thus, it is required to find another energy resources, especially the renewable ones, to meet the energy demand. One of prospective renewable energy resources is marine energy. In this paper, an ammonia-water zeotropic mixture is proposed to improve the ocean thermal energy conversion system's efficiency. Two scenarios of the ammonia-water zeotropic mixture are selected i.e. a mixture of 95% ammonia/ 5% water and a mixture of 97% ammonia/ 3% water. The ammonia-water zeotropic mixture working fluid provides much better efficiency than the pure ammonia working fluid, especially the mixture of 97% ammonia/ 3%water provides the best net efficiency of 4.71%.

Keywords— efficiency, marine energy, renewable energy, OTEC, zeotropic mixture working fluid

Paper ID 70

Hybrid WDM-TDM Fiber Bragg Grating Sensor Based on Wavelength Slicing

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Abstract— In this paper, we propose and implement the simultaneous interrogation of high and low reflectance fiber Bragg grating (FBG) sensors in both the wavelength and the time domain by utilizing a single conventional broadband laser source. Our results have confirmed the ability of the wavelength domain section of the proposed scheme to resolve the cross strain and temperature measurements of $300 \mu\epsilon$ and $50 \text{ }^\circ\text{C}$. Consecutively, the time domain section of the setup showed the full ability to cover up the temperature measurement range of $75 \text{ }^\circ\text{C}$ with excellent linearity.

Keywords—fiber Bragg grating, FBG, OptiSystem, strain, TDM, temperature, WDM

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Paper ID 3

The Effects of Serious Games on Students' Higher-Order Thinking Skills in Science Education

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Abstract— Thinking skills are considered essential to remain competitive in the 21st century. However, low achievement in science subjects reflects students' weaknesses in mastering their thinking skills. The study aim to investigate the effectiveness of a serious game's application method called "Litar Elektrik" on learners' higher-order thinking skills (HOTS) in science. This serious game is a learning game for HOTS that focuses on the science learning syllabus of Year Five's electrical circuit topics. The effectiveness evaluation used a quasi-experimental technique via pre-and post-tests. The sample involved 32 primary school students, 16 in the experimental group who used the serious game application and 16 in the control group who used the conventional method. The findings showed that using the serious game as a teaching approach could enhance students' HOTS in science subjects. Hence, this study suggests that serious games can be an alternative teaching and learning tool to promote HOTS learning in science subjects.

Keywords— higher-order thinking skills, science education, serious games

Paper ID 5

The Validation of an E-Voting Adoption Model using Focus Group

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Abstract— The e-voting adoption model has been developed to assess the acceptance of the end user (voter) of a voting system in which the information technology (IT) is deployed in its processes and explain the factors predicting its acceptance. The study sought to explore the validity and feasibility of the model using a focus group study (FGS) to streamline the validation process as an initial step before the researcher carried out quantitatively the validation. A total of 7 experts in the election field agreed to participate in the FGDs to validate the model according to pre-defined validation criteria using a 5-point Likert scale for scoring. Consensus on expert opinions was defined at Interquartile Range (IQR) ≤ 1 . Apart from Effort Expectancy and Political Trust, all other constructs in the proposed model got the experts consensus and satisfaction. Consequently, the results indicated that the proposed e-voting adoption model is suitable for assessing the voters' acceptance and can also be used for continuous improvement.

Keywords—e-voting, Focus Group, IT adoption, IT security, Political Trust, Trust in Government, UTAUT

Paper ID 7

Designing Storyboard for Climate Change Game

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Abstract— The world is in danger as the weather changes drastically while humans still struggling to take care of nature. It becomes necessary to understand how environmental elements work; therefore, people can keep it safe to live. Learning the technical process in a one-way campaign or the classroom may be less engaging. Thus the information should be presented in a simulated and interactive manner as a digital game. This paper describes the designing process for climate change game to increase awareness and understanding of environmental issues. The game storyboard is designed based on verified game elements that are gathered from the previous study. Each element of the climate change game is described briefly in the storyboard. In the future, the storyboard will be validated and optimistically ready to use for development purposes.

Keywords— carbon cycle, climate change, low-fidelity prototype, serious game, storyboard

Paper ID 12

The Usage of Electronic Resources in Libraries

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Abstract— Electronic resources are crucial to facilitate teaching, learning, and research activities. Today, developing countries subscribe and utilize electronic journals, however its usage is considerably low. Therefore, this study aims to examine the usage of electronic resources in the University of Diponegoro library, Indonesia and investigate user behavior in using e-resources. The data were then analyzed by using a quantitative method. The results are that the use of electronic resources in the university's Diponegoro library is recorded as low 35.9 % for electronic journals and another 16.75 % for electronic books. User behavior that can be seen in the use of electronic journals is shown to be more dominant in downloading PDF, viewing the content display, browsing, exporting PPT, reading lists, email excerpts, and print content. This is slightly different from user behavior in using the more dominant electronic book such as viewing content display, browsing and then uploading PDFs.

Keywords— e-resources, library, usage, user behavior

Paper ID 21

Low-Fidelity Testing of Gamification Application for Low Cognitive Users

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Abstract— In recent years, researchers have shown an increased interest in using gamification exclusively in education. Research has consistently provided positive feedback on gamification. However, gamification is seldom studied, and the extent of accessibility to all users remains unclear, especially users with disabilities. Children in the low cognitive user category have problems processing tasks and accepting information because they have below-average IQs compared to normal children. Therefore, this study aims to identify the problem by conducting low fidelity testing to gauge the user experience as early as possible. In this study, the techniques used during testing are paper prototype, Wizard of Oz, think aloud, and interview protocol. The nine testers chosen for this study are all children aged eight who are from a remedial class. The results of this study showed positive feedback from the testers.

Keywords—gamification, low-fidelity testing, paper prototype, thin, Wizard of Oz

Paper ID 23

Determining the Values and Attributes in E-Learning from Vocational Teacher's Perspectives

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Abstract—Building an e-learning platform based on the user's point of view is a way of getting the user's to use the system. In this study, value co-creation is adopted from service science theory that involves users in service processes. The purpose of this paper is to use the means-end-chain (MEC) methodology by identifying the favorable attributes, consequences, and values from a teacher's point of view. The relationship among these items would build a ladder and lead to the purpose of the study. This study adopted the hard laddering – Association pattern technique (APT) technique to develop the implication matrix, frequency table, and the hierarchical value map (HVM). The study is aimed at vocational teachers as they are one of the primary users of the e-learning platform. The significance of this study is to help identify the co-creation value based on critical features on an e-learning platform. The results discover that teachers develop eight important values led by self-fulfillment, sense of accomplishment, and responsible with the attributes in e-learning, which motivate them to continue using the platform for teaching and learning.

Keywords— co-creation, e-learning, means-end-chain, teacher, vocational

Paper ID 25

Analysis of Behaviour and Learning Style on Education 4.0 in Virtual Mentoring using Gamification

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Abstract—Mentoring is an essential agenda for the next 20 years, in line with Education 4.0, which helps students improve their soft skills. It plays important role in a successful career for fresh graduates and social interactions in society. Nevertheless, the spread of information technologies and adapting instructions to suit millennial student's needs and learning styles pose challenges for new and experienced mentors. The newness of the use of virtual worlds in education poses the challenge of creating a pedagogical understanding around the connection between the use and education of synthesized experiences in today's society. The extensive gamification in virtual mentoring environments has also been criticized for focusing too much on external rewards when the actual engagement should come from student's intrinsic motivation. Therefore, this study is to conduct a preliminary study to assess student's motivation elements and learning strategies in conjunction with the implementation of gamification in learning. Results show the highest score for test anxiety and intrinsic for motivation elements, while peer learning was chosen the most for learning strategy.

Keywords— Education 4.0, gamification, learning strategies, motivation virtual mentoring

Paper ID 28

Conceptual Framework of Value in Use and E-Learning Success

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Abstract— E-learning systems are increasingly becoming essentials tools for delivering education. Hence, understanding factors determining their use and continuous satisfaction is important for both practitioners and institutions of higher learning in formulating strategies for their development and instructional guidance. The narrative review method was used to review and synthesize relevant articles for this study. The review indicates that many authors have investigated e-learning adoption, implementation, and e-learning success from diverse angles. However, none of them has studied the influence of value in use on e-learning success. As a result, this study proposes a new framework that combines value-in-use construct to DeLone and McLean Information System Success constructs for examining e-learning success. This study's contribution is (1) the provision of a new framework for examining e-learning success. (2) Empirical evidence that could be achieved from this framework could guide practitioners on creating online artifacts and assist educational authorities in exploring the users' value in use of e-learning technologies and formulating e-learning strategies that meet these values. (3) An investigation of value in use of e-learning can provide new opportunities for research in learning technologies and bring new understanding in the field of instructional technology.

Keywords— Conceptual framework, E-learning Success, Value in Use, Service-Dominant Logic

Paper ID 32

Enhance Motivation and Engagement in Blended e-Learning for TVET Using Gamification

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Abstract— Technical and Vocational Education and Training (TVET) offered TVET graduates more employment opportunities based on their competencies. Currently, most TVET students learn both theory and practical with blended e-learning approaches developed by TVET teachers. From the research background on the previous studies, there is some issue to be overcome. Therefore, this paper proposed to develop the application of the instructional designs on blended e-learning for selected TVET fields by incorporating gamification elements and assessing the impact of gamification usage on student motivation and engagement. Gamification is the use of game-thinking or game elements in non-game contexts. The proposed research methodology would use the ADDIE model development cycle on how to accomplish the research. The expected results will be analyzing from quantitative and qualitative data from the evaluation phase. They are some implications and limitations acknowledge in the discussion chapter. Positively with the research can prove gamification usage can enhance motivation and engagement of blended e-learning for TVET.

Keywords— blended e-learning, engagement, gamification, motivation, TVET

Paper ID 33

The Design of a Mobile Application for Managing Stress, DailyCalm

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Abstract— Stress is a particular individual has mental pressure due to environmental and social well-being. It can also trigger when we meet unexpected situations that can threaten our life. Every person must know how to deal with stress to prevent it from getting worst. Long-term stress can affect our psychological, behavioral problems and physical. To cope with the stress, we need always to know our stress level. The stress level can help us decide which therapy, activity or treatment is suitable. In realizing the importance of managing stress, a mobile application named DailyCalm was developed to help users identify and manage their stress better. The mobile application was designed with a stress level detector and a few tips for managing stress. This application was tested on a group of secondary school students. The satisfaction survey has concluded this application can help in reducing stress level.

Keywords— mobile application, psychological, stress, stress management, therapy

Paper ID 34

The Motivational Factors in the Learning Management System

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Abstract—The Learning Management System plays an important role in teaching and learning in technical and vocational institutions. It helps students, lecturers, and administrators to monitor their learning outcomes if used continuously. On the other hand, lack of motivation has been a significant concern in the development of a rapidly expanding online learning environment. Previous studies have demonstrated the importance of both intrinsic and extrinsic motivation while using a learning management system. This paper discusses the motivational factors of LMS from the perspective of lecturers. A qualitative method was used to explore the LMS motivational factors. Interviews were conducted at two polytechnics in Kelantan and Terengganu with sixteen lecturers. Findings show that the motivation to use LMS can be grouped by motivation through the system, human, and environment. These groups have five supporting factors: system quality, information quality, service quality, attitude, and ICT environment. The findings from this study can help in motivating the use of the learning management system in Technical and Vocational Education and Training in Malaysia.

Keywords—continuous use, LMS, learning management system, motivation, motivational factors, TVET

Paper ID 36

User Interface/User Experience (UI/UX) Analysis & Design of Mobile Banking App for Senior Citizens: A Case Study in Sarawak, Malaysia

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Abstract— Smartphones are having such a huge impact to our society and in our daily lives. However, most smartphone applications are not that user-friendly for a senior-aged person. Due to the COVID-19 pandemic, everything now is done online including mobile banking services. There are seniors who refuse to use mobile banking applications in Malaysia because they are not familiar nor comfortable with the app's interface and flow. This study aims to perform a need analysis on user interface and user experience (UI/UX) design for Malaysian seniors when using a mobile banking app. A questionnaire was used in this research as a quantitative research tool, involving 36 respondents aged 55 years old and above, an currently a resident of Sarawak. The questionnaire is split into 5 sections, i.e., demographic, technology background, task, task rating, and preferences. We observed that “Fast loading time” is ranked as the most important feature with the highest mean value of 5.0. The least important feature is “Payment via QR Code” with a mean value of 2.7. Our findings can be used as a basis to prioritize features when designing a mobile banking app to accommodate senior users.

Keywords— mobile banking application, requirement analysis, seniors, UI/UX

Paper ID 38

The Conceptual Framework of Megalithic Cultural Information Visualization

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Abstract— Improper method of data storage, lack of complete and up-to-date information sources, weakness in information sharing and decimation, and poor visual representation have attributed to loss of megalithic cultural heritage. Thus, the study aims to design a web-based application that visualises megalithic culture information in Malaysia, specifically in Negeri Sembilan. This study used the Rapid Application Development (RAD) research methodology, which consists of four phases: requirements planning, design development, testing, and implementation. The RAD model was selected to ensure that the design and development processes of information visualisation were conducted systematically. This study has discussed each phase in detail, highlighting specific activities involved. These phases were optimised using the Gestalt principles and Visualisation techniques, the main component of the conceptual research model. The Gestalt principles play an important role in ensuring the application development layout and web interfaces by considering the psychological aspects and experience of the users. Furthermore, visualisation techniques, including photos, maps, charts, and drawing illustrations, were applied to enhance the delivery of information for easier understanding and interpretation by the users. The conceptual framework was designed to reflect the overview of the application development and highlight the components and elements involved. In this light, Negeri Sembilan megalithic culture information should be highlighted to the public as it is a unique treasure and culture practised by previous generations. Thus, the web applications produced in this study are expected to encourage the digital preservation of Megalithic culture in line with current technological developments.

Keywords— conceptual design, information visualisation, megalithic, Rapid Application Development (RAD), web applications

Paper ID 41

Usability Experience on Tourism Website using the USE Questionnaire Approach

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Abstract—Tourism is an important component of social and economic activities in many countries as it creates employment and business opportunities. Tourism has been revolutionized with many innovation. Technological innovation in the tourism industry serves as a means to meet visitor satisfaction in carrying out tourism activities. One form of the application of technology in tourism is a travel website. In order to invite many people to use it, tourism websites need to pay attention to the usability aspect. It is also important to understand how users perceive or react to websites. In this study, the author applies the USE Questionnaire approach, where USE stands for Usefulness, Satisfaction, and Ease of Use (Ease of Learning and Ease of Use) to evaluate Indonesian tourism website. Respondents will be asked to run a scenario that has been designed by the author and then respondents will be asked to fill out a questionnaire. The results of this study can be considered for developing a travel website in terms of usability.

Keywords—tourism, usability, USE questionnaire

Paper ID 59

Adaptive Navigation Design Model for Education Learning System

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Abstract— Adaptive user interface (AUI) is an evolving research area that offers personalized user experiences based on user activities. It can be implemented in a variety of ways and one of them is the implementation of Adaptive Navigation technique. Even though several approaches were proposed, there are still limitations and issues in supporting navigation such as complex navigation structure can decrease user's satisfaction. Minimal navigation also can be the potential for users to get lost. The purpose of this study is to determine and analyze the element of adaptive navigation in terms of user model and its baseline which are required to improve existing adaptive navigation model in order to enhance AUI. Results of the study would include the suitable design adaptive navigation model which how they affect the user experience despite their increasingly common use. This is to understand user's preferences, abilities, needs, interests, and knowledge by providing navigation that are most relevant to the user in an effort to shape the user's cognitive load. The results are expected to lead towards comprehensive adaptive navigation model-based, which will be more competent, concise and satisfaction to user.

Keywords— adaptive education learning system, adaptive navigation, human-computer interaction, learning styles, multimedia application

Paper ID 75

Gamifying Drug Abuse Screening Test: A Proof of Concept

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Abstract—Gamified surveys have much potential for capturing data such as behavior, motivation, and enjoyment. The main challenge of data collection with traditional (paper-based) and online web surveys is the lengthy and monotonous questionnaire design, resulting in unsatisfying behaviors. We use game elements as motivational affordances to motivate respondent involvement in screening tests. This paper presents our attempt on gamified drug abuse screening test, the Alcohol, Smoking and Involvement Screening Test Lite version (ASSIST-Lite). We design and develop our prototype after conducting two focus group discussion (FGD) sessions to get design feedback. Results from FGD show experts agreed that gamified versions of ASSIST-Lite with avatar and narrative elements could provide a more entertaining and motivating experience than the traditional version. Finally, we address our research plan for moving this project forward.

Keywords— drug abuse screening test, gamification of surveys, gamified surveys, gamification, motivation

Paper ID 76

Health Monitoring Framework for Drug Addict Rehab in Cure & Care Service Centre Malaysia

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Abstract—Electronic Health Records (EHR) have become state-of-the-art in healthcare services. It offers more efficient information management, enables robust data manipulation, and is cost-effective compared to the traditional approach. In Malaysia, studies have shown that healthcare workers manually monitor the health of drug addicts during rehabilitation. This causes late intervention issues when patients have withdrawals which can be the cause of death. This paper proposes an EHR framework that automates health monitoring using the Internet of Medical Things devices. This paper also discusses the differences between EHR frameworks, the application of Internet of Medical Things devices, and user requirements from healthcare worker's perspectives; that is the parameters to be monitored (1) oxygen saturation, (2) heart rate, (3) body temperature, and (4) GPS location. The medical industry would profit from this framework because it aligns with the Ministry of Health's present rules and standards. This framework enables total data ownership, which gives patients transparency and reassurance about data security and handling.

Keywords— electronic health record, healthcare, internet of medical things, smart wearable

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