KDUIRC
INTERNATIONAL RESEARCH CONFERENCE

15TH INTERNATIONAL RESEARCH CONFERENCE

Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation

29TH - 30TH SEPTEMBER 2022

COMPUTING

ABSTRACTS

GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY

15TH INTERNATIONAL RESEARCH CONFERENCE

ECONOMIC REVIVAL, NATIONAL SECURITY, AND SUSTAINABILITY
THROUGH ADVANCEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

COMPUTING

ABSTRACTS

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Message from the Secretary, Ministry of Defence

I am indeed delighted to pen this message whilst extending my earnest felicitations to the KDU on this significant occasion of the annual International Research Conference. At this juncture, I would also like to congratulate the Vice-Chancellor and the team for continuing the tradition of organising this conference consecutively for the 15th time, despite the numerous economic and social challenges faced by the country in the post-COVID environment.

Further to that, I am delighted to perceive that this year's conference theme; 'Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation' focuses on the National Economic Growth and National Security as core concepts, and suggests that 'economic development' and 'security' of a country should always go hand in hand. Therefore, this conference would undoubtedly become a forum for academia to discuss an area of absolute need in the development interests of our motherland.

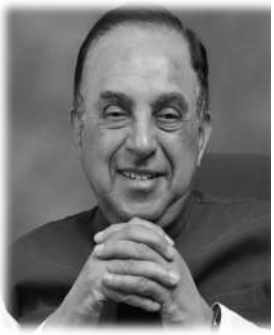
Moreover, I am pleased to witness that KDU, under our ministerial guidance, is setting an example for all other universities in Sri Lanka in progressing research in many academic fields. I hope this year's conference will produce a significant research outcome that the policy community of Sri Lanka could utilise to support the present development drive of the country. Further, I would like to urge the conference organisers to explore the possibility of distributing the outcomes of the conference to all the relevant Ministries and Departments of the country so that said entities could link with the researchers and employ their valuable research outcomes for the benefit of the nation.

I wish that KDU IRC 2022 will enhance the wisdom of all the participants to serve Mother Lanka for a better tomorrow.

GENERAL KAMAL GUNARATNE (Retd)

WWV RWP RSP USP ndc psc MPhil
Secretary - Ministry of Defence

Message from the Keynote Speaker



It gives me immense pleasure to send this message on the occasion of the 15th International Research Conference of the General Sir John Kotelawala Defence University (KDU). I would like to congratulate KDU for being able to conduct its International Research Conference in 2022, consecutively for the 15th time. It is not an easy task to organize such a momentous event particularly under many difficulties and challenges posed by the COVID 19 pandemic situation and social and economic crisis. It is gratifying to witness that KDU, the only Defence University in the country, has been able to transform a challenge into an opportunity, as it usually does.

The theme of the conference, namely the "Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation," is very timely and of great significance for deliberation in expert panels of this conference. The nexus between National Growth and National Security is closely interwoven. The 'economic revival', 'sustainability'' advancement' and 'security' of a country cannot be compartmentalized and discussed in isolation of each other. There is no security for a nation without economic and social progress, and likewise, economic and social progress cannot be achieved without stability and a secure environment. I hope various panels of this conference will be able to discuss many facets of economic revival, national growth, sustainability and security and their interconnectedness. These two areas have a direct bearing on the development of Sri Lanka, a country which succeeded in ending a 30-year long separatist war. In the context of the present need for robust development, it is absolutely necessary to engage in serious research which leads to discoveries as well as policy-oriented recommendations. Therefore, all academic establishments must provide a conducive space for their intellectuals to reach new frontiers in research. I am glad that KDU is setting an example for all other universities in Sri Lanka in this regard. I hope this year's conference will produce significant research outcomes that the policy community in Sri Lanka could utilize for the benefit of the country. I wish this conference all the success.

HON PROF SUBRAMANIAN SWAMY

Former Minister of Commerce, Law & justice, India

Message from the Vice Chancellor

The International Research Conference (IRC) of General Sir John Kotelawala Defence University held for the 15th consecutive year is significant in terms of the continued contribution of the University to the field of research in diverse disciplines much needed for the progression of the nation, especially in the face of unprecedented challenges caused by the COVID-19 pandemic and the current economic crisis in the country.

The conference themes carefully selected by KDU each year have addressed contemporary needs of the country that are linked up with national security perspectives, and they are complementary to the development paradigm of the country. This year's theme "Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation" encompasses a wide range of research possibilities for scholars of different disciplines to engage in much useful research relevant to the current issues faced by the nation.

It is heartening to note that the number of papers submitted for the conference has increased despite the challenging circumstances, which is a positive indication of the enthusiasm growing in the country on development and security related multi-disciplinary research. In this respect, I am extremely glad that the KDU's efforts in expanding higher educational opportunities, increasing quality of higher education, enhancing research and innovation, linking up research with the industry and so on have increasingly been acknowledged by many, which is also reflected in the Times Higher Education Impact Ranking, 2022 table, where KDU has been ranked 2nd in Sri Lanka for Quality of Education and 4th in the overall ranking in the country and in the 801-1000 range globally.

KDU IRC also creates a sound platform to initiate collaborative research at both national and global levels, and I invite all participants to use this conference to make lasting and productive connections and networks at the individual, institutional, national, and international levels to envisage and explore mutually beneficial research possibilities and higher education experiences for the future.

While appreciating the commitment of the organizers of this year's conference, I wish you all, the presenters and participants taking part in the conference all the very best, and I hope you will enjoy every moment of this two-day academic endeavour.

MAJOR GENERAL MILINDA PEIRIS

RWP RSP VSV USP ndc psc MPhil (Ind) PGDM
Vice Chancellor
General Sir John Kotelawala Defence University

Message from the Conference Chair

For the 15th consecutive year, General Sir John Kotelawala Defence University (KDU), organises its International Research Conference (KDU IRC 2022) under the theme of "Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation". It is with great pleasure and honour that the organising committee extends its compliments to all of you taking part in KDU IRC 2022. Holding the KDU IRC 2022, under the patronage of the Vice Chancellor, amidst many challenges encountered throughout the year, was a remarkable experience for me. I believe that the organising committee accomplished a very successful mission.

Despite the economic crisis, KDU IRC 2022 is a tremendous opening for many researchers all over the world encompassing various disciplines such as Defence and Strategic Studies; Medicine; Engineering; Management, Social Sciences and Humanities; Law; Built Environment and Spatial Sciences; Allied Health Sciences; Basic and Applied Sciences; Computing; Criminal Justice and Technology to present their research to fellow scholars, professionals, and students.

In this context, we have assembled excellent thought-provoking scientific sessions under the conference theme of this year, and it is remarkable to highlight your participation, at this conference through a highly competitive selection process. In addition, world-renowned invited speakers will deliver keynote and plenary speeches while covering a wide range of important sessions with great networking opportunities and providing solutions using science, technology, and innovation. It is the esteem of the conference to bring together a diverse group of people to disseminate high-quality and novel research results, which will assist to chart our journey forward to reach new heights.

Finally, I would like to extend my best wishes to all the presenters, authors and participants, joining the KDU IRC 2022 on site or online, and I hope that all of you will find this conference informative, enjoyable, and encouraging to feel the experience of KDU hospitality during these two fruitful days.

DR KALPA W SAMARAKOON

PhD, MSc, BSc, MACS (USA), M.I.Biol (SL), C.Biol (SL)
Conference Chair
General Sir John Kotelawala Defence University

Message from the Conference Secretary

Together with the committees and participating academia of this university, I share the immense pleasure and honour of perseverance with the 15th International Research Conference of KDU (KDU IRC 2022), amidst many challenges, under the patronage of our Vice Chancellor and Deputy Vice Chancellor.

The timely congregation for IRC 2022, of all our staff, students and contributors from faculties all over the world, under the theme "Economic Revival, National Security, and Sustainability through Advancement of Science, Technology, and Innovation", is of paramount importance in this current climate of the global recession.

Whilst thanking all of you, I express my sincere hope that this would be an ideal platform for academia and professionals to discuss economically viable intelligent solutions for diverse problems for the nation to emerge stronger out of the recession, with the ability to provide equitable health, food, and social security, quality education, and enforcement of law and order in our country, for the betterment of our society.

DR PANDULA ATHAUDA-ARACHCHI

MBBS MRCP(UK) PhD (Cantab) CCT(UK) FESC FRCP(Glasg) FRCP(Edin) FACC
Consultant Interventional Cardiologist & Senior Lecturer(I)
Faculty of Medicine
General Sir John Kotelawala Defence University
Secretary-IRC2022

ORAL PRESENTATIONS

KDU IRC INTERNATIONAL RESEARCH CONFERENCE 2022

ID 664

Challenging Issues of the Railway Ticketing System of Sri Lanka

JASV Jayasuriya[1#], RPS Kathriarachchi[1] and DU Vidanagama[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-it-0044@kdu.ac.lk

This system is formulated to overcome the significant flaws in the present system and the consequences of traveller ticket buying and seat reservations, which frequently lead to mistakes and many issues. In Sri Lanka, the Railway system mainly uses traditional methods, and ticketing and seat reservation processes are the same. In the modern technical world, traditional systems are getting converted to computerized systems to achieve convenient and efficient methods. However, Sri Lankan train passengers regularly face different kinds of issues. Therefore, people tend to use their private vehicles for transportation. Encouraging people to use public transport is a better way to solve the abovementioned issues. But public transport should be properly developed to make the journey comfortable for every passenger. This is one of the purposes of this research. The Sri Lankan railway's existing ticketing and seat reservation system happens on a manual method. Therefore, passengers face a lot of issues such as waiting in long queues, no proper way to make a seat reservation by themselves, waiting for a long time to make a reservation, and other issues. This research identifies those issues by using two methods. Firstly, using observations to detect issues by visiting some train stations. The second method is an online survey. After detecting the issues, research moves to the analysis part to identify the system features that reduce passengers' issues. The main purpose is to identify the system features and functions of Smart Ticketing and Seat Reservation systems for the Sri Lankan Railway. Using this application, people can prevent their issues because system features can reduce the passengers' issues.

Keywords: *smart reservation, e-ticketing, train ticketing, e-transportation*

KDU IRC INTERNATIONAL RESEARCH CONFERENCE 2022

ID 139

Comparison Analysis and Systematic Study on Secure Transmission of Data in the Cloud Using Steganographic Techniques and Cryptographic Algorithms

AKSA Anudini[1#], G Gayamini[2] and TL Weerawardana [3]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*

[2]*Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[3]*Department of Electrical, Electronic & Telecommunication Engineering, Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-cs-0011@kdu.ac.lk

Data and information can be considered the most precious assets in electronic communication systems, but security has become a concern in this competitive world. Cloud computing has emerged as the most exciting technology for on-demand computing, and it is now used by the military, healthcare, education, financial, and a variety of other organizations to handle their large volume of information. Cloud computing has many benefits including efficiency, high performance, scalability, accessibility, backup, and recovery. Security is a primary concern in cloud computing because everyone in the organization shares the same cloud platform. The most significant issue for the user is securely saving, retrieving, and transmitting data through the cloud network and storage. Cryptography and steganography can be defined as the most popular techniques that can be used to enhance data security. Cryptography scrambles the messages into an unintelligible format, while steganography hides the message as it is not observable to the attacker. High-level security is given for both the sender and the receiver inside the cloud platform when cryptography is used along with steganography. This paper analyses the performance of cryptographic and steganographic techniques and suggests the best hybrid cryptographic algorithms and multilayer steganographic techniques that can be combined for efficient and secure data transmission in the cloud. This proposed system will provide availability, integrity, authenticity, confidentiality, and non-repudiation to the data and information.

Keywords*: asymmetric key cryptography, cryptography, image steganography, steganography, symmetric key cryptography*

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ID 452

Role of Hydro GIS Tools in Hydrological Modelling and Urban Flood Management: A Literature Review

RMM Pradeep[1#] and NTS Wijesekera[2]

[1]Faculty of Computing, Kotelawala Defence University, Ratmalana, Sri Lanka
[2] Construction Industry Development Authority, Ministry of Urban Development, Water Supply and Housing Facilities, Wijerama Mawatha, Colombo 07, Sri Lanka

[#]pradeep@kdu.ac.lk

Hydrological modelling and urban floods have a strong relationship as flood management is based on accurate hydrological calculation. GIS assists this relation by providing an easy environment to carry out complex steps of hydrological calculations. However, when automating those processes, there are no guidelines available to manage the software project easily. Then developing a comprehensive guideline requires a clear understanding of the role of GIS in the urban flood and hydrological modelling relation. The present work carried out an in-depth study on; flood management, land management, hydrological modelling, and GIS assistance in modelling to understand the role of hydro and GIS tools in urban flood management. It used the semi-systematic literature review method to review the gathered knowledge. Through the analysis, a close relation between flood and land management is found, especially in urban areas. Further, it is found that now GIS effectively carries out core steps of hydrological models and visualizes the outputs than the inception. Also, the HydroGIS term is evolved to name the software tools that assist flood management through GIS and hydrology modelling. Further, this work could illustrate how such HydroGIS tools can assist local-level flood management decision-making; and the relationships between non-technical decision-makers, hydro model, flood model, and flood management decision-making. Then, the present work can conclude by stating that HydroGIS tools are a key role player in the local level flood management decision-making process as it provides an interface to non-technical decision makers for performing complex hydrological processes.

Keywords: *urban flood, hydrological modelling, state-of-art review, HydroGIS tool, flood management, GIS tools*

ID 249

Factors Affecting User Acceptance of Mobile Banking Applications in Sri Lanka

MAA Geethmi[1#] and BMTN Rathnayaka[1]

[1]*Department of Information Technology, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-is-0005@kdu.ac.lk

In Sri Lanka, numerous banks are beginning to provide financial services via mobile devices. However, a limited number of studies examine the factors affecting user acceptance of m-banking applications. This research aims to find the problems in the existing m-banking applications in Sri Lanka, gather factors affecting the user acceptance of M- banking applications, and collect suggestions from the users on mobile banking applications in Sri Lanka. The researchers conducted a survey by using a google form which includes fifteen questions. The sample size of this research is seventy-five. According to the results of the survey, there are various issues in existing mobile-banking applications such as complex user interface, annoying security processes such as complicated steps to follow once the password is forgotten, application not functioning well, slow, language problems, connection problems, the application is being stuck and issues in taking screenshots. So, when building a mobile application, the banks should consider these problems to ensure that the users can use the mobile banking application accurately and efficiently. It is imperative to gather suggestions from users, As stated in the results of the survey, the responders have suggested that when building a mobile-banking application, there should be some features such as an understandable and simple interface with simple icons, voice commands, and voice explanation that explains the features of the banking application, using simple language with different language options, personalization, enabling notification facility, user-friendliness, simplicity, and enabling authentic security with simple steps and enabling Chabot. The researcher has concluded that when creating a mobile-banking application, the simplicity of the interface, using simple language with different language options, and good security with simple steps to follow are the most critical factors.

Keywords: *mobile, banking, technology, application*

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ID 604

The Potential of One-Shot Learning for Drug Discovery – A Review

K Anuradha[1#], DPM Lakshan[1] and WAAM Wanniarachchi[1]

[1]*Department of Information Technology, General Sir John Kotelawala Defence University, Sri Lanka*

[#]kanuradha@kdu.ac.lk

Compounds with specific chemical properties for the treatment of diseases are sought out through drug discovery. The search for drugs can be made more efficient, less expensive, and less time-consuming by incorporating automation. New approaches and technologies in drug discovery have grown dramatically over the past few decades. "One-shot" learning is the best hope for the widespread adoption of machine learning in all industries. In this study, the authors show how one-shot learning can reduce the amount of data required to make meaningful predictions in drug discovery applications. With Few-Shot Learning (also referred to as One-Shot Learning), models can be trained to learn the desired goal with less data, like how humans do it. The objectives of the study are to explore the most prominent ways to identify and forecast drug discovery, potential applications as well as several of the remaining challenges. Chemical structures can be represented using some structural descriptors, a similarity measure is used to compare them, and a strategy can be used to predict the activity of a query compound in this manner. We expect this review to serve as an impetus for future experiments that seek to validate the use of one-shot learning in the chemical sciences.

Keywords: *one-shot learning, few-shot learning, drug discovery, machine learning*

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ID 495

An Augmented Reality-Based Approach towards Furniture Shopping

MTA Wickramasinghe[1#] and WJ Samaraweera[1]

[1]Department of Information Technology, Faculty of Computing,
General Sir John Kotelawala Defence University, Sri Lanka

[#]36-it-0020@kdu.ac.lk

In the furniture industry, all the companies have been involved in furniture designing, manufacturing, distributing, and selling decorative household equipment. But the furniture industry is one of the major industries facing challenges these days. The researchers have gone through the existing and current furniture selling applications, and conducted interviews, observations, and a questionnaire based survey among furniture sellers and clients during the process of identifying the problem. It was discovered that purchasing the most suitable furniture item according to the customer's expectation is the main challenge that people have faced during online purchases. That means it can be challenging to visualise how the furniture will look in our homes and work with the décor already in place. Researchers pointed out that augmented reality can quickly resolve this problem. The usage of augmented reality in industrial applications is still relatively limited in a world where technology rules. Augmented reality is a field of image processing that deals with the combination of the real-world and virtual environment. The researchers have used ARCore plugins through the furniture item visualisation. Users will be able to see how the item will appear in their space in real-time. The researchers aimed to implement an application for smartphones to assist customers who purchase interior items directly online by allowing them to virtually see how their area will look after making the purchase. After implementation, researchers compared this developed system with the related current world applications and scenarios in the system evaluation process. Those system evaluations show that the proposed system will be more supportable to make the current furniture industry more profitable.

Keywords: *augmented reality, AR furniture, ARCore*

ID 200

Smart Wireless Forest Fire Alerting System

UDNN Rodrigo[1#] and TL Weerawardana[2]

[1]Department of Computer Engineering, Faculty of Computing,
General Sir John Kotelawala Defence University, Sri Lanka
[2]Department of Electrical, Electronic & Telecommunication Engineering, Faculty of Engineering,
General Sir John Kotelawala Defence University, Sri Lanka

[#]35-ce-5502@kdu.ac.lk

The forest coverage of over 30% of the Earth's land surface assists to balance the water cycle as well as the natural conversion of O2 and CO2, which aids in organism respiration. Therefore, various research studies have paid attention to the prevention of deforestation. Deforestation is mostly caused by forest fires, which can occur naturally or as a result of human negligence. Since a forest fire can be started by a single lightning strike, preventing them before they start is deemed impossible. However, early discovery and response can lower the frequency of occurrence. The study proposes a Wireless Sensor Network with a smart sensor concept, which uses radio frequency communication as the communication technique and allows sensor nodes to connect with each other to verify the status of their neighbours. The base station or master node of the sensor network, which is located outside the forest cover, has been used to send out alerts using GSM technology. The communication network was built up with the help of HC-12 and NRF 24L01+ radio frequency transceivers, and the DHT-11 temperature and humidity sensors were utilized for detection. The accuracy was tested through different testing strategies with a prototype of a distributed single-sink wireless sensor network, and the results were evaluated. A comprehensive system with more components can be developed to expand the sensor network to cover a large forest area.

Keywords: *forest fire detection and alerting, wireless sensor networks, smart sensors, inter sensor communication, HC-12 communication, NRF24l01+ communication*

ID 337

Towards an IoT-based Vehicle Management System for Vehicle Tracking & Vehicle Diagnostics with OBD2 Telematics

WNS Dabarera[1#], NT Jayatilake[1], RHNS Jayathissa[1] and TL Weerawardane[2]

[1]*Department of Computer Engineering, General Sir John Kotelawela Defence University, Sri Lanka*
[2]*Department of Electrical, Electronic & Telecommunication Engineering, Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-ce-0005@kdu.ac.lk

In a fleet of vehicles, concern about each vehicle is mandatory. A Vehicle Management System (VMS) is primarily used to manage the vehicles' details and track the details of the vehicles. The importance of vehicle tracking and diagnostics must be stressed as other fleet management features also depend on them. Most fleet management systems depend only on vehicle location tracking using Global Positioning System (GPS) technology to manage the fleet's data. This proposed system aims to combine the vehicles' tracking details and diagnostic details for doing fleet management remotely by minimizing human resources. According to the reviewed systems, On-Board Diagnostics (OBD) has been identified as a reliable automotive technology for tracking the performance inside the vehicle and regulate the performance. The proposed system has both a tracking device and an ELM327 Bluetooth OBD scanner in order to receive coordinates of the vehicle's location and vehicle diagnostics, respectively. This paper signifies the use of the Internet of Things (IoT) to accomplish remote access to vehicles' data. For vehicle data to be sent to the cloud, GSM technology is required to send the vehicle's data to the cloud server for remote monitoring. As a cloud server, it uses a Message Queuing Telemetry Transport (MQTT) broker. The Arduino sensor data is lightweight and therefore uses the messaging protocol for the IoT for data transmission by connecting the devices to the internet. The proposed system incorporates the most advantageous technologies and devices for fleet management.

Keywords: *fleet management, IOT, OBD, GPS, MQTT, ECU, remote monitoring, telematics*

ID 179

Simultaneous Detection of Covid-19 and Its Pneumonia Using Multitask Learning

TLN Nadeeshana[1#] and WMKS Ilmini[1]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-cs-0014@kdu.ac.lk

With the rapid growth of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or Covid-19 into a pandemic, quick and efficient alternative testing methods were needed. Although Viral Nucleic Acid tests are the primary and standard method of testing, due to the time-consuming process, and the lack of availability of test kits in certain areas have been problematic for the quick diagnosis of the disease. Therefore, using radiologic modalities such as chest X-rays and Computerized Tomography (CT) were studied due to their wider availability because of their usage in the diagnosis of other diseases. This research is based on chest X-rays, and tests the usage of deep multi-task convolutional neural networks (CNN) to detect both Covid-19 and Covid-19-related pneumonia conditions in a patient simultaneously. Usage of chest X-rays allows for wider availability in rural areas, where computerized tomography facilities are rare. Current results from separate custom CNN models with the same layer structure but different task-specific features, give an accuracy of 94% on Covid-19 detection and 90% accuracy on Covid-19 pneumonia detection. As a novelty, this paper suggests that a multitask learning-based CNN model in the same architecture would be viable to detect both conditions simultaneously from a single neural network. The simultaneous detection of Covid-19 and Covid-19 pneumonia in a patient is a further extension of traditional testing methods and allows for more effective treatments from the beginning.

Keywords: *Covid-19, CNN, multi-task deep leaning, X-ray*

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ID 124

A Design Guideline to Overcome Web Accessibility Issues Challenged by the Visually Impaired Community in Sri Lanka

N Wedasinghe[1#], NT Sirisoma[1] and APR Wickramarachchi[2]

[1]General Sir John Kotelawala Defence University, Sri Lanka
[2]Faculty of Science, University of Kelaniya, Sri Lanka

[#] nirosha@kdu.ac.lk

Visual impaired communities are one of the hindrance groups to accessing web content in the world. The obstacles encountered by this community in their current practices and in developing best practice guidelines to overcome the digital divide in Sri Lanka is a gap that needs to be filled in this domain. A preliminary survey indicated five main problems including 1.) Access limited by the impairment, 2.) Usability issues due to lack designing, 3.) Unavailability of visually-impaired-friendly applications, 4.) Lack of communication, and 5.) Web navigation issues as the most dominant issues. To overcome those issues, solutions are tested and validated using the Design Science approach. The purposive sampling method was used and interviews and questionnaires were used to extract data. A content analysis was also used to derive the result. Results are further validated by using expert opinion. Results indicate that significant factors that need to be incorporated are ensuring a keyboard-friendly website, easy accessibility and support with semantic annotation by adding alternative text for images. Furthermore, using headers to structure the content correctly, designing all forms to support accessibility in mind, including Content developing and designing, navigation, the best colour combination, Pre-recorded video with the audio facilities, braille support on the web, the designing option has no significant impact on visually impaired web users. Introducing a rating widget option to a website identifies the level of accessibility features availability facilitates, thereby overcoming the disability digital divide. The results further conclude that a significant difference exists in websites, with and without the involvement of the visually impaired community. Semantic web and semantic annotations of the context of page elements, content serialisation, and navigation by special keyboard commands are also highly influencing the effective use of the web and increasing the satisfaction level of the website accessing process.

Keywords: *digital divide, web content accessibility, visual impairment*

KDU IRC INTERNATIONAL RESEARCH CONFERENCE 2022

ID 133

A Philosophical Axiom Review on "The Methodology" of Computing Research

RMM Pradeep[1#] and M Morris [2]

[1] *General Sir John Kotelawala Defence University, Sri Lanka*

[2] *World Wildlife Fund -UK & Natural Resources Institute, University of Greenwich, London, United Kingdom*

[#] pradeep@kdu.ac.lk

Computer Science today spans an increasing range of theoretical and practical disciplines in its exploration of what can and cannot be automated, giving rise to a greater diversity of disciplinary collaboration. Where collaboration is between individuals from different disciplines, then accommodations are needed in agreeing on a research philosophy and developing the research methodology. A review of the general research literature suggested that where research is undertaken by different disciplines, misalignment between the respective understandings of the ontology, epistemology, and axiology (o-e-a) underpinning the research is not uncommon. Studying the prominent literature, it developed an online mind-map to illustrate such misalignment and opened to discussion. The mind map was constructively criticised by experienced researchers from multiple disciplines and it has potential for enhancement. In addition to consideration of the different forms of collaboration deployed by researchers, multi-disciplinary, inter-disciplinary, and trans-disciplinary – conceptualisations of the problem/enquiry domain itself were examined, as was the relevance of perspectives by non-research stakeholders, who may be critical to the uptake of research findings. The level and scale of complications entailed by research interventions in navigating complex situations suggest that the nature of o-e-a cannot be determined by any one discipline (i.e., the 'research as usual' ticket), but most probably will emerge through collaborative negotiation. The development of such processes has hitherto been marked by the transition from multi-disciplinary to interdisciplinary research. Where research extends beyond and outside scientific disciplines (i.e., includes non-scientific sources or practice, engages with learning processes from wider society) – trans-disciplinary research – the challenge to academia is establishing whose o-e-a counts, that of the researchers, or that of the knowledge users? This paper explores these options.

Keywords: *complexity, interdisciplinary, research methodology, ontology, epistemology, axiology*

ID 355

Factors Affecting Undergraduates' Intention towards Digital Piracy of Software in Sri Lanka with Special Reference to Undergraduates in General Sir John Kotelawala Defence University

KGU Sankalpana[1#] and N Wedasinghe[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]udyotha@gmail.com

The development of easy and affordable internet access has led to a growth of Digital Piracy of Software (DPS). DPS has resulted in losses to the Software industry and convictions for some people who practice DPS. Therefore, the author identified that it is important to find the factors that affect DPS from a digital consumer's viewpoint. The purpose of this study was to identify the factors that affect the intention of undergraduates of Sri Lanka toward DPS. The theory of planned behaviour was used for this study. To achieve the purpose of this study, a model was developed which included 4 independent variables: Attitude, social influence (SI), perceived behavioural control (PBC), moral obligation (MO), and one dependent variable (DV): Intention toward DPS. The study population comprised undergraduates in Sri Lanka, and a non-probability sampling technique was used for selecting the sample for the study. Data collection for the analysis was done using a web-based questionnaire survey which resulted in a sample size of 165 responses. The collected data were analysed using quantitative analysis techniques with the help of IBM SPSS software. In the analysis process, the reliability and significance of the data were checked first, and then the impact of independent variables on the DV was measured. The results showed that only the MO factor had an impact on IDPS of undergraduates of Sri Lanka from the four factors proposed by the authors.

Keywords: *digital piracy, software, intention, copyrights*

ID 302

A Review of Personality of Interaction and Cross-Cultural Applicability of User Evaluation Methods

J Senadheera[1#] and B Hettige[1]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]37-cs-5972@kdu.ac.lk

Introduction and Importance a designed artefact must constructively promote the brand and aid in creating favourable brand experiences. A recent area of interface design that is essential for designers from many disciplines is culture-based user interface design. This review compares user evaluation methods' cross-cultural applicability and personality of interaction with the simple beauty of a comprehensive understanding of the user experience. Basic Methodology Comparative analysis is what is contributed and implications this study should help. It implies that these are the results of ingrained cultural disparities in how people interact with one another. 87% of the studies evaluated for this analysis came to the conclusion that cultural variations do, in fact, affect user experience and user interface.

Keywords: *interaction, personality, experience, cross-culture*

ID 612

Development of HydroGIS Model Development Framework: Research Methodological Perspectives

RMM Pradeep[1#] and NTS Wijesekera[2]

[1]Faculty of Computing, Kotelawala Defence University, Sri Lanka
[2]Construction Industry Development Authority, Ministry of Urban Development, Water Supply and Housing Facilities, Wijerama Mawatha, Colombo 07, Sri Lanka

[#] pradeep@kdu.ac.lk

The common problem of transdisciplinary research is the acceptable research methodology. The author was questioned with the same when developing a HydroGIS model development framework as it synthesises multiple disciplines. Hence, the present work aims to systematically select the methodology options for developing research methodology for the research. For that purpose, it carried out a comprehensive literature review to formulate how ontology, epistemology, and axiology axioms are aligned with the author's thoughts. By utilising the "Heightening your Awareness of your Research Philosophy" tool and Burrell and Morgan's (year) four paradigm approach selected and verified the most suited philosophy. Based on such underpinning, it analysed the best-suited theory-building approach and formulated the research steps. Founded on those steps it comprehended the methodological choices available to the research design. By analysing the findings, it systematically selected the research strategies for operationalising the research design. Finally, it could identify the framework developed in the interpretivism philosophy and explains the subjectivistic truth which is axiologically experienced by the researcher. The deductive approach is identified as the theory-building approach, where the components of the framework are identified through the explanatory science approach while the design science approach verifies the findings. Due to this bidirectional shift, research needs to follow the sequential multi-phase approach of the mixed method. Further, it identified constructivist grounded theory, survey, document research, and Multi-Criteria Decision-Making tools as the best-chosen research strategies to operationalise the research design. Finally, this study demonstrates how to systematically select the research philosophy and formulate research methodology for transdisciplinary research.

Keywords: *ontology, epistemology, axiology, interpretivism, abduction, sequential multi-phase approach of the mixed method, constructivist grounded theory*

KDUIRC INTERNATIONAL RESEARCH CONFERENCE 2022

ID 228

Designing of a Web App for Hiring Vehicles and Purchasing Travelling Items Using Kansei Engineering

RMMR Rathnayake[1#], KKVSM Kalyanapriya[1], PHN Muthumali[1], PDCJ Paranagama[1], PTC Sandamini[1], WCD Rathnasiri[1], RDAV Thennakoon[1] and P Kalansooriya[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]37-ce-0002@kdu.ac.lk

In web designing, user interface design is crucial. Designing a user interface that meets the emotional requirements of users is critical since the user interface plays an essential part in creating memorable user experiences for websites. A poorly designed user interface gives a wrong impression on users and decreases their comfortability. It will provide them with opposing ideas and less satisfaction. This must be avoided to get the best results from a user interface design in applications. Kansei Engineering, a well-known technique for designing applications, considers the emotions and feelings of particular users. This study attempts to turn users' feelings and emotions into design aspects using Kansei Engineering technology to develop an appropriate travel website by defining a standard web design that fosters emotional engagement. This study proposes and explains the idea of Kansei Engineering and an overview of a developed travel website using Kansei Engineering, including all critical factors considered while designing and statistical data.

Keywords: *e-commerce site, Kansei engineering, travel*

ID 483

Wellness Care: OCR-Based Web Application for Cosmetic Product Safety Assurance

KCM de Alwis[1#] and TGI Udayangi[1]

[1] *Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#] *chamodidealwis@gmail.com*

Cosmetic products are intended to enhance certain physical aspects that appeal to the aesthetic senses, particularly sight, such as the shape, colour, or form of human beings. The global cosmetics market has shown consistent growth throughout time due to the consumers who are mindful of their appearance. However, consumers encounter certain issues when using cosmetics. As a result of the study's findings, it is evident that the majority of the cosmetic product consumers face difficulties in understanding the meanings of the ingredients, and some ingredient names are not correctly included in the product. The popular side effects faced by cosmetic consumers are skin rashes, pimples, dryness, and irritation. This study is aimed at developing a web application to ensure the safety of the cosmetics products used by consumers in their day-to-day life. This proposed system will allow the user to ensure safety by uploading an image of the ingredient label or by manually typing the lists of ingredients. Here, the subset of the image processing domain, Optical Character Recognition technology is used to extract text from the uploaded image. It will output a report by displaying the descriptions of each and every ingredient, respective severity scores, and the overall score of the product by mentioning whether it is favourable or harmful to the health. Here, the necessary datasets are gathered from a reliable and accurate source. This system will ultimately contribute to the economic growth and will increase the sales of products and the safety of the consumers in the beauty industry.

Keywords: *optical character technology, cosmetic products, safety assurance*

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ID 341

Development of a Smart Ring Series Using Kansei Engineering

NWAGN Nanayakkara[1#], UI Abeyasinghe[1], BKT Pabasara[1], ML Karunaratne[1], NS Wisidagama[1], NTD Dharmasiri[1], SALU Dissanayake[1] and P Kalansooriya[1]

[1]Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka

[#]37-cs-5966@kdu.ac.lk

People have become more flexible and healthier by using smart devices to track and do their daily work. Exercises and daily activity management are key factors in a human's daily life. After analysing humans' issues and difficulties, the authors decided to develop an automated device. The researcher's aim is to develop a smart ring series with different features embedded to make human life easier. Some people do not like to wear watches. However, almost all humans, especially females, love to wear rings. So, the authors decided that a ring should be more efficient and user-friendly. After the study, the authors decided to design a ring series as it would be easy for users. They can choose the ring with the features they need rather than buy all the rings. Accordingly, the authors designed four rings. The first ring is capable of tracking your fitness level. The second ring can be used to lock and unlock your belongings. The third ring can be used to track your emotions, while the last ring is capable of tracking motions. Each ring has a particular feature along with the relevant sensors needed to accomplish the task. The authors have conducted a survey to find the relevant features and have followed Kansei Engineering concepts when designing the final design. The authors have designed the final design by conducting a statistical analysis of the results.

Keywords: *smart ring series, Kansei engineering, ring, sensors*

ID 148

ePharm: A Mobile Pharmacy Application for Locating Nearby Pharmacies

WKNC Perera[1#] and HRWP Gunathilake[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0008@kdu.ac.lk

The use of mobile phones and the implementation of mobile applications and services have progressed dramatically in the present society as they have made people's lives more efficient. Even then, if the prescribed medications are difficult to obtain or unavailable in some pharmacies, patients must visit many different pharmacies to obtain them. This is mainly because there is no proper network between the existing pharmacies. It is a hectic task to visit numerous locations merely to find a certain medicine, especially in the current economic crisis in the country with the shortage of medicines and fuel. It would be more efficient and effective, in terms of time and energy, if there was an app that could discover nearby pharmacies where the recommended medications are accessible. A mobile pharmacy application is presented as a solution to the problems that individuals experience daily. The goal of this research is to find the major requirements for implementing the application and designing it by integrating those features. Following a thorough literature analysis, the drawbacks of the existing systems were identified and the appropriate technologies for implementing the identified features were determined. Through Google Maps API and Google Directions API were recognized as adequate for geographical placing and tracking of pharmacies. These technologies would improve the accuracy of the system's ultimate output while also making it more usable for consumers. Further, these outcomes can be used for the future implementation purposes of the mobile pharmacy application.

Keywords: *mobile app, system design, pharmacy application, geolocation positioning*

ID 168

Touchless Palm Print Recognition System Using Image Processing

TN Nicklesha[1#], DMR Kulasekara[1] and MAST Goonatilleke[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-ce-0006@kdu.ac.lk

A biometric system is a system that uses biometric data and mathematical algorithms to recognize a certain feature of an individual. In recent years, from various biometric identifiers, palm print has been widely used for identifying people. Palm print is popular nowadays because their ridges are larger compared to fingerprints. The use of palm prints has reawakened attention due to recent developments in image capabilities on mobile and wearable consumer devices, especially during the COVID-19 pandemic, and because it is good for privacy and sanitation. Further, it is more secure to use a touchless system rather than a touch-based system. So, a touchless system prevents society from using fake biometrics. In this paper, we design and develop a touchless palm print recognition system to verify people. In the proposed system people can verify themselves more accurately and quickly. This system contains two modules as Enrolment module and the Identification module. The Enrolment module is mainly used to store the palm print details in the database, and the Identification module system is used to verify people. Here we use the Gabor filter as the feature extraction tool and used IITD touchless palm print dataset.

Keywords: *palm print recognition, touchless palm print recognition systems, feature extraction, gabor filter*

ID 161

Knowledge-Based Expert System for Defect Identification and Rectification in Engine and Steering Control Systems of Fast Attack Crafts

KMCM Karunanayake[1#], P Gunathilake[2], T Kumara[1] and S Nanayakkara[1]

[1]*Electrical Engineer, Sri Lanka Navy, Sri Lanka*
[2]*Acting Director Naval Electrical & Electronic Engineering, Sri Lanka Navy*

[#]chathurkamihiraj@gmail.com

Cognitive systems deal with symbolic manipulations of knowledge, which are stored as rules, theories etc. State-of-the-art fault detection methods are equipment that are domain-specific and non-comprehensive. However, possessing domain knowledge and human reasoning can be applied for fault detection by having a thorough understanding of the associated system and its surroundings. This study introduces a complete semantic framework for Fault Detection and Diagnostics (FDD) in system simulation and control of an indigenously designed engine and steering control system for Fast Attack Crafts (FAC) by the Sri Lanka Navy. The suggested technique includes the construction of a knowledge base for FDD purposes using rules, and results in increased functionality of such systems using inference-based reasoning to extract information about operational anomalies. Hence, an Expert System (ES) has been designed as a solution for defect identification and rectification (DIDR) that are challenges affecting the indigenously designed Naval Propulsion and Steering Control (NPSC) System on-board FACs.

Keywords: *defect identification and defect rectification, expert system, knowledge base, inference-engine, user interface*

ID 174

Integrating Artificial Cognitive Systems in Smart Agriculture

TA Gamage[1#], EMNM Ekanayake[2], RMNM Rajapaksha[1], MTD Mackonal[1] and DDM Ranasinghe[1]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Electrical and Computer Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka*

[#]36-se-0009@kdu.ac.lk

Agriculture is one of the most crucial sectors in the world since the lives of both human beings and animals depend on the attempts taken to uplift and sustain the agricultural sector. The concept of smart agriculture has been a research arena that has been broadly researched and discussed by researchers around the world, and is being applied in almost all aspects of the agricultural sector, namely, soil, weed, cultivation, and crop management. Yet, all the systems deployed in smart agriculture still try to automate a narrow action thus increasing the efficiency. The integration of cognition into the agricultural process by utilizing the new trends in artificial intelligence can result in major improvements in the concept of smart agriculture. Nevertheless, artificial cognition and embodiment of cognition in the agricultural process have not been achieved to a greater extent. A comprehensive literature review has been carried out in this research and this study aims on overviewing the role of artificial cognition in smart agriculture. In future research, the agricultural aspects namely, soil, crops, and plant diseases have been overviewed with the contemporary artificial systems along with the challenges to the concepts of smart agriculture and artificial cognition.

Keywords: *artificial intelligence, artificial cognition, cognitive architectures, smart agriculture*

ID 26

Driver Emotion Recognition for Safe Driving: A Comprehensive Survey

TA Gamage[1#], ERC Sandamali[1] and P Kalansooriya[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0009@kdu.ac.lk

Road accidents have been a serious issue affecting the world for decades. As a solution to this issue, driver emotion recognition has gained much attention where the affective states of the drivers are monitored. In the context of driver emotion recognition, both the physiological and non-physiological signals are utilized for identifying the emotional states of the drivers. Among the approaches taken by researchers in determining the driver's emotional status facial emotions, speech emotions, Galvanic Skin Response (GSR), Electrocardiogram (ECG) signals, Electroencephalography (EEG) signals etc. are more prominent. Nevertheless, physiological signals are a valuable asset in identifying emotional states since non-physiological signals such as facial emotion recognition, which is mainly used to detect driver affective states, can be misleading. This study aims to review the literature related to driver emotion recognition that aims on ensuring the safety of road users. Furthermore, the approaches taken by the researchers in the reviewed literature have been briefly discussed, and the challenges to these approaches have been further discussed to enhance the safety of road users and future research in the paradigm of driver emotion recognition.

Keywords: *affective computing, challenges, driver emotion recognition, road safety, safe driving*

ID 453

Data Retrieval and Analysis to Identify the Associated People of Instagram Using Image Processing

JKSL Jayakody[1#], NT Jayathilake[1] and TL Weerawardane[2]

[1]Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka
[2]Department of Electrical, Electronic & Telecommunication Engineering, Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka

[#]36-se-0014@kdu.ac.lk

In the past three years, Instagram has had the fastest growth of any social network. Users may post photographs with a description, a location, and a few hashtags that do not always correspond to the content of the images to express their status. As a result, Instagram is currently the most widely used photo-sharing platform. Even though Instagram is a rather straightforward service, its ease of use has helped it become so popular all around the world. But regrettably, some individuals abuse websites for immoral activities including the dissemination of false information and fake news, support for terrorism, immoral religious practices, and the sale of illegal drugs etc. Therefore, according to the results of the literature review, we can use the technologies such as Demographic analysis, Text analysis, Image analysis, Snowball Technology, and some of the face recognition technologies used in iPhone photos, face recognition technologies such as Eigenfaces technology, Neural Networks, Graph Matching, Line Edge Mapping as the Data Retrieving and Image Processing technologies. This paper discusses the implementation of a system to retrieve and analyse image data from Instagram and to identify the most associated people of a certain Instagram user.

Keywords: *Instagram, social network, face recognition, neural networks, retrieve and analyse image data, demographic analysis*

ID 202

Future Forecasting and Analysis of Sri Lankan Tea Exports in Terms of Driving Forces Using Data Mining Concepts

R Laveena[1#] and UP Kudagamage[1]

[1]*Department of Computing and Information Systems, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka*

[#]rlaveena@std.appsc.sab.ac.lk

In order to identify new research directions and gaps in the body of knowledge for the time period under consideration, this study concentrated on collecting data specifically related to the Future Forecasting and Analysis of Sri Lankan Tea Exports in Terms of Driving Forces Using Data Mining Concepts. For individuals working in the sector, this research analyses and projects tea exports depending on the types of tea exported. Finding the elements that lead to fluctuations in tea export volume is made easier by examining the link between tea export and important variables. The prices and volumes of various tea types over that time period, as well as monthly data on tea exports from the previous ten years were used in this study. These historical data were utilised to assess and establish the strength of the correlation between the important variables and their patterns of variation in order to forecast tea export volume using WEKA software. Out of a variety of prediction and forecasting techniques, the Multilayer Perceptron, a form of Feed Forward Artificial Neural Network (FFANN), was determined to be the most efficient method for creating an accurate prediction model. A confusion matrix was used to gauge the accuracy of the results. With a 98 percent accuracy rate, this forecasting model is deemed suitable for predicting the volume of tea exports. It is also discovered that year, month, and tea types have the highest level of connection among the components in determining Sri Lankan tea export.

Keywords: *economic conditions in Sri Lanka, machine learning and varieties of tea*

ID 199

Real-Time Vehicle Type Recognition Using Deep Learning Techniques

AMRNVB Pethiyagoda[1#], TL Weerawardane[2], MWP Maduranga[1] and DMR Kulasekara[1]

[1]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Electrical, Electronic & Telecommunication Engineering, Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#] nadinpethiyagoda4@gmail.com

Modern intelligent transportation systems heavily rely on vehicle type classification technology. Deep learning-based d vehicle type classification techniques have sparked a growing concern as Image Processing, Pattern recognition, and Deep Learning have all advanced. Convolutional neural work, particularly You Only Look Once (YOLO), has demonstrated significant benefits in image classification and object detection during the past few years. Due to its ability to forecast objects in real time, this algorithm increases detection speed. High accuracy: The YOLO prediction method yields precise results with few background mistakes. Additionally, YOLO is aware of generalized object representation. This method, which ranks among the best for object t detection, performs significantly better than R-CNN techniques. In this paper, YOLOv5 is used to demonstrate vehicle type detection; the YOLOv5 m model was chosen since it suits mobile deployments. The model was trained with a dataset of 9200 images, where 2300 images were allocated for each class with a variety of vehicles. Experimental results for 100 epochs with a batch size of 16 show mAP@.5 at 78.1% and mAP@.5:.95 at 71.7% trained and tested on four vehicle classes.

Keywords: *You Only Look Once (YOLO), deep learning, Convolutional Neural Networks (CNN), Single Shot Detector (SSD), vehicle recognition*

ID 505

Fuzzy Logic Based Learning Style Selection Integrated Smart Learning Management System

SPM Arachchi#[1], DU Vidanagama[1] and WMSK Ilmini[2]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

#36-it-0015@kdu.ac.lk

Being cognizant of things that individuals learn promotes individual learning and motivation. Acquiring the skills and concepts based on understanding things that teachers teach inside the classroom become important. Gender, age, mindfulness, ability, interest, anterior knowledge, learning style, motivation, locus of control, self-potency, and phenomenological beliefs differentiates one learner from another. The contribution of this research is to enhance the proficiency of the instructors in preparing the learning materials by considering the learning style of each learner displayed on students' profile view of the LMS. Referring to previous literature, it was found out that most of the methodologies that are used to detect learning styles are based on advanced pattern recognition techniques which are based on huge datasets. The results of this study indicate that the use of this inventing feature called fuzzy logic can reduce the complexity of learning style selection. Rather than using complex algorithms to detect learning styles, it works similarly to human reasoning, and any user can easily understand the structure of Fuzzy Logic. As it does not need a large memory, algorithms can be easily described with fewer data, and it easily provides effective solutions to problems that have high complexity and uncertainty while being able to easily modify the rules in the FLS system. Trials of the learning style selection feature will be tested as the evaluation process. This refers to the process of analysing the survey results from students. A group of students who knows their learning style via a psychological session will be selected out of a university and each student will be evaluated by a test regarding their learning style as similar to LMS. Results will be compared and find the probability of the truth of the learning style selection feature.

Keywords: *FLS system, Matlab, visual and text based learners*

ID 108

Computerisation of Flash Cards in Early Childhood Education

AVN Sandamini[1#], MKP Madushanka[1] and HL Premaratne[1]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0006@kdu.ac.lk

The Sri Lankan education sector faced some major conversions with online education due to the Covid-19 pandemic and the country's economic crisis. Early childhood education was undebated in the development stages of the online education concept. This study aims at computerizing flashcards for early childhood education by developing an application that helps to strengthen the foundation of education for Sri Lankan children under the age of eight, in all three native languages Sinhala, Tamil, and English. This system is modelled focusing on detecting an object in an image considering the specific categories (numbers, letters, animals, fruits, and vegetables) specialized for children under the age of 8 and giving the text as well as the audio output in all three languages used in the country. The categories were selected according to the NIE syllabus and their teaching methodologies. The detection process is done through a set of custom-trained models using TensorFlow and Keras. The models are built upon CNN and YOLO algorithms with the ability to get all three native languages are powered through the internal translators that will map the words with the languages. A mobile-based development through Kivy is chosen to ease the detection process, where the user can be given the ability of real-time detection. Each model was trained with 80+ classes that include 100+ images with an accuracy range from 70%-90%, which provides the user with vast diversity and high validity. The focus on developing this system is to introduce an online platform for the learning process of early childhood, which is lacking in the current Sri Lankan education system, and teaching young children all three languages used in means of communication inside the country while prioritizing early childhood education in online learning methodologies.

Keywords*: flash cards, computerisation, early childhood education*

ID 290

Facial Recognition Based Temporary Employee Management System

KAJV Arunarathna[1#], JJRS Fernando[1] and DMR Kulasekara[1]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]35-se-5504@kdu.ac.lk

In Sri Lanka, 90% of temporary workers are employed in the private sector. Overall, around 60% of employees work as temporary workers, out of all 2.8 million private-sector employees in Sri Lanka. Although these temporary workers get a daily wage, they are not promised continued work in the future. In other words, their job security is much lower compared to other private sector workers. Two of the major issues with their employment are, the temporary nature of their occupations and the difficulty in controlling these occupations because of the lack of a permanent set of rules. In many workplaces at present, their work is obtained through brokers. Therefore, these temporary employees as well as the companies face many problems. With the intention of overcoming these issues, this paper introduces an automated system for factories to hire and manage temporary workers without an intermediate broker. This application is developed mainly in four modules: employee registration, employee identification and attendance marking rating the employees according to their performance, and payroll management. Attendance marking is operated using the (LBPH) face recognition technique. It enables the recognition of the real identities of the employees thus achieving a better level of accuracy in both identity recognition as well as attendance marking. After the identification of the employee, the system will display the tasks assigned to them on a particular day. Tasks are assigned considering the rating value of the employee which will be calculated based on their performance and proficiency on allocated work, as recorded in their work history. The sectional heads are responsible for rating the employees. Their arrival time and date are recorded to ensure the smooth functioning of the payroll system.

Keywords: *temporary employee management system, face recognition, temporary employee*

ID 146

A Self-Monitoring System for Online Education

S de Silva[1#] and B Hettige[1]

[1]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-ce-0001@kdu.ac.lk

Over the past decade, the rapid growth of technology has resulted in online learning gaining a lot of traction as the preferred method of studying amongst students. During the COVID-19 global pandemic, online education has overtaken traditional classroom education as students' preferred choice in learning. Traditional classroom teaching has always been bi-directional, involving interactions between students and their teachers. Online Education in comparison has become more unidirectional and this lack of interaction between the student and teacher can severely impede a student's concentration. In addition, the presence of countless other distractions in a virtual environment has contributed towards students being more demotivated and uninterested in their education. This has brought the true effectiveness of online education into question. It is with the intention of countering these problems that a Self-Monitoring System for online education has been developed. The System will be developed to follow the guidelines of the Buddhist Philosophy of "Iddhipada" and will monitor students in a variety of ways including tracking emotion and monitoring activity which would help to improve concentration, and motivation and produce better results. It is hoped that this system will help make online education as productive and focused as it can be.

Keywords: *self-monitoring system, emotion recognition, artificial intelligence*

ID 259

Sibil AI: Children's Story Generator in Sinhala Using Transformers

RMVD Bandara[1#,] HAA Sanja[1] and B Hettige[2]

[1]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]35-cs-0004@kdu.ac.lk

Ever since the birth of humankind, stories have been used as a means of sharing information and educating people. Stories are more than just a form of entertainment; they impart lessons that often help children to develop the skills they need to thrive in life. Research and development teams have unquestionably mastered the practicalities of producing human-like creative text tales, which has been a significant barrier in natural language processing in recent years. A system based on artificial intelligence that generates children's stories can serve as a resource for parents and children to connect with. The ability to generate natural language stories that people can understand, remember, and enjoy is difficult to achieve with current technology. A new model based on transformers is introduced in this paper. This new approach for generating stories for children based on the GPT-2 model with the help of a web application. The GPT-2 is a model is based on a neural network that is designed to imitate the human behaviour of producing creative and coherent text. It can generate stories in different genres and start captions. The web application takes advantage of the GPT-2 model's ability to generate fluent texts, including proper punctuation, complex syntaxes, and grammar rules. The solution allows users to generate creative stories from different genres with starting captions, especially, using the proof-of-concept to support the narration given in Sinhala language, one of the native languages in Sri Lanka.

Keywords: *artificial intelligence, GPT-2, story generator*

ID 282

Multilingual Learning Platform for Kids to Learn Foreign Languages in Sri Lanka

GHGI Nimesha[1#] and BMTN Rathnayake[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-it-0014@kdu.ac.lk

Learning and teaching a foreign language is not easy, but it is less challenging if it is practiced from childhood. This research paper mainly considers which age range of students will be helpful and scrutinizes the attitudes of parents and teachers of foreign language learning tools. The main aim is to achieve the initial steps when developing a foreign language learning tool for kids. For that, the researchers have surveyed to gather information about the students who are learning foreign languages and those who are willing to learn. Also, to find the most popular foreign languages that are used in Sri Lanka, the difficulties that occur when following these languages, and identify methodologies that can be used to improve the language learning skills of small children and mitigate the time constraints and students' shyness in learning Foreign Languages.

Keywords: *foreign languages, learning tools, kids' language learning interests, multilingualism*

ID 344

Speech Emotion Recognition for Autism Spectrum Disorder Using Deep Learning

MD Gunathilake[1#] and GAI Uwanthika[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-cs-0002@kdu.ac.lk

Children who belong to autism spectrum disorder have difficulty in identifying emotions and expressing their emotions because it is hard to identify the emotions like anger, disgust, fear, happiness, sadness and surprise in other people and in themselves. This can be even more severe when it could not be found at the beginning and may lead to impairment of social communication of the child. Through the proposed systematic methodology, children can identify their basic emotions and try to express them. This evolved methodology was developed using python language. For emotion recognition, a deep machine learning model like Recurrent Neural Network (RNN) using Keras with a TensorFlow backend was used. RNN consists of four layers with two long short-term memory (LSTM) layers. To optimize the performance of the model Adam optimizer was used. For the training and testing of the model online available data were used. For the classification of the emotion's valuable features of the audio signal like Zero Crossing Rate (ZCR), Chroma STFT, Mel-Frequency Cepstral Coefficient (MFCC), Root Mean Square (RMS) value, and Mel spectrogram were extracted using the python libROSA library. Due to the lack of the data amount and GPU requirements model's performance can decrease. This model performed well with the TESS data corpus with 91% test accuracy.

Keywords: *speech emotion recognition, autism spectrum disorder, ZCR, Chroma STFT, MFCC, RMS, MEL spectrogram*

ID 212

UxVote – Blockchain-Based E-Voting System for Secure Electronic Voting

BAK Vinsura[1#], RMVD Bandara[1], ADAI Gunasekara[2], B Hettige[1] and GAI Uwanthika[2]

[1]*Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*

[#] vinsurakumuthu@gmail.com

Voting is a process of group decision-making or opinion-gathering that can be utilized to resolve any ideological disagreements. Voting on paper is still the most popular method. However, this traditional method of collecting votes is quite expensive and employs paper ballots. As a solution to this, a very secure and transparent solution, which should also ensure the privacy of the participants, is a necessity. An e-voting system can be taken into consideration as a remedy to the problems the traditional voting system currently has, and one of the technologies that are most suited for use in highly secure situations like blockchain. A hashing technique serves to strengthen the security of a blockchain, which is a decentralized system. Peer-to-Peer networks and a decentralized timestamping server make it difficult to manipulate or alter the data in this system. In this paper, we present a safe voting system that was created using blockchain technology that allows voters to select one candidate from an existing group for major elections (e.g.: presidencies) and general elections. In this system, we used the Ethereum network, Ganache blockchain, and the Solidity programming language to create and test an example e-voting application as a smart contract for the Ethereum network. The records of ballots and votes will eventually be stored on the Ethereum blockchain. Voting requests are handled by the consensus of all Ethereum nodes and can be made by users straight from their Ethereum wallets. This agreement offers an open environment for electronic voting. With the help of this system, voting may be done more securely and affordably online.

Keywords: *Blockchain, UX of voting, E-voting system, dapps, ethereum*

ID 417

Towards a Decentralized Publication Platform with Authors Incentivized by Blockchain Technology

CS Wanigasooriya[1#], JJRS Fernando[1], SCM De Silva[1] and M Sirisuriya[1]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0004@kdu.ac.lk

Concerns regarding fairness, quality, performance, cost, and accuracy arise when science is published, and peer-reviewed. The Open Access movement has failed to deliver all its promises, and intermediaries' publishers can still enforce regulations and profit concentrations. Existing publication platforms have several serious flaws, such as rather than encouraging extensive knowledge sharing, access to publications on publisher-owned platforms is typically charged. Furthermore, most present publication systems are prone to inefficient peer review since reviewers are not properly compensated for delivering high-quality reviews. A decentralized publication system for open research using upcoming distributed technologies like Blockchain creates transparent governance. In addition to a thorough analysis of the methods, resources, and strategies put out in the literature to deal with the problems brought on by the development of the proposed system, we propose an application that takes advantage of the Ethereum blockchain to address all these issues. The system promotes peer review and develops its own reputation ecosystem as a substitute for the dominant prestige structure now in existence in academic publications.

Keywords: *decentralized publication platform, Blockchain, open access, ethereum*

ID 293

Computer Game Industry and Economic Growth: A Study on How Blockchain Computer Games Make Impact on Current Economic Crisis in Sri Lanka

BMTN Rathnayake[1#] and GIF de Silva[1]

[1]*Department of Information Technology, General Sir John Kotelawala Defence University of Sri Lanka*

[#]rathnayakanawanjanathisaru@gmail.com

Globally the computer gaming industry is a vast industry that rapidly changes with the new technology. Earlier, gaming was used for the purpose of entertainment. Over the years, people played games but did not earn money from them. Cryptocurrency and blockchain technology are game-changers here and created the economic system around the computer gaming industry. At present the gaming industry is growing rapidly changing with these modern technologies and gamers are allowed to earn income from playing games. On the other hand, introducing this play-to-earn game model for computer game developers and game development companies has been increasing their annual revenue. Here the game changer is the blockchain gamification known as NFT games or W3 games. Blockchain gamification created an entirely new economic system around the globe and created a direct impact on economic growth. Meanwhile, Sri Lanka is going through an economic crisis and needs solutions to return to normal and grow again. The researchers' goal here is to identify the impact of blockchain gamification on the economy, and how to implement and identify what is the business model suitable for Sri Lanka. Implementing blockchain gamification gives a solution to the current economic crisis and changes the current economic ecosystem. Globally, even in Covid-19 pandemic, other countries started blockchain gamification and even business owners moved to it to earn their daily income and succeed. With the current situation in Sri Lanka, as a solution to the economic crisis, people can move to blockchain games, earn income, and help Sri Lanka's economy.

Keywords: *computer games, blockchain, economic growth, non-fungible token*

ID 34

Story Catcher: E-Library to Improve Early Literacy Skills and Verbal Fluency in Kids

MTA Deen[1#], DSS Jithmisha[2], PDCJ Paranagam[2], HHAMI Hettiarachchi[2] and WPJ Pemarathne[1]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*
[2] *Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#]37-cs-0007@kdu.ac.lk

Mobile smart devices are gaining popularity rapidly. These digital devices facilitate a new generation of technological tools that offer unprecedented access to content as well as opportunities for creative use even for young children. The development of mobile technology and the proliferation of smartphones have made m-Learning and e-Learning one of the most efficient methods of learning. Previous studies have explained the positive impact of using e-library mobile applications to develop the literacy skills of children. Despite positive outcomes, Sri Lanka does not have an e-library mobile application for children to improve their reading and writing skills in both Sinhala and English languages. A solution to overcome this problem is to develop an e-library mobile application for kids. Story Catcher e-library mobile application contains books, poems, and songs in both Sinhala and English languages with a special narrating feature that helps kids to learn correct pronunciation and improve verbal fluency and communication skills. Distinctive features like a screen time management option for parental control and to avoid overuse, an interactive game for the kids, and an option to add or remove any book, song or poem from favourites are included in this mobile application. This research paper proposes a novel method to improve the literacy skills of kids in Sri Lanka.

Keywords: *story catcher, e-library, android development, early childhood literacy skills, verbal fluency*

ID 645

Identify the Usage Level of ICT-Based Knowledge Management Systems (IKMS) among Vegetable Farmers in Sri Lanka

SI Baddegamage[1#], J Goonetillake[2] and L De Silva[2]

[1]*National Institute of Library and Information Science, The University of Colombo, Colombo, Sri Lanka*
[2]*School of Computing, The University of Colombo, Colombo, Sri Lanka*

[#]indika_bg@hotmail.com

Information and communication technologies significantly bridge the information gap within communities towards creating a knowledge economy. Agriculture in Sri Lanka is one such sector that can derive benefits by providing the correct information at the right time to make actionable decisions. The use of information during the crop lifecycle helps farmers eliminate most of the daily issues. Information on cultivation methods, price fluctuations, supply, and demand is essential for farmers to make the right choices and get a better income. Having identified the essence of information and communication systems in bridging the information gap in farming communities, many mobile-based information systems have been introduced to the agriculture sector of Sri Lanka. We conducted a survey to understand how widespread these information systems among the farmer communities were, and found out that the use of such systems is very low among farmers. This survey was conducted among 54 farmers covering the major agriculture zones in Sri Lanka and findings of the study revealed that only 63% were aware of the available systems. In contrast, only 35% of the farmers use these applications to obtain information. Around 37% were unaware of the existence of applications though smartphone usage is recorded to be about 85%. This paper highlights the reasons for the lack of digital information systems usage among the farming community in Sri Lanka. Furthermore, the paper will pave the path by highlighting the initiatives that can be carried out to increase the use and thus contribute toward a knowledge economy.

Keywords: *ICT-based knowledge management systems, knowledge economy, technology acceptance model*

POSTER PRESENTATIONS

ID 33

VehiPark- Online Vehicle Parking Management System

HMIJ Herath[1#], BM Kasthuriarachchi[2], PTC Sandamini[1], WCD Rathnasiri[1] and WPJ Pemarathne[2]

[1]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawela University, Sri Lanka*
[2]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawela University, Sri Lanka*

[#]37-ce-0006@kdu.ac.lk

Traffic congestion is exacerbated by the parking issue. The proposed vehicle parking system is built with Android (Mobile) and Web Applications. Android (Mobile) application is for car owners to book their parking space and Web application is for park owners to design their park and easily update park information. In addition, our project's goal will be outlined. Traditional methods of arranging a car slot do not appear more efficient. Many human resources are required to keep track of the details of the individual who reserved the parking space. The primary goal of this project is to create a new smart parking system that assists vehicles in identifying parking slots in a specific parking area. For this paper's data collection methods, document analysis and questionnaires were used. It was discovered that the current technique is time-consuming and generates gridlock when there is no proper and simple system in place to govern parking spaces. This proposed system would allow consumers to book a car slot before arriving at their selected location. This system results in functions such as displaying available parking spaces, accepting money for parking spaces, and legally accepting booking a slot.

Keywords: *android, web development, mobile computing, vehicle parking*

ID 74

Technology Involvement and Effectiveness for Online Learning during Covid-19 Pandemic

GHAS Navodya#1 and N Wedasinghe2

[1]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawela University, Sri Lanka*
[2]*Department of Computer Science, Faculty of Computing, General Sir John Kotelawela University, Sri Lanka*

#36-it-0004@kdu.ac.lk

Every aspect of life has changed due to the ongoing COVID-19 pandemic. Schools and universities have been forced to conduct courses in online learning environments due to the COVID-19 epidemic. Online learning is a type of education in which students learn in a completely virtual setting. Due to the global breakout of the Covid-19 pandemic, distant learning plays a key role in the education sector. The major goal of distance learning techniques is to improve the quality of learning and teaching in the educational system. This research examines the effect of online learning technology on learning effectiveness. This survey involved both school and university students in Sri Lanka. The quantitative study was conducted using Google Forms as the online questionnaire for collecting data. The number of responses to the survey was 83. The survey helped to identify the technology involvement and effectiveness of online learning during the Covid-19 pandemic in Sri Lanka. The results found a powerful relationship and influence between online learning technology and learning effectiveness. Technology can be used to enhance learning in a variety of ways, including electronic grade books, digital portfolios, learning games, and real-time feedback on teacher and student performance. Furthermore, in rural areas, a lack of basic informational technical skills has a significant impact on online education. The research articles and survey identified online learning effective for this pandemic situation, and Covid-19 has impacted education. Furthermore, this paper supports identifying online learning advantages for both school and university students and some of the most common issues students are having with online learning right now.

Keywords: *Covid-19 pandemic, effectiveness, impact, online learning, technology*

ID 79

Machine Learning Based Mobile Robot Localisation in Indoor Environments

HKIS Lakmal[1#], YSP Weerasinghe[2], RPS Kathriarachchi[3] and MWP Maduranga[4]

[1] *Department of Engineering Technology, General Sir John Kotelawala Defence University, Sri Lanka*
[2] *Department of Electrical and Electronic Engineering, NERD Centre, Ja-Ela, Sri Lanka*
[3] *Department of Information Technology, General Sir John Kotelawala Defence University, Sri Lanka*
[4] *Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#] lakmalhkis@kdu.ac.lk

The mobile robot Indoor Positioning Systems (IPS) are widely used in the automation industry to find the location of moving robots in indoor environments. Existing IPS are expensive, and designs are complex. Moreover, the requirement for further installation work seems to be a common problem in these applications. This paper proposes a simplified localization technique based on the Received Signal Strength (RSS) by employing Machine Learning (ML) algorithms. The collected Received Signal Strength Indicator (RSSI) data from three different anchor nodes in the testbed has been trained using supervised learning algorithms to estimate the mobile robot's geographical location. During the experiment, several algorithms were investigated, and the Decision Tree Regression (DTR) algorithm outperformed with 28.84 RMSE and 0.9 R^2

Keywords: *Indoor Positioning Systems (IPS), machine learning, IoT, RSSI, mobile robots*

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ID 106

Security Vulnerabilities and Security Elements of Frequently Used E-learning Platforms: A Review

PH Perera[1#], SCM Sirisuriya[1] and HRWP Gunathilake[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0001@kdu.ac.lk

E-learning has come to the fore with renewed interest and popularity among the student population worldwide. The sudden outbreak of Covid-19 compelled the traditional education system to shift to online education mode. Online education is provided via e-learning platforms which provide easy access to students around the globe to learn, communicate and interact with each other. However, the concerns at hand are how secure these e-learning platforms are for the users. If the use of e-learning systems causes security and privacy issues, the learners will be reluctant to be exposed to the platform. Therefore, it has become a major challenge to ensure that only authorized parties have access to the system. The purpose of this study is to investigate all possible security vulnerabilities in the current e-learning platforms and provides appropriate solutions to overcome the security threats. This study has undertaken a comprehensive review to filter the literature for the security elements, threats and vulnerabilities in e-learning platforms. When analyzing the existing research, it could be identified that Moodle, Blackboard and Sakai are the most commonly used platforms. Therefore, this study is based on the security threats and vulnerabilities of the platforms mentioned above. It is revealed that security vulnerabilities of the platforms, Blackboard and Sakai have not been addressed as much as Moodle. Furthermore, this study reveals that confidentiality and integrity are the most important security elements that need to be considered and prioritized within the e-learning environment.

Keywords: *security vulnerabilities, security elements, e-learning platforms*

ID 107

Comparative Study on Existing Input Validation Techniques and Their Challenges: A Review

KGH Piumali[1#] and B Hettige[1]

[1]*General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-se-0011@kdu.ac.lk

Data gathering techniques are widely spread around the world. Gathering data by filling out a form is one of the most popular techniques of data gathering. Most modern Internet users expect to interact with web-based forms in a personalized way. Thus, many technologies have been built for web-form handling. Validation is one of the prominent approaches among them. Mainly, client-side and server-side validation can be applicable in web form validation. Thus, the main objective of this study is to explore the characteristics of existing input validation mechanisms that have been built based on advanced technologies and comparatively analyze their approaches and drawbacks in handling the input. So, a comparative study on input validation technologies was conducted using more than 20 research articles. The study revealed that most of the existing input validation tools and techniques had been built using advanced technologies like semantic web technologies, Regular Expressions, Static Analysis, Dynamic Analysis, and String analysis etc. But it is controversial that these existing tools and techniques have flaws though they are said to be developed. The users come with uncertainties about whether their responses are validated accurately, andit is difficult to precisely guarantee the security of the sensitive information entered. Thus, most of the approaches seem in vain that they do not contain precise, accurate, and trustworthy validation mechanisms. So, there is an urgent need for an alternative tool or a mechanism to reduce the existing drawbacks in input validation.

Keywords: *form handling, form validation, client-side validation, server-side validation, security*

ID 114

A Review on Application of Artificial Intelligence in Fashion and Apparel Industry

NTD Dharmasiri[1#] and B Hettige[2]

[1] *Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*
[2] *Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#]37-ce-0006@kdu.ac.lk

Dressing or clothes is a fundamental need of human beings that are not limited to a particular gender. Hence, fashion design is a very demanding industry that involves many of the concepts, requirements, and demands of human beings. An area like this, which has a huge involvement of people, requires some sort of technology to solve its problems and give the best service to the consumers. So, like every other industry, the fashion and Apparel industry also has some issues such as high production costs, wastage, customer dissatisfaction, and environmental pollution. In order to address these issues, Artificial Intelligence based technologies have been used, including Machine Learning, Decision Support Systems, Expert Systems, Optimization, and Image Recognition & Vision. This review presents different research on Artificial Intelligence-based technologies and issues related to the fashion industry. Based on the operational procedures, this study's concerns are also divided into four areas, such as apparel design, production, retail, and supply chain management. In addition to that, big data helps Apparel e-commerce retailers provide personalized offerings to customers. Machine learning and image processing techniques are commonly used to develop data-driven solutions using product-related data provided by Apparel product manufacturers & designers, and also, these technologies help the supply chain to improve business operations.

Keywords: *fashion designing, artificial intelligence, big data analytics*

ID 119

A Review on the Application of Artificial Intelligence and Automation in Digital Forensics

MTA Deen[1#] and B Hettige[2]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*
[2]*Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

#37-cs-0007@kdu.ac.lk

As a branch of forensic science, Digital Forensics is concerned with identifying, acquiring, processing, analysing, and reporting on digital data. For law enforcement investigators, Digital Forensics support is crucial since electronic evidence is present in almost all criminal activities. An array of electronic evidence can be gathered from a variety of sources, including computers, smartphones, remote storage, unmanned aerial systems, and shipborne equipment. The main objective in Digital Forensic is to extract data from electronic evidence, process it into actionable intelligence and present the findings for prosecution. The success, efficiency, and efficacy of a typical forensic inquiry are significantly influenced by the knowledge and prior experience of the investigator or any security agent. The outcomes of a digital investigation will be more effective and efficient if the power of intelligence in the available computer resources is utilized. In modern computer science, Artificial Intelligence (AI) is a well-established field that can often provide a means of solving computationally complex or large problems in a realistic timeframe. The influence of AI on several fields in modern society and its achievements throughout time suggest that it can help with a variety of challenging Digital Forensics investigative issues. This review outlines various methods of evaluating, optimizing and standardizing applications of artificial intelligence and Automation models used in digital forensics.

Keywords: *digital forensic, artificial intelligence, automation, machine learning, intelligent forensics*

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ID 149

Implementation of Autonomous Robotic Arm for Nerenchi Board Game

AHBKY Gawesha[1#], B Hettige[1] and MAST Goonatilleke[1]

[1]*Department of Computer Engineering, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-ce -0010@kdu.ac.lk

Sri Lankan board games have a special place in Sri Lankan traditions. Peralikatuma, Olinda Keliya and Nerenchi are some examples for these board games. Among these games, Nerenchi is one of the oldest board games, and it is even mentioned in Sri Lankan ancient textbooks. It is a board game that can be played by up to two players. Playing board games like Nerenchi helps us to improve our soft and tactical skills. With the improvement of social media and video games, the new generation distanced from these games. Because of these old folk games like Nerenchi on the brick of existence. It is urgent to use new technologies to attract the young generation to these games. A web-based game that can be played Nerenchi game up to 2 players introduced to overcome this issue. UI/UX of that web-based game is not up to date and that it's difficult to attract the new generation. This paper discussed a robotic solution to automate the Nerenchi board game. The proposed system consists of two main parts. They are smart Nerenchi board and robotic arm. Smart Nerenchi board consists of 24 IR sensors which are used to detect the Nerenchi pieces on the board and are powered by Arduino mega board. A fully 3D-printed 5 DOF robotic arm was used for this system. Arduino Mega board is also used in the robotic arm to control the function of the servo motors. The proposed system is going to test in laboratory conditions and compare the detection accuracy with the image processing approach.

Keywords: *Nerenchi, robotic arm, sensors*

ID 175

Autonomous Car: Current Issues, Challenges and Solution: A Review

RGS Deemantha[1#] and B Hettige[1]

[1]*Department of Computer Engineering, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

[#]sdgallage751515@gmail.com

Autonomous vehicles can operate on their own and perform necessary functions without any human intervention. Thus, modern world gives high demands on these areas especially on military-based research. The adoption of self-driving car technology offers several advantages that may be realized via research and development. Historically, first radio-controlled automobiles were created in 1920 and presently they come with many significant changes. Later, self-driving automobiles with identical electrical guidance systems first appeared in 1960. Vision-directed autonomous cars were a key technological milestone in the 1980s, and still comparable or updated kinds of vision and radio-guided technology trends are employed. However, these autonomous vehicles face many challenges and issues on their development process. At present, many companies including Google and Mazda have been able to develop successful solutions while providing acceptable solutions to human behaviour, ethics, strategy of traffic maintenance, liability, and policies of country. This paper presents a comparative review on existing autonomous cars, key challenges and issues.

Keywords: *autonomous vehicle, challenge, technology, vision-directed autonomous cars*

ID 177

American Sign Language Recognition Using Deep Learning

PADA Seneviratne[1#] and N Wedasinghe[1]

[1]*General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-cs-0006@kdu.ac.lk

American Sign Language (ASL) is a visual-gestural language used by the deaf community for communication. There exists a communication gap between hearing impaired people and normal people because most normal people do not understand sign language. Conversations with hearing-impaired people become more difficult as most of us do not know sign language. Hand movements are one of the most powerful nonverbal communication methods, using non-manual and manual correspondence. ASL to text interpreting technology using hand gesture recognition could fill this communication gap. Recently, hand gesture recognition systems received great attention, and many researchers have been conducting studies on the methods for hand gesture recognition for many different purposes. Sign Language recognition is one main purpose among those purposes. Among these, the Finger Spelling method is a very interesting research problem in computer vision which has been addressed for years with different kinds of applications in various domains. In this paper, a survey of existing hand gesture recognition systems and sign language recognition systems are presented for the recognition of the Static Finger Spelling method in the American Sign Language. This sign language recognition can be achieved by using sensor-based or vision-based approaches. In this paper, both these approaches are reviewed along with the background of the problem and the pros and cons are also discussed algorithms.

Keywords: *sign language recognition, hand gesture recognition, American Sign Language*

ID 242

Smart Reading Chair Design by Using Kansei Engineering

HMIJ Herath[1]#, DSS Jithmisha[1], CCW Siriwardha[1], MPKT Perera[1], SAA Samarasinghe[1], BM Kasthuriarachchi[1], AMPS Gunaratne[1] and P Kalansooriya[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

#37-ce-0006@kdu.ac.lk

Reading is an interesting activity people engage in, whether for an exam, leisure, or to gain knowledge on a specific subject. Because reading usually takes a long time, the reader should be as comfortable as possible while reading. Therefore, a reading chair is an essential piece of furniture. As per our research findings, there are numerous reasons why someone should have a reading chair in his or her reading room rather than sitting in alternative ways such as standing or lying down on mats. The methodology used is document analysis and questionnaires with 192 respondents. Furthermore, the research indicates that backache is a common problem for avid readers and people who sit for long periods and is strongly related to their posture. According to research, Kansei Engineering is a method for translating consumer Kansei into product design elements. According to this study, Kansei engineering translates customers' psychological needs and feelings into the design of products and services. This technique will allow designers and manufacturers to incorporate Kansei into product design to gain a competitive advantage. Our research paper proposes a smart reading chair design based on Kansei Engineering's fundamental principles and methods, which provided scientific guidance for designing a chair to meet consumers' emotional needs.

Keywords: *Kansei engineering, Kansei word, smart reading chair, product design*

ID 246

Surgical Instrument Tracking and Maintenance System for the University Hospital, KDU

KPPT Gunaratne[1#], HRWP Gunathilake[1] and KDW Wijenayake[1]

[1]*General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-se-0010@kdu.ac.lk

Lack of attention to the correct use of surgical instruments leads to errors in practice and especially, it is difficult to control losses. The present research aims to effectively use a surgical instrument tracking and maintenance system at University Hospital KDU, Sri Lanka. The features required to develop a system for the institution were identified by studying the existing literature about traceability systems. We decided to use the QR code technology to detect and find the location of an individual surgical instrument. While securing the main purpose of the health and safety of patients, the system would increase labour efficiency and lessen worker responsibility, even though statistically significant data have not yet been discovered. The paper also demonstrates the benefits of using a surgical instrument tracking and maintenance system in a hospital's Central Sterile Supply Department. The outcomes of this study will be used for future implementation purposes of the system.

Keywords: *QR code, instrument tracking system, medical equipment management system*

ID 321

Development of a Heated Jacket for Bike Riders Using Kansei Engineering

JR Senadheera[1#], EMNMR Edirisinge[1], HMOSB Herath[1], PBSM Priyankara[1], SA Sathsara[1], PKBTD Pallawala[1], JP Kodithuwakku[1] and DDGR Karunarathne[1]

[1]*General Sir John Kotelawala Defence University, Sri Lanka*

[#]37-cs-5972@kdu.ac.lk

We are highly uncomfortable in hot and cold temperatures because our bodies produce heat through metabolic processes, especially when working hard. We dress more comfortably in jackets and pants during colder months. Hence, we created a novel evaporative-type motorcycle seat, a jacket, and a pair of pants designed and made using several heating coils. The body temperature is measured using numerous feedback thermal sensors dispersed over a large area of the seat, jacket, and pants. The measurements are then sent to the control unit, where they are used to raise the temperature of the heating coils in response to the body's need to warm up.

Keywords: *heated jacket, Kansei engineering, bike riders*

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ID 328

Tracking System and Issues in Public Transport: A Review

C Rathnasiri[1#] and B Hettige[1]

[1]*Department of Computer Engineering, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

[#] 37-ce-5977@kdu.ac.lk

In Sri Lanka, the general public uses static timetables for public transit. However, the timetables with appropriate alignment are not occurring for several reasons, including traffic congestion, poor road conditions, and a lack of technological or human resources. It is crucial to have a means for tracking a user's location in a transit system so that they may spend less time waiting. The globe has seen a lot of studies on location tracking and surveillance. In recent years, certain commercial tracking systems allow the installation of costly devices to track private cars. Currently there is no reliable way to determine the real-time position of a bus or train. This study concentrated on using widely available infrastructure and technology to construct a location monitoring system for the public transportation industry. This system enables location tracking consisting of web application and a mobile application. The bus or train timetables and real locations can be viewed by the general public using an interface provided by the system's central web application. In addition to providing location data, it also forecasts arrival and destination times by comparing historical data with the most recent real-time data. Master data may be m using the main web application's administrative interface. Through this system, it is anticipated that travellers would be help to make better travel selections by providing them with the necessary information. Additionally, relevant authorities can utilize system data to assist choices to improve bus and train services.

Keywords*: global positioning system, GMS system, display service, SMS tracking*

ID 419

E-Agri Web Application for Agricultural Development in Sri Lanka

DMC Kulasekara[1#] and G Kularathna[1]

[1]*British Computer Society*

[#]minesha123@gmail.com

Sri Lanka has been an agricultural country since the age of kings. As one of the main economic streams in the country, even today it brings a massive amount of foreign exchange to strengthen the economy. Rice and organic food consumption have drastically increased due to the population and high demand for fresh and healthy foods. Both fruits and vegetables are cultivated all across the country including the highlands of the central province and the in-land areas. The main reason of building an E-commerce platform is to address the problem of unnecessary involvement of the middlemen who buy products from farmers and sell them to customers. They are the ones who control the market price and cause unnecessary price hikes, gaining the highest profit from the business. Every farmer doesn't have the storage and transport facilities to deliver the product to markets. Farmers can't get the price they deserve and the customers have to pay extra amount. The solution suggested in this research paper will stifle this problem by keeping a steady market price while farmers can make a better profit from their products. Therefore, they can widespread their sales all over the world. Through this e-commerce platform, farmers can suppress the middlemen's involvement by directly interacting with customers. Nevertheless, with this web application, users will be aware of the agricultural products in the nearest locations. This web application can reduce the wastage of food in transport, and ensure that anyone can buy the products they need with ease.

Keywords: *e-commerce, agricultural goods, web application*

ID 431

A Systematic Application to Manage Residential Rental and Maintenance in Sri Lanka

MTA Wickramasinghe[1#], SHIDN De Silva[1] and D Gunasekara[1]

[1] *Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-it-0020@kdu.ac.lk

The impact of the COVID-19 outbreak was felt across all real estate management. A slowdown in the house rental and maintenance management can be anticipated as a result of the lock-down and limitations in financing. The most severe impact is on the inability of handling the relationship between the house owners, tenants, and the handyman. Property management is a crucial component of being a landlord, but it is far from straightforward. An appropriate methodology was employed by the researchers to identify all the problems regarding real state property management through quantitative and qualitative data gathering procedures such as semi-structured interviews, face-to-face interviews, questionnaires, and direct observation of the selected sample. After analysing, it was identified that the house owner must screen tenants, collect rental fees, handle complaints, and keep tenants satisfied, among other things. In this pandemic situation, tenants faced more difficulties such as difficulty in finding a better house, paying monthly payments, paying utility bills, loss of connection with house owners, and finding the nearest handymen. Handymen suffered a lot mainly because of the inability to find work. Researchers' main aim is to give an appropriate solution for Sri Lankans to manage house rental and maintenance. By examining the responses, this investigation shows that a mobile application would be a better solution than implementing a web application. Iterative waterfall methodology was used for implementing this application. The researchers decided to develop this application using android studio. To enhance the effectiveness of the system by using 360 VR photography, Machine learning (ML)-based technologies, OTP/Fingerprint for User Verification and Geolocation, and Geo-tagging were used.

Keywords: *house rental maintenance management, 360 VR photography, machine learning*

ID 462

Private Motor Coach Management System

HAA Madushanka[1#], WJ Samaraweera[1] and WAAM Wanniarachchi[1]

[1]*Faculty of Computing General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-is-0032-@kdu.ac.lk

Management Systems are very popular in the present day. The goal of this research is to determine how to make the transition from a manual, paper-based Private Motorcoach Management System to an automated system by enhancing and perfecting the current automated Private Motorcoach Management System. This will make it easier to employ automated Private Motorcoach Management Systems more effectively and eliminate the usage of manual paper-based systems. The purpose of this research is to examine the effectiveness of currently used Private Motorcoach Management Systems, how they utilize new technologies, and what areas will need future attention. What features should be produced in the current automated Private Motorcoach Management System for future enhancement can be reached with the use of published research studies, questionnaires, and interviews. This paper examines the ways to improve the existing Automated Private Motorcoach Management System in order to help with the transition from a traditional paper-based system to an automated Private Motorcoach Management System.

Keywords: *technological systems, management systems, Motorcoach management systems*

ID 468

Automated Car Service Management System to Increase Industry Efficiency

GMIP Aponsu[1#], WAAM Wanniarachchi[1] and GIF de Silva[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-is-0008@kdu.ac.lk

The automobile maintenance and service industry are currently witnessing the trend of people expecting to order items online like other consumer goods and services. But it is a weakness that many leading vehicle maintenance service providers are still doing business based on paperwork. Because of this, it appears that there is a minimum level of trust and willingness of the customers regarding the existing efficiency of the automobile maintenance and services sector. Due to this, the customers have to spend their time and effort in vain, while the opportunity for the organizations to use their time and resources efficiently is also reduced. In the existing manual system, the ability to provide the necessary information to the customer immediately and provide the most accurate information has been reduced. As an alternative to that, automating the existing manual system provides the space for organizations to successfully gain increased customer attraction and business competitiveness. This automation provides an opportunity for customers to book an appointment and get services without the hassle that they expect and pay online, as well as get information about services and prices from home. This allows the organization to increase sales and avoid unnecessary labour losses due to the ability to offer discounts to frequent customers and carry out corporate marketing campaigns to attract customers. The purpose of this study is to limit the mistakes and wastages of not only consumers but also the automobile service industry by automating the existing manual systems.

Keywords: *automobile, web-based system, automate, online booking, reporting*

ID 472

SpiAuc: Development of an Online Platform for Spice Sales in the Sri Lankan Market

UWHK Ukgoda[1#], MWP Maduranga[2] and N Wedasinghe[1]

[1]*Department of Information Technology, General Sir John Kotelawala Defence University Sri Lanka*
[2] *Department of Computer Engineering, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-it-0005@kdu.ac.lk

Sri Lanka's spice market has a significant impact on the global spice market. In the current context, farmers are encountering practical issues such as high production costs, difficulties in finding international markets, and high margins from intermediate sellers. Moreover, farmers are less aware of reaching the international market due to several barriers. This paper presents a user- friendly online auction system that allows bidders and sellers to interact through an online platform. The proposed system is low-cost and includes additional features including price forecasting, complaint management etc.

Keywords: *online auction systems, e-commerce, price forecasting, time series*

ID 476

District Hospital Ambulance Management System

MSR Keerthisinghe[1#], WAAM Wanniarachchi[1], DB Wijesinghe[1] and PPNV Kumara[1]

[1]*Department of Information Technology, General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-is-5735@kdu.ac.lk

A significant issue in hospitals is the exchange of ambulance information and updates. The District Hospitals, who maintain Ambulance information as well as other information like drivers' and partners' availability, are also having problems with it. All these activities take place in the hospital office's transport department. The entire mechanism operates entirely manually. Today, government entities place a high value on the use of computers and information technology. Most government entities conduct their regular business utilizing manual processes, and it is the same in hospitals as well. Due to the workload, there is a lot of confusion in the system when district hospitals are involved. As a result, there will be delays and information loss. Because district hospitals now use manual procedures for this, the suggested methodology and the associated program to construct an ambulance management system are pertinent and accurate. Therefore, it should be easier for the district hospitals to efficiently handle their ambulances.

Keywords: *emergency service, ambulances, hospitals*

ID 486

Problems Faced by Staff and Patients in Anuradhapura Teaching Hospital Due to the Existing Paper-Based System and How to Overcome Those Problems

NBSH Buddhadasa[1#], TGI Udayangi[1] and PRD Wijesinghe[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-is-004@kdu.ac.lk

Sri Lanka is currently facing various difficulties related to the patients as well as the hospital staff. In the past, due to the Covid-19 pandemic in the country, the patients as well as the hospital staff, faced various difficulties. This theory is based on the current traditional paper-based system of Anuradhapura Teaching Hospital, a grant hospital in Anuradhapura District, Sri Lanka. Due to this current system, the hospital staff as well as the patients, are suffering greatly during the Covid- 19 season and in the face of the current fuel shortage. The information for this study was found through a Google form. The hospital staff as well as the patients have participated in this study. This study cites 7 grant problems in the current system. Compared to other countries, Sri Lanka still does not seem to go beyond traditional practices. The purpose of this research is to find a technical solution to solve the problems. It is an automated web-based software. The software can solve the existing problems in the system. Also, the researcher has provided 12 attributes that the web-based software should have. Following these, how to solve the existing problems will be found in this study.

Keywords: *hospital problems in Sri Lanka, patients' problems, healthcare workers' problems*

ID 490

Convolutional Neural Networks Based Face Mask Detection and Automated Door Entry Control System

ADLD Amarathunga[1#], JJRS Fernando[1] and WMKS Ilmini[1]

[1]*Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-cs-5698@kdu.ac.lk

The Covid-19 disease is the latest health disaster caused by the coronavirus and its variants. It is rapidly spreading from person to person by air transmission caused by the close contact of the infected people. Due to the rapid spreading of the Covid-19 outbreak, World Health Organization (WHO) issued some health guidelines to minimize the spread of the Covid-19 virus. From regular Sanitization, keeping a social distance, and wearing face masks are the most health guidelines provided by the WHO. Wearing a facemask slows down the rapid community transmission of the virus. Using human resources to observe the wearing of face masks are the traditional way used to monitor the violations of face mask-wearing health guidelines. It was difficult to observe person by person in crowded places and those actions created huge queues in public places. This proposed system is monitoring the Facemask wearing incorrectly by the camera and Raspberry Pi module. This research analyses the existing machine learning algorithms to choose the best-matched one for the system. In the system VGG16 model is used to train the model since it was the most accurate one, founded in the research with 99.83% accuracy. This makes the researchers automate this procedure to get effective results to minimize the spreading of Covid-19.

Keywords: *convolutional neural networks, deep learning, face mask detection, raspberry PI*

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ID 497

Towards IoT: Development of an IoT Based Smart Elder Care System

WATR Amarasinghe[1#], MWP Maduranga[1] and D Gunasekara[1]

[1]*Department of Information Technology, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

[#]36-it009@kdu.ac.lk

Providing elder care necessitates input from a variety of sources, which the use of digital technology can aid. Both hardware and software are potential technologies that can be integrated into elder care. Some elders spend the last part of their lives alone at home or elder homes. Therefore, elderly people forget their medicine schedules, diet plans etc. So they face various troubles. There are several impacts such as burglary threats, and daily home threats. So, this system built for create a safe zone to elders. These are the focus areas, Comfort, Health, Location, Safety, and Wellness. Monitoring systems for the elderly collect a variety of information, including, movement, temperature, behavioural and sleep patterns, and more. The data provides critical insights into a senior's health and daily life to careers and medical professionals. Depending on the rules of the senior living community, medical alert devices can be utilized at home or in the community. Many have emergency buttons or sensors that detect emergencies such as fires or falls. Depending on the aging monitoring system, calls to the police or caregiver can normally be made directly or indirectly.

Keywords: *IoT, ambient assisted living, web-based monitoring, physical engagements*

ID 498

Facilitating Interaction between Medical Reps and Health Professionals through a Drug Management System

LR Mohammed[1#], D Gunasekera[1] and N Wedasinghe[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-it-0024@kdu.ac.lk

One of the crucial components of healthcare that needs to be managed correctly and efficiently is medication. The drug management system, also known as the drug information system, is a system that stores data and enables functionality that organizes and maintains the medication use process within pharmacies. Some businesses sell medications despite not having pharmacies without a prescription, purchased. It may be found in a pharmacy's standalone building or elsewhere in the same complex. Additionally, there are other places like a pharmacy, a doctor's office, or hospital druggists are licensed. Registered pharmacists are those who have registered with the pharmaceutical council. But since this is a title that is only granted upon the successful completion of rigorously national, practical, and legal studies, this research conducted a survey with a list of 5 questions sent to professionals in the medical sector to find out the impact of Drug Management System (DMS) in the healthcare industry. Researchers have identified that approximately 81.1% of the respondents of health professionals believe that DMS can provide more accurate and fast diagnoses and reduce the healthcare workers workload. Moreover, pharmacists must always be on the lookout for fake prescriptions that addicts who are attempting to obtain narcotics and other prohibited substances unlawfully. Additionally, the pharmacy indicates that it is engaged in professional pharmacy practice. The appeal of pharmacy is strong. We now have the ability to swiftly and effectively acquire or collect huge volumes of information linked to patient care, evaluate it, transfer it, and store it.

Keywords: *drug management systems, artificial intelligence*

ID 504

Bin-Eazy: The Tracking-Based Solid Waste Collection System

MMNH Bandara[1#] and TGI Udayangi[1]

[1]*Department of Information Technology, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

[#] hasimmnhb@gmail.com

The majority of developing countries, including Sri Lanka, are still struggling to manage solid waste, resulting in a slew of social, environmental, and health issues. In Sri Lanka, as in the majority of other nations, the responsibility for waste management is delegated to Local Authorities (LAs). With rising solid waste quantities, Sri Lanka is now struggling to manage trash. This research aims to develop an automated solid waste management collection Mobile application named "Bin-Eazy" and a Web application to reduce the above situation in Sri Lanka. These applications facilitate both the Municipal Council and the citizens to avoid the problems that arise during waste collection. This methodology for the improvement of the waste collecting and transportation system was devised based on Google Map API. This system includes a mobile application to organize garbage in various locations. We can communicate directly with the Municipal Council and provide information on the location of the garbage bins or dump with this mobile application. Python, Image Processing, Flutter, SQLite, react are technologies that were used in this project. Image processing is the technical analysis of images by using complex algorithms. The municipality uses image processing to check whether the citizens have correctly classified the garbage. This system mainly focuses on household solid waste. In a country like Sri Lanka, both residents and municipal councils may save time and money by using this mobile application to collect solid waste. Those are the expected primary goal of this paper.

Keywords: *solid waste management, localization, image processing*

ID 514

Air Powered Rotating Steered Car

A Gamage[1#], R Jayakody[1], P Sanji[1], D Lahiru[1], N Kularathne[1], S Deemantha[1] and DKMVTB Kulasekara[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University*

[#]37-ce-5979@kdu.ac.lk

Independent short-distance transportation with light utility vehicles is getting increasingly popular. Vehicle manufacturers are creating vehicles powered by alternative energies because of the high cost and pollution of gasoline and diesel. Engineers are focusing their efforts on using air as an energy source to power light utility vehicles. Compressed air can be used to store energy in a way that is not only effective and healthy but also cost-effective. The lack of torque produced by the "engines" and the high expense of air compression were the main issues with compressed air cars. Compressed air vehicles are currently being developed by a number of businesses, and while they have many benefits, there are still significant barriers to be overcome. In the other case, whether a car is front-wheel drive, rear-wheel drive, or all-wheel drive, it still moves primarily with the help of a two wheel steering system in modern times. However, because of their great performance and stability, four-wheel steering vehicles are being employed more frequently as a result of increased safety awareness. The performance of a four-wheel-steered vehicle model that is optimally controlled during a lane change manoeuvre is taken into account in this research. These conditions are low speed manoeuvre, medium-speed manoeuvre, and high-speed manoeuvre. The rear wheels are controlled via four-wheel steering. The rear wheels steer in the opposite direction from the front wheels during parking and low-speed manoeuvres, enabling sharper bends. The rear wheels steer in the same direction as the front wheels at higher speeds. As a result of the front wheels not having to drag the non-steering rear wheels into the path, there is increased stability and less body lean during fast lane changes and curves. This paper effectively explains both design ideas.

Keywords: *autonomous car, robotics*

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ID 517

Review for an Information Management System for Automation of the Covid-19 Vaccination Programme in Sri Lanka

SHWS Karunaratne[1#], PRD Wijesinghe[1] and GIF de Silva[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#] 36-is-0030@kdu.ac.lk

The COVID-19 epidemic has swept the globe. Early in 2020, the epidemic began in Sri Lanka, and it is presently in control of the Indian Ocean's pearl. Vaccines that have been created all around the world are currently being used in Sri Lanka as well. To prevent a large number of individuals from congregating in one location, the vaccination procedure is carried out in batches on several days. The divisional secretariat offices of Sri Lanka maintain the information of the immunized using a manual, paper-based information management system. The whole procedure, from the collecting of forms to the tally of the total number immunized, is carried out manually. Through the conversion of the manual paper-based information management system to an automated information management system, this research intends to identify the challenges that this manual paper-based system faces and how to fix them. This study is predominantly designed as positivist paradigm based on survey data. Further, the findings of the study draw conclusions on the issues with the present system and the features and functions that ought to be added to the automated COVID-19 vaccine information management system using published research papers, scholarly articles, web articles, questionnaires, and interviews. The results of the study indicate that the manual system is not viable to carry on the task and it should be converted to an automated system.

Keywords: *Covid-19 vaccination information management, manual information management systems*

ID 521

Development of Flexible Airline Reservation System Using Quality Attributes for Domestic Airlines in Sri Lanka

SHIDN de Silva[1#], MTA Wickramasinghe[1] and D Gunasekera[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawela Defence University, Sri Lanka*

[#] 36-it-0010@kdu.ac.lk

The airline industry is characterized by rapid change, innovation, and new technology. It is a fast-growing industry with annual revenues of millions of dollars. From the up-sky, travellers could experience breath-taking views of Sri Lanka. So, using domestic airlines is the best way to travel in Sri Lanka. Therefore, local airline websites must be developed. However, there is fierce rivalry in the airline industry because everyone is striving to be the best to gain their market share through various strategies such as offering excellent customer service, low-cost fares, and other perks for travellers accomplish those tasks, the researchers identified the importance of developing a web application through an investigation. Researchers identified the challenges faced by the flight seekers and administrators of the airlines through many problem identification techniques. Functionalities that will be supported to improve the efficiency of the domestic airline reservation system were authorizing an administrator to manage all the passenger details and flight details, developing a more secure system, automating the e-ticket generating system, improving user satisfaction by enhancing the user experience, reducing the developing and maintenance cost, encourage the users who have a low level of computer literacy to use the system. So, the researchers' main aim was to develop the application by enhancing the above-mentioned functionalities. For that researchers decided to use features such as tokenization, bar code generators, report generators, and automated ticket generators. After the successful development researchers have done a system test by contributing domestic airline users. Through the analysis of testing results, all respondents have been satisfied with the successful development of the domestic airline reservation system.

Keywords: *domestic airline reservation, flight-booking, web-application*

ID 524

A Systematic Approach to Detect and Manage Academic Stress of University Students Using Emotional AI

KCM de Alwis[1#] and KBA Madushi[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]chamodidealwis@gmail.com

Stress is a prevalent issue that affects all of us at some point in our lives. The most common sort of stress that university students suffer is academic stress. This has a huge possibility of harming a university student's academic performance. According to the research findings stress is caused due to assignments on time submission, GPA Values, Modular Grades, and Loss of Hopes and Ambitions. Also, the personal coping mechanisms used by university students to manage academic stress are listening to music, watching videos, being motivated, and working hard, and wishful positive thinking. Moreover, the data gathered shows that there is a meaningful relationship between the ability to manage stress levels, gender, academic year, or university type of undergraduate students. Academic stress has become a part of university students' lives; which at times, encourages them to improve themselves and work hard but at other times, it has become a burden when they are unable to manage it. Therefore, this research paper focuses on proposing a system to detect stress levels and manage academic stress of university students through stress-releasing mechanisms that will assist university students to reduce stress levels caused due to many factors using various strategies. This proposed system uses Emotional Artificial Intelligence to detect students' emotions and identifies stress levels through Text Input (natural language processing), audio (voice emotion AI), video (facial movement analysis, physiological signals, and other factors), and system assists university students for various stress reduction techniques.

Keywords: *academic stress, stress reduction system, emotional artificial intelligence*

ID 542

Voice Command and Face Motion Based Activated Web Browser for Differently Abled People

L Tharaka[1#], DU Vidanagama[1] and WMSRB Wijayarathne[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]36-it-5733@kdu.ac.lk

There are many people who are unable to use their hands due to a disability from birth or external factors like accidents. There are many military personnel who have lost their arms and hands because of bombing and shootouts from the war in the country. These people require further assistance from another person to access the Internet. They are embarrassed because they cannot do it independently, and they might hesitate to seek assistance constantly. This also raises the issue of their privacy. But because of technological advancement, now people who are disabled can do their work very easily. There are many developed applications with the voice command ability to search or type something. The main difference between those applications and the proposed system is it has the ability to use voice commands to control and use face detection to control the mouse cursor in the same application. Differently abled and handless people can use this web browser to do their work as a normal person. This proposed browser may use a voice command to control the mouse cursor and it can use voice to text to type URL. Further, computer vision may use to control the mouse cursor. This web browser can use to ease the work of normal people as well as used by disabled personnel. Both the voice command module and the web browser module were created using python. Additionally, the python Application Development Kit was used to develop the front end and back end. The researcher used open-cv to create the cursor control module. Numerous libraries have been used in the system's development. PyQT5 and QtWebEngine were both used in the development of the web browser application module. Google Speech Recognition engine API and PytTsx3 were both utilized in the development of the voice command module. OpenCV-Python-cv2, Numphy, Dilib, and autopy were used in the creation of the cursor control module.

Keywords: *face detection, speech recognition, assistive technology*

ID 552

Online Platform for Preschool Management

MWKN Dasundari[1#] and BMTN Rathnayaka[1]

[1]*Department of Information Technology, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

[#] nandikadasuni@gmail.com

This study's primary goal is to examine three potential options for enhancing preschool learning and instruction. The report will provide a recommendation for the best course of action to take to address the research questions. Information and communications technology (ICT) in pre-schools will be examined as part of this study. But it will address the benefits and drawbacks of a web-based electronic learning system in comparison to a conventional educational system for children.

Keywords: *childhood, education, web-based, e- learning, preschool*

ID 553

Red Onion Price Prediction Using Random Forest Regression Machine Learning Model for Jaffna District

S Mithuna[1#] and JKDBG Jayaneththi[1]

[1]*Faculty of Technology, University of Ruhuna*

[#]jfsmeena@gmail.com

Red onion is one of the important commercial vegetable crops grown in Sri Lanka. It is widely cultivated in many regions of the country, but its prices are unstable in Sri Lankan markets due to supply and demand. The price fluctuations cause substantial economic losses for farmers and consumers due to improper price prediction techniques followed by Jaffna farmers. Red onion Famer usually cultivates the onion in a specific season in Jaffna. Farmers have been facing losses for the last ten years because of weather conditions, fertilizer prices, USD exchange rates, Seeds prices, labour costs, transportation costs, demand for development and utility, biological lag, government price controls, and competitive product prices. The research focused on analysing certain factors were date, USD exchange, Rainfall, labour cost, and competitive product as big onion market price, fertilizer price and red onion price. Data is collected from January 2017 to December 2021. The consideration factors data were pre-processed and analysed by the Google Colab tool. The correlation of the data to the red onion prices indicates USD exchange rates of 19%, Rainfall at 14%, Labour cost at 21%, competitive product at 34%, and Fertilizer price at 16%. Different Machine Learning models were used to predict the accurate red onion price such as Linear Regression with lasso regression, Auto Regressive, and Random Forest Regression. The Random Forest Regression shows significant price prediction accuracy of 88.46% compared with the existing red onion price. The model gives more accuracy, and it will be helpful for farmers to get yield profit.

Keywords: *machine learning, random forest regression, red onion price prediction*

ID 590

How Does Social Media Affect the Economy?

JD Miral[1#], HCT Gamage[1], PLDN Karunarathne[1], NACJC Jayasinghe[1] and RMM Pradeep[1]

[1]*Department of Information Technology, Faculty of Computing,*
General Sir John Kotelawala Defence University, Sri Lanka

#38-bis-0014@kdu.ac.lk

It is commonly accepted that social media reduces the productivity of an organization. However, due to the shape of social media changing over time and assisting to evolve new businesses, several studies state that social media is no more an economic killer. The aim of this study is to identify the effects of social media on economic growth. For this purpose, we have conducted a systematic literature review after identifying appropriate keywords, it examined five research databases and extracted related articles. The selected articles were summarised considering the article's description of social media and economic relations. Apart from that, it explored the social media usage and inflation statistics of economically default countries to visualise the relationship between the usage of social media over inflation. According to the findings of the literature review, social media positively impacts on macroeconomic and small business activities. However, there is a negative impact on social media and national economic growth. Proving the literature outcome, the inflation statistics analysis illustrated a positive relation between social media usage and inflation increase. Thus, it can be stated that social media affect economic growth adversely but assist to start economic activities.

Keywords: *social media, economic growth, inflation*

ID 597

Public Bus Tracking System for Sri Lanka

WCD Wijesinghe[1#], D Gunasekera[1] and RMM Pradeep[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#]*36-it-0035@kdu.ac.lk*

The COVID-19 pandemic placed the entire world on lockdown for the first time. People are afraid to go to crowded places like bus stops during this situation. Further, public transportation services are in trouble due to traffic congestion, unexpected delays, and irregular vehicle dispatching times. Manually, the system has encountered a security problem with the data and lost records. Due to those issues, automated systems have been developed for public bus transport. These systems can solve some problems, but they are not yet perfect due to all the issues in public bus transportation. Due to a variety of advantages, most people choose to take public transportation rather than drive their own vehicles. If people know the schedule for their bus route through their mobile devices, they can arrive at the bus stop in time to avoid waiting and thus reduce time waste. High technology has a major impact on human life and allows us to significantly simplify and automate daily activities. General computerization allows for easier access to all kinds of information needed in daily life, as well as more specialized ones. The proposed system is to develop web-based and mobile-based applications for public people because they waste money and time in daily life. Global Positioning Technology System (GPS) technology is used for system development as it can be used to track the location easily. Therefore, people can reduce their difficulties and access and manage the system easily.

Keywords: *bus tracking system, automation, android, GPS*

ID 618

Designing a Bag for Computing Students of General Sir John Kotelawala Defence University by Using a Kansei Engineering Methodology

LHD Tharuka[1]#, GMT Amarasinghe[1], TWLA Perera[1], RWBMP Nishadi[1], PR Waidyaratne[1], CW Dissanayake[1], SP Gayanika[1] and P Kalansooriya[1]

[1]*Faculty of Computing, General Sir John Kotelawala Defence University, Sri Lanka*

[#] 37-se-0005@kdu.ac.lk

As computing undergraduates, a bag that can accommodate all personal requirements is essential during university life. The bag itself should possess qualities such as space, durability, comfort, safety, and most importantly, provide proper protection for electronic devices carried by computing students. This study aims to design a bag that addresses the existing problems in the bag provided by the university for computing undergraduates. This paper presents an integrative framework of Kansei Engineering (KE), and the Kano model (KM) applied to produce the design of the bag. To explore the relationship between the quality attributes of the design and Kansei, the Kano model is incorporated into KE, which collects and communicates the emotional demands of the consumer. In this study, the bag used daily by computing students is utilized as a case study to demonstrate how KE and KM are integrated into the product development process. The results of this research were generated from thirteen Kansei words which were produced from a questionnaire. The final design of the bag was developed by evaluating total customer satisfaction. According to the findings of the study, the final design of the bag was of urban shape with a padded top grip and straps. Polyurethane/ Thermoplastic Polyurethane (PU/TPU) was chosen as the outer fabric for durability and water-resistant quality while polyester ripstop was chosen as the inner lining for the bag to make it lightweight.

Keywords: *Kansei engineering, Kano model, university bag, computing students*

ID 641

Web-Based Student Counselling Management System for General Sir John Kotelawala Defence University

WGAM Rajapaksha[1#] and D Gunasekara[1]

[1]*Department of Information Technology, Faculty of Computing, General Sir John Kotelawela Defence University, Sri Lanka*

[#]36-is-5738@kdu.ac.lk

Today's education system is mostly focusing on students' abilities in the academics, without giving much attention to their emotional aspects. Psychological problems including fear of failing, family pressure, competitive pressure, depression, academic stress, homesickness, and relationship issues are the major issues that students face and find hard to deal with. Student counselling is a very important aspect for the students because it helps to save them from all issues that can negatively impact their studies and mental well-being. The students are under extreme pressure that needs to be heard, but they may not be able to verbalize their problems in front of the counsellors as they do not feel comfortable speaking, and, they do not like to expose others when they meet a counsellor. Therefore, the necessity for an online system that can manage all counselling processes was identified. Even though many counselling management systems have been introduced to the market, those systems are not capable of using in particular universities, institutes, etc. Our proposed system has the capability of implementing in institutes and doing online counselling via chat, video conferencing, or meeting in person as preferred by the user.

Keywords: *psychological problems, student counselling, counselling management systems*

ID 655

Multi-Criteria Group Decision-Making (MCGDM) for Verification of HydroGIS Model Development Framework

RMM Pradeep[1#] and NTS Wijesekera[2]

[1]*Faculty of Computing, Kotelawala Defence University, Sri Lanka*
[2]*Construction Industry Development Authority, Ministry of Urban Development, Water Supply and Housing Facilities, Wijerama Mawatha, Colombo 07, Sri Lanka*

[#] pradeep@kdu.ac.lk

Expert review is the best method for the verification of flood management frameworks. However, when verifying a building-block software framework for urban flood management HydroGIS model development (HydroGIS Framework), the framework is always subjected to more arguable or marginal acceptance because the development process is less observed by the expert evaluators and a higher possibility of localised thinking limited to experts' field of studies. Therefore, in such scenarios, the multi-criteria group decision-making (MCGDM) method gets popular as it mainly analysis the group of experts' view on a set of alternatives (options) following the same set of criteria. However, the MCGDM method directly does not support the present verification. Therefore, the present work aims to modify the MCGDM method for verification of the present HydroGIS framework. For that, it studied different works on MCGDM and formulate a general map of integrated processes. Then analyse the HydroGIS framework components' integration depths using spatial analysis method (area comparison) and attention theory explanation, to select a suitable fuzzy type to be used in MCGDM. After that present work map, the framework verification attributes to the MCGDM model and carry out the verification. As result, it developed a verified relation map of various fuzzy concepts, formulated a generalised process map of the MCGDM process, identified Type-1 fuzzy concept is substantial to expert preferences demodulation, and demonstrated how it can employ modified MCGDM method to evaluate the urban flood management framework satisfactorily. The present work shows how MCGDM can be utilised for flood management framework verification.

Keywords: *multi-criteria group decision-making, Hydrogis tool, urban flood management framework, fuzzy concept, expert review*