2023 1st IEEE International Conference
on Smart Technology (ICE-SMARTec)

# ADVANCES IN SMART TECHNOLOGY FOR SUSTAINABLE WELL-BEING

**17-19 July 2023**
Bandung, Indonesia

# Conference Program and Book of Abstracts

# 2023 1st IEEE International Conference on Smart Technology (ICE-SMARTec)

**Advances in Smart Technology for Sustainable Well-Being**

17-19 July 2023

Hybrid from Maranatha Christian University, Surya Sumantri Street No.63, Bandung, West Java, Indonesia, 40164

Hosted by:

Maranatha Christian University, Indonesia

IEEE Indonesia Section Control Systems and Robotics and Automation Joint Societies Chapter

IEEE Indonesia Section

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# Message from General Chairs

We are happy to welcome authors and participants of 2023 1st IEEE International Conference on Smart Technology (ICE-SMARTec), held on 17-19 July 2023 at Maranatha Christian University, Bandung, Indonesia. The conference serves as a platform for academics and practitioners to share and exchange their ideas.

The theme of the conference is Advances in Smart Technology for Sustainable Well-Being, implying the need of smart technology in sustainable future. This year we receive 134 submissions from 15 countries: USA, New Zealand, Japan, Korea, Malaysia, Philippines, Laos, Sri Lanka, Pakistan, Nigeria, Benin, Senegal, Iraq, Oman, and Indonesia. Thirty-seven of them are accepted in the conference.

We would like to thank Valentina Dagiene from Vilnius University, Lithuania who delivers the keynote speech entitled "Computational Thinking in "Mind-Size Bites". The conference is also featured with several invited speakers. Lenin Gopal from University of Southampton, Malaysia delivers "Intelligence System Designs for IoT Environments Applications". Mewati Ayub from Universitas Kristen Maranatha delivers "Artificial Intelligence in Education". Alfrendo Satyanaga from Nazarbayev University, Kazakhstan delivers "Susceptibility Map-based Geographical Information System for Sustainable Slope Design against Climate Change". Oscar Karnalim from Universitas Kristen Maranatha delivers "Maintaining Academic Integrity: How to Outsmart Misuses of Technology". Arnadi Murtiyoso from ETH Zürich, Switzerland delivers "A Digital Link To the Past: AI and Geospatial Technologies for Heritage Documentation". Aulia Zahrina Qashri from Digital Transformation Office, Ministry of Health, Indonesia delivers "Digital Technology in Indonesia Healthcare: Experience and Roadmap".

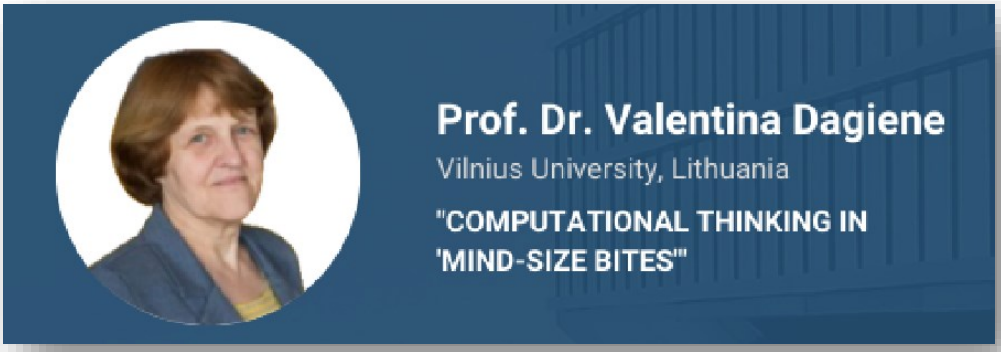
We would also like to thank Maranatha Christian University, Indonesia, IEEE Indonesia Section Control Systems and Robotics and Automation Joint Societies Chapter, and IEEE Indonesia Section for supporting the conference.

We hope all authors and participants enjoy the conference and the conference can contribute to the body of knowledge.

Thank you.

General chairs of ICE-SMARTec 2023

# Keynote Speaker




**Abstract**

Computational Thinking (CT) involves solving problems, abstract thinking, designing systems, and understanding human behavior by drawing on the fundamental concepts of Informatics or Computing, or Computer Science (CS). CT encompasses a wide range of mental processes, which are considered nessassary supplies for the 21st century children. However, despite the wide attention that CT has received, there is still limited strategies that can promote the acquisition and development of such skills. Computational thinking provides a powerful framework for studying computing, with wide application beyond computing itself. It is the process of recognising aspects of computation in the world that surrounds us and applying tools and techniques from computing to understand and reason about natural, social and artificial systems and processes. It allows pupils to tackle problems, to break them down into solvable chunks and to devise algorithms to solve them. The worldwide Bebras challenge on Informatics (CS) and CT is discussed as an example of connecting formal and non-formal informatics education by using thousands of tasks based on informatics concepts and applying problem solving strategies. The main goal of the Bebras challenge is to motivate pupils to be interested in informatics topics and to promote thinking which is algorithmic, logical, operational, and based on informatics fundamentals. The Bebras activities have to promote pupils' interest in informatics at

the early stage of the school education and to motivate pupils to learn deeper and master better technology. The main goal of CS education at school is to teach students how to think computationally, which involves problem-solving skills using both computer and non-computer methods. CT involves defining, understanding, and solving problems, reasoning at different levels of abstraction, understanding and applying automation, and analyzing the appropriateness of abstractions. To achieve this goal, computer science educators can use a variety of methods to select tasks for their students. One suggested approach is to use short tasks that can be solved in a few minutes, also known as "mind-size bites" according to S. Papert. These tasks should have a double-folded aim: to cover informatics concepts and to be solvable in a short period. Using short tasks can be an effective method for teaching CT because it helps students develop their problem-solving skills in a manageable way. By breaking down larger problems into smaller components, students can more easily understand and apply computational concepts. Additionally, short tasks can be used to assess student learning and understanding of concepts, allowing teachers to adjust their instruction as needed. Solving short CT tasks is a powerful method that can support a pedagogical shift in the classroom and foster pupils' engagement and motivation to learn. Problem solving of short tasks can be considered as a systematic process involving pupils into deeper understanding of informatics concepts. Solving short tasks can be one of the strategies that engage and motivates pupils for deeper learning and fosters the deeper thinking skills.

# Invited Speaker 1


**Abstract**

The increasing popularity of photovoltaic (PV) solar panels in residential buildings has been driven by the advancements in smart grid systems. However, the commonly used fixed-mounted rooftop PV panels are less efficient as they cannot track the sun's movement. To address this issue, solar tracking systems (STS) are preferred as they offer improved power efficiency. Nonetheless, the cost of PV solar tracking systems remains a challenge compared to conventional fixed PV installations. In the proposed system, a low-cost and simple dual-axis solar tracking system is developed that utilizes pre-calculated solar positions for efficient solar tracking. The implementation includes a linear actuator with a potentiometer, simplifying control and reducing the complexity of the STS structure. Furthermore, the solar angle is modelled with parameter A using global positioning system (GPS) location information of the experimental site. The proposed STS solution stores solar angle information in the memory of a microcontroller system, which allows for adaptive orientation of the PV module

towards the direction of sunlight. Additionally, we incorporate a MPPT in the proposed system to increase the harvested energy from the PV system.

Conventional Maximum Power Point Tracking (MPPT) algorithms face challenges in reaching the Maximum Power Point (MPP) under partial shading conditions (PSC) due to the non-linear characteristics of the power-voltage curve. Although existing algorithms like the Fireworks algorithm (FWA) and Particle Swarm Optimization (PSO) have been utilized to obtain the MPP, they exhibit suboptimal convergence rates and tracking accuracy, thereby affecting MPPT performance. In our research work, we propose few novel algorithms, termed Global Maximum Power Point Tracking (GMPPT), specifically designed to track the global maximum power point (GMPP) under PSC. The proposed approach applies a hybrid method combining PSO, FWA and gravitational search particle swarm optimization (GSPSO) algorithm to track GMPP faster and more efficiently.

# Invited Speaker 2


**Abstract**

The rapid development of computing technologies has increased the application of artificial intelligence (AI) to today's society and human beings, including education. Education, being an important component of societal development, is constantly evolving in terms of methods, concepts, and models. AI in education has been developed to enhance the quality and functionality of education systems. The application of AI in education has been implemented into administration, teaching or instructions, and learning. AI is expected to foster the performance of administrative tasks in education, and to improve the effectiveness of instruction and learning. The application of AI in K-12 education is also important to develop, it is believed that the students of today will work with AI in almost whole parts of their daily life in the future. For learning, AI tools could adapt to each student's need, also allow teachers to support students more approriately. For institutions, AI tools provide the evaluation of teachers and students performace more accurately and rapidly. The AI for K-12 initiatives has been developing guidelines for teaching AI in K-12 since 2018. The guidelines define what students should know about AI

and what they should be able to do with it. The guidelines will serve as a framework to assist standards writers and curriculum developers on AI concepts, essential knowledge, and skills.

# Invited Speaker 3


**Abstract**

Neurorobotics is the combined study of neuroscience, robotics and artificially intelligent systems. It can be used to provide a means of communication for people suffering from severe motor disabilities or with limb amputation. This talk with focus on development of electromyography (EMG)-based control of prosthetic arm and electroencephalography (EEG)-based control of external devices including a wheelchair for rehabilitation of mobility in paralyzed individuals. Details of a recently developed functional near-infrared spectroscopy (fNIRS) system for brain-imaging and its application for brain-computer interface will be presented. All necessary steps involved in developing EMG-, EEG- and fNIRS-based neurorobotics interfaces including bioinstrumentation, filtering, pattern recognition and control command generation will be discussed. Some recent works done at Neurorobotics Research Group at Air University, Islamabad will be presented as well.

# Invited Speaker 4


**Abstract**

With increasing risk both from natural and anthropological sources, the conservation of cultural heritage is becoming ever more important. Modern techniques to create a metric representation of tangible heritage generally involve the creation of 3D point clouds via geospatial tools. This digital twin, created from faithful 3D measurements, act as a metric digital archive for the future. The advent of artificial intelligence has also increased interest in its application for heritage documentation. The main application involves the use of AI and algorithms in processing 3D point clouds to convey meaning into them in the form of semantic attributes. AI has also been used to improve the shortcomings of conventional 3D measurement techniques, such as the development of semantic photogrammetry and neural radiance fields. In this talk, a brief overview of geospatial technologies (photogrammetry, lidar, etc.) in the field of heritage documentation will be given. Modern applications of AI in helping the task of archiving historical sites will also be presented to give the audience an overview of state-of-the-art technologies in this domain.

# Invited Speaker 5


This talk will discuss about common breaches in academic integrity: plagiarism, collusion, contract cheating, exam cheating, and research fraud. Specifically, we will discuss how technology can distrupt the breaches, making them easier to do. Some recommendations in dealing with those issues are also reported. We will also discuss about misuse of AI chatbots like ChatGPT, especially the unfair benefits and the characteristics. Some AI assistance detectors are also reported along with practical recommendations

# Invited Speaker 6


**Abstract**

Despite being a major challenge in the past few years, the COVID-19 pandemic has highlighted the importance of health system advancement. To ride with the waves while overcoming the pandemic, the Ministry of Health has formulated an initiative to accelerate healthcare digitisation in Indonesia. In this session, we will be introduced to SATUSEHAT — our national health data interoperability platform, including its ecosystem and how we can collaborate to accelerate health system transformation in Indonesia.

# Program at Glance

All time schedules are set to GMT +7 (Jakarta Time)
**Location:** Gedung Administrasi Pusat (GAP) Floor 8, Universitas Kristen Maranatha, Indonesia
**Zoom link:** https://bit.ly/43gwQAk

| Time | Event | Speaker | Moderator |
|---|---|---|---|
| **Monday, 17/07/2023** | | | |
| 07.15-07.45 | Registration | | |
| 07.45-08.05 | *Pre-event and Opening Performance* | | |
| 08.05-08.15 | Opening Prayer | Pdt. Yohanes Bambang Mulyono, M.Th. | |
| 08.15-08.25 | Singing " Indonesia Raya " | | |
| 08.25-08.35 | Opening Speech by a general chair of IEEE ICE-SMARTec | Dr. Dra. Ariesa Pandanwangi, M.Sn. | |
| 08.35-08.45 | Opening Speech by the Chairman of IEEE Indonesia CSS/RAS | Dr. Arjon Turnip | |
| 08.45-09.00 | Opening Speech by the Rector of UKM | Prof. Ir. Sri Widiyantoro, M.Sc., Ph.D. | |
| 09.00-10.00 | *Keynote Speaker* | Prof. Dr. Valentina Dagiene | Prof. Dr. Mewati Ayub |
| | *Computational Thinking in "Mind-Size Bites"* | | |
| 10.00-11.00 | Invited Speaker 1 | Prof. Dr. Lenin Gopal | Prof. Ir. Endra Joelianto, Ph.D. |

| Time | Event | Speaker | Moderator |
|---|---|---|---|
| | Intelligence System Designs for IoT Environments Applications | | |
| 11.00-12.00 | Invited Speaker 2 | Prof. Dr. Mewati Ayub | Dr. Riko Arlando, S.T., M.T . |
| | Artificial Intelligence in Education | | |
| 12.00-13.00 | Break | | |
| 13.00-14.30 | Papers Presentation 1 (Parallel Session-1) | | |
| 14.30-16.00 | Papers Presentation 2 ( Parallel Session-2) | | |
| 18.00-20.00 | Gala Dinner | | |
| **Tuesday, 18/07/2023** | | | |
| 07.30-08.00 | Registration | | |
| 08.00-08.30 | *Performance* | | |
| 08.30-08.45 | Opening Prayer | Pdt. Yohanes Bambang Mulyono, M.Th. | |
| 08.45-09.00 | Singing " Indonesia Raya " | | |
| 09.00-09.45 | Invited Speaker 3 | Dr. Alfrendo Satyanaga | Oscar Karnalim, S.T., M.T., Ph.D. |
| | Susceptibility Map-based Geographical Information System for Sustainable Slope Design against Climate Change | | |
| 09.45-10.30 | Invited Speaker | Oscar Karnalim, S.T., M.T., Ph.D. | Dr. Hapnes Toba, M. Sc |
| | Maintaining Academic Integrity: "How to Outsmart Misuses of Technology" | | |

| Time | Event | Speaker | Moderator |
|---|---|---|---|
| 10.30-11.15 | Invited Speaker | Aulia Zahrina Qashri, S.Kom, MSc, MMedSci | Dr. dr. Ardo Sanjaya, M. Kes., Pg.Cert., FHEA |
| | Digital Technology in Indonesia Healthcare : "Experience and Roadmap" | | |
| 11.15-12.00 | Invited Speaker | Dr. Arnadi Murtiyoso | Cindrawaty Lesmana, Ph.D. |
| | A Digital Link To the Past: "AI and Geospatial Technologies for Heritage Documentation" | | |
| 12.00-13.00 | Break | | |
| 13.00-14.30 | Papers Presentation 3 (Parallel Session-3) | | |
| 14.30-14.45 | Break | | |
| 14.45-15.00 | Closing Ceremony by Chairman of LPPM UKM | Dr. Meythi, S.E., M.Si., Ak., CA. | |
| 15.00-15.15 | Announcement of Best Papers | Dr.Arjon Turnip | |
| 15.15-15.30 | Closing Prayer | Dr. Rosida Tiurma Manurung, M.Hum. | |
| **Wednesday, 19/07/2023 (Optional, Booking in Advance at Day 1)** | | | |
| 07.30-08.00 | Registration of Cultural Program to Saung Udjo | | |
| 08.00-08.30 | Going to Saung Udjo | | |
| 08.30-13.00 | Cultural Performance Saung Udjo + Lunch | | |
| 13.30-14.00 | Going back to Maranatha Christian University | | |

# Parallel Sessions

All time schedules are set to GMT +7 (Jakarta Time)
**Location:** Gedung Widya Maranatha (GWM) Floor 8: ADV 1 (Room A), ADV 2 (Room B), ADV 3 (Room C), Universitas Kristen Maranatha, Indonesia
**Zoom link:**
Room A, ADV 1:
https://bit.ly/44KdZyR
Room B, ADV 2:
https://zoom.us/j/94613880830
Room C, ADV 3:
https://zoom.us/j/93325982931

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| **Parallel Session 1** | | | | |
| Instrumentations | A | A Review on Optical Coherence Tomography (OCT) Technique in Dentistry Application: Limitations and Challenges | Juliza Jamaludin | Muliady |
| | | Internet of Things for Real-Time Multi Room Monitoring System | Antonius Suhartomo | |
| | | Social Robot Services to Substitute Humans as a Companion and Virtual Assistant | Erwin Halim | |

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| | | Quadcopter Design and Development for Precision Agriculture Implementation in a Rice Field | Muliady Muliady | |
| IT Application System | B | Designing Performance Dashboard for Monitoring Post-Harvest Loss in Transportation | Siana Halim | Nur Suhaili Mansor |
| | | Unmoderated Usability Testing of DutaTaniku Android Application for Farmers | Lukas Chrisantyo | |
| Artificial Intelligence | C | Analysis of the Effects Using BERT Feature Extraction Method on Case of Sentiment Classification on Twitter Social Media | Diaz Adha Asri Prakoso | Oscar Karnalim |
| | | Development of Convolutional Neural Network (CNN) Method for Classification of Tomato Leaf Disease Based on Android | Otto Nathanael | |
| | | Long Short-Term Memory and Word Embedding for Sentiment Analysis of User Review | Lia Silviana | |

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| | | Comparative Analysis of Machine Learning Models for Relative Humidity Prediction in the Philippines | Pitz Gerald Lagrazon | |
| **Parallel Session 2** | | | | |
| Smart Technology | A | Development of Smart Lights to Reduce Electricity Usage by Using Fuzzy Logic | Alexander Gunawan | Mohamad Ghozali bin Hassan |
| | | Analysis and Implementation of Social Robots to Increase Language Learning Capability | Erwin Halim | |
| | | The Effect of Redundant Capacity Strategy on Supply Chain Resilience Using Simulation | David Kristiawan /David Oboe | |
| | | Automated Counting System Based on Watershed Algorithm for Tilapia Fish Egg | Mohamad Ghozali bin Hassan | |
| Engineering | B | Optimize Advantage Actor-Critic with Policy Gradient Algorithm and Deep Q-Learning to Maximize Prediction in Forex Trading | Abdillah Baradja | Cindrawaty Lesmana |

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| | | Clustering Analysis of Occupant Groups Based on Wireless Signal Indicators in Under-Actuated HVAC Zones Using K-Means | Yaddarabullah Yaddarabullah | |
| IT Application System | C | Unveiling Purchasing Patterns in Grocery Store Consumer Segmentation: Insight From K-Means Clustering | Ivan Diryana Sudirman | Hapini Awang |
| | | Developing 360 Degree Virtual Tour of Dharma Rakhita Temple as a Cultural Learning Source | Elizabeth Susanti Gunawan | |
| | | A New Interactive Gaming Approach for Enhancing Math Learning Among Marginalized Communities | Hapini Awang | |
| **Parallel Session 3** | | | | |
| Engineering | A | A Real-Time Video Analysis Using an Omni-Directional Camera for Multi Object Detection Using the Hough Transform Method | Bagus Hikmahwan | Matahari Nendya |
| | | Forest Fire Detection Techniques Based on IoT Technology: Review | Ahmed Radhi | |

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| | | Design of a Continuous Ambulatory Peritoneal Dialysis (CAPD) Fluid Monitoring System Prototype for IoT-Based Kidney Failure Patients | Melinda Melinda | |
| | | Augmented Reality Indoor Navigation Using NavMesh | Matahari Nendya | |
| IT Application System | B | Industrial Revolution 4.0 Technology Application Capability: A Portrait of Higher Education Institutions' Readiness in West Java Province, Indonesia | Se Tin | Hapnes Toba |
| | | Design Enterprise Architecture Using the TOGAF-ADM Framework Support Academic Information Systems Nusa Nipa University | Yohanes Darkel | |
| | | A-Qyu General Purpose Cloud-Based Queue Management | Erico Darmawan Handoyo | |
| | | Challenges in Introducing Programming in | Hapnes Toba | |

| Topic | Room | Title | Presenter | Moderator |
|---|---|---|---|---|
| | | Indonesian K-12 Education | | |
| Machine Learninng | C | A Review: Deep Learning Techniques for Analyzing Diabetic Wound Images | Oleh Soleh | Andreas Widjaja |
| | | Sentiment Analysis on Smart City Mobile Platform Based on Lexicon | Usman Ependi | |
| | | Critical Success Factor of Impulsive Buying in Short Video Platform | Erwin Halim | |

# Paper Abstracts

**Development of Convolutional Neural Network (CNN) Method for Classification of Tomato Leaf Disease Based on Android**

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Abstract—Tomato has become one of the vegetable fruit plants that Indonesian people widely cultivate. In cultivation activities, tomato cultivators will face diseases and pests that affect growth, such as diseases on tomato leaves. With multiple types of tomato leaf diseases, it is challenging for a cultivator to distinguish between them. This research aims to provide cultivators with valuable information about tomato leaf diseases and how to address them using Android-based disease detection. The tomato leaf disease detection application was developed on the Android platform that uses the camera as its main feature to be widely used by the community. TensorFlow Lite is developed as a model for tomato plant disease detection by implementing the Convolutional Neural Network (CNN) method with a total of 9,000 sick and 1,000 healthy tomato leaf datasets. The accuracy, loss, and confidence score are calculated. The system was tested using 50 Epochs, with a dataset comparison scenario of 80:10:10 when training the model. The results obtained by performing five tests show an average accuracy of 92.31% and an average loss of 24.81%, with a confidence score of 80-95%.

Keywords—tomato plants, tomato disease, android application, Convolutional Neural Network, CNN

**A Cluster Analysis of Consumer Segmentation from a Grocery Store Using K-means and Elbow Method**

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Abstract—The purpose of this research was to apply cluster analysis to a real, never-before-published sales data from a grocery store over the course of three months. Cluster analysis, applied to a dataset containing 1,544 samples, reveals four distinct subsets of consumers, distinguished by their age and the total amount they spent on a subset of products. Consumers who are older and who prefer cooking oil products, but buy fewer eggs are identified as a distinct subset of the market. Another demographic consists of younger buyers who are interested in purchasing chicken eggs but do not want to use cooking oil. It is possible to differentiate between these two groups. This study

demonstrates the promise of clustering k-means and how the elbow method can produce a useful cluster number, both of which can improve the accuracy of consumer segmentation and the efficacy of retail businesses' efforts to target customers.

Keywords—data mining, clustering, K-means, elbow method, product-based segmentation

**Design Enterprise Architecture Using The TOGAF-ADM Framework To Support Academic Information Systems at Nusa Nipa University**

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Abstract—Information technology support is desperately needed for higher education, an institution that organizes education. Universities must use information technology to effectively and efficiently manage potential resources to compete with other institutions. Utilization of IT in Higher Education Governance, particularly the academic information system at Nusa Nipa University, lacks a structured architecture. It is believed that the current IT infrastructure is insufficient to respond promptly and precisely to application and business change solutions. This study aims to simplify the process of developing information system architecture by developing an architectural model and an implementation roadmap. This study's design uses the TOGAF model, which has three stages: the organization's initial condition analysis stage, which begins with the preliminary requirement management phase; architectural vision; and business architecture. The enterprise

architecture design begins with the second stage's information system architecture and technology architecture phases. Starting with the phases of opportunities and solutions, migration planning, and change management, recommendations for implementing enterprise architecture are presented in the third section. The consequences of this study are IT outlines for each engineering stage given the TOGAF-ADM structure for business processes in new understudy affirmations frameworks, scholastic cycles, graduated classes, and libraries to help data frameworks at Nusa Nipa College. It is trusted that this exploration can create a suggestion for the data framework configuration expected to help business techniques at Nusa Nipa College.

Keywords—TOGAF-ADM, enterprise architecture, IT blueprint, Academic Information System.

**Development of Smart Lights to Reduce Electricity Usage by Using Fuzzy Logic**

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Abstract—In wealthy nations, the demand for electrical energy is steadily increasing, despite the scarcity of available resources. Considering that individuals spend approximately 80% of their lives indoors, it is imperative to implement energy-efficient lighting solutions to reduce electricity consumption. In this research, we have developed a prototype of an intelligent lamp that employs LUX sensors and fuzzy logic to automatically adjust power usage based on ambient light levels. The primary objective of this study is to minimize energy wastage through experimentation with the prototype's performance. Our findings indicate that, depending on the room's lighting conditions, this innovative smart lamp can achieve an average energy savings of 45.46%.

Keywords—fuzzy logic, smart lamp, energy efficiency

**Optimizing Advantage Actor-Critic with Policy Gradient and Deep Q-learning to Maximize Profit in Forex Trading Prediction**

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Abstract—Financial markets, such as forex markets, are inherently complex, with high volatility, noise, trends, and market shocks. Therefore, designing effective trading strategies is crucial for maximizing investment returns. The implementation of deep reinforcement learning (DRL) in financial trading has become an attractive research topic in recent years. This study proposes Advantage Actor-Critic-based algorithms (A2C) algorithms to learn forex trading strategies using deep reinforcement schemes. The ensemble trading strategy was obtained by combining the best features of the two algorithms' Policy Gradient as Actor and Q-learning as Critic, resulting in a robust strategy that adapts to different market situations. Our experiment on the EURUSD currency on the 4 hour candlestick timeframe using five years of data history was divided into three parts for training, validating, and testing. The A2C agent learns to buy, sell, and hold a trade with the goals of maximizing profits and reducing losses. Our proposed method provides an effective and robust solution to various financial trading problems using deep reinforcement learning. Our proposed methods provide effective and robust solutions to various financial trading problems using deep reinforcement learning. The evaluation results improved from each training, where the Cumulative Return evaluation increased from 29.65 to 112.74, the Maximum Drawdown reduced from 36.18% to 4.48%, the Sharp Ratio increased from 0.94 to 2.47%, and the AHPR increased from 0.19% to 3.56%. This indicates that longer training data result in higher cumulative rewards and an increase in total profit.

Keywords—forex trading, advantage actor critic, deep q-learning, ensemble strategy

**Unmoderated Usability Testing of Agricultural Android Application for Farmers**

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Abstract—As an effort to integrate technology in the agricultural sector, especially to develop new competencies for farmers to manage land, a digital solution has been created in the form of a land data collection system, an agricultural technology learning system and a system for selling agricultural products through various researches and community services initiated by a team from the Faculty of Information Technology, Duta Wacana Christian University. However, there should be tests towards such digital solution in the form of applications that have been developed to determine the usefulness elements. Therefore, in this article, the researchers are intended to test and discuss certain Android application called DutaTaniku. DutaTaniku application was developed for users aged 20-50 years who work as farmers. For this reason, efforts are made in various aspects to design a user-friendly interface for the target users. An unmoderated usability test was applied for

the initial features. Unmoderated testing was intended to allow the test to reach more people in less time, without the risk of being influenced by the constraints related to the pandemic. Based on the results of the study, it was found that the unmoderated usability testing solution could help shorten the testing period, especially during the recent pandemic situation. However, based on the results of the study regarding the accuracy of the test, it turned out that moderated usability test was more appropriate for the target respondents and users. Moderated usability testing yielded 10% Task Completion Rate value beyond unmoderated one.

Keywords: unmoderated usability testing, agriculture information system

**Developing 360 Degree Virtual Tour of Dharma Rakhita Temple as a Cultural Learning Source**

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Abstract—The Dharma Rakhita Temple was the center of activity for the ancient Chinese community. The Dharma Rakhita Temple, located in Jamblang Village, Cirebon Regency, is a heritage site that is more than 200 years old and rich in cultural heritage. Its location among houses no longer inhabited by residents makes this temple empty of visitors. This study aims to construct a 360-degree virtual tour as a cultural learning source. A 360-image development model for culture-based virtual tours is proposed to promote the Dharma Rakhita temple as one of the centers of the Chinatown area, which is hundreds of years old. This research utilizes Camera 360 technology and website-based applications to develop virtual tours so that this temple can

attract public attention and be accessed easily. Researchers can use the results of the virtual tour modeling created to become a model and comprehensive information about virtual tours with cultural learning sources. Ordinary people can also use them as culture-based virtual tours without going to the location.

Keywords—360 image, digital technology, Jamblang, virtual tour, cultural heritage

**Sentiment Analysis on Smart City Mobile Platform Based on Lexicon**

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Abstract—This study investigates the analysis of social media data from platforms such as Facebook, Twitter, Instagram, and application reviews, with a focus on Smart City mobile platforms. While the availability of public service-related data presents a promising opportunity for analysis, the complexities and nuances of language pose significant challenges. To overcome this, the study employs lexicon-based analysis and machine learning-based classifiers to examine sentiment on Smart City platforms using data from reviews on the Tangerang Live application. The results demonstrate that lexicon-based analysis accurately describes the weighting of each word, enabling a clear portrayal of sentiment distribution. Furthermore, sentiment

results can serve as a foundation for labeling, as evidenced by the high accuracy of the random forest, k-nearest neighbors, and naive Bayes classifiers, achieving 84%, 72%, and 64% accuracy, respectively. Overall, this study offers valuable insights into sentiment analysis on Smart City platforms, which can inform future research in this area.

Keywords—smart city platform, sentiment analysis, lexicon, machine learning

**Long Short-Term Memory and Word Embedding For Sentiment Analysis of User Review**

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Abstract—Accuracy in training sentiment analysis models for large number of review datasets is affected by the correct classification of sentiment labels. Improving the accuracy of sentiment labels, text representation also affects the performance of sentiment analysis models. Deep learning methods have been widely used to solve various sentiment analysis problems. To improve the performance of deep learning in sentiment analysis, it is necessary to use the right labeling method and good text representation to be used as an embedding layer. This study proposes sentiment labeling using Lexicon and Long Short-Term Memory (LSTM) as well as used FastText as embedding words in sentiment classification. As a corpus, the InSet Lexicon Dictionary is

employed for feature extraction. The sentiment data used is the reviews given by users on several applications provided on Google Play. The results showed that the LSTM network using Word embedded FastText with a dimension of 300 words received a small error value of 0.111 with an accuracy of 95.55% for data labeled based on Lexicon..

Keywords: classification, fasttext, lexicon based, long short-term memory, sentiment analysis, word embedding.

**Internet of Things for Real-Time Multi Room Monitoring System**

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Abstract -. Electronic devices has become an integral component in our daily activities. In fact, the consumption on electrical energy in household reached 49% in 2018, and is expected to increase to 58% in 2050. Concurrently, the LPG is the second highest consumed energy in the household, and is expected to increase to 37% in 2050. However, the devices utilizing these energies could lead to a danger such as housefire if not operated and treated carefully. An Internet of Things (IoT)-based smart home monitoring system would solve this problem, especially by effectively monitoring several parameters in the

house simultaneously. In this study, a system is built to monitor and control three rooms in the house independent and simultaneously. The sensors and/or actuators in the kitchen, bedroom, and living area were controlled by NodeMCU ESP8266s. Kitchen LPG supply, flame, temperature, and humidity are all being monitored. Temperature, humidity, and movement behavior in the bedroom are all tracked. The condition of the electronic apparatus is observed in the main room. All microcontrollers are linked via the Internet to a Raspberry Pi local server, where all data is analyzed, saved, and transmitted to the user over the network using the MQTT protocol. The monitoring is able to be done by the user via MQTT dashboard in the smartphone. Following testing, the three microcontrollers are fully capable of exchanging data with the user's smartphone. The humidity changed by 1%, while the temperature changed by 0.1 °C. Perfect data interchange is possible between the relays, flame, gas, movement activity sensor, and others.

Keywords - data informatization, monitoring system, NodeMCU ESP8266, Node Red, Raspberry Pi

**Analysis of the Effects Using BERT Feature Extraction Method on Case of Sentiment Classification on Twitter Social Media**

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Abstract—This study will analyze the effect of the BERT feature extraction method on the evaluation results of the logistic regression, SVM, K-NN, and MLP algorithms. The parameters compared to each algorithm evaluation result are accuracy, recall, precision, specificity, and F1 score. We are compared the evaluation results from BERT with TF-IDF feature extraction from several classification algorithms. Based on the results, the effect of using BERT feature extraction causes classification evaluation resulting from the SVM, logistic regression, K-NN, and multilayer perceptron algorithms are decrease. Our best evaluation result is from logistic regression using TF-IDF with 99% of accuracy.

Keywords—Supervised learning, Classification, TF-IDF, BERT, logistic regression, SVM, K-NN, MLP

**Design of a Continuous Ambulatory Peritoneal Dialysis (CAPD) Fluid Monitoring System Prototype for IoT-Based Kidney Failure Patients**

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Abstract—Continuous Ambulatory Peritoneal Dialysis (CAPD) is one of the dialysis methods used for patients with kidney failure. The CAPD process occurs 3 to 4 times daily within 24 hours. CAPD patients need to record manually in a logbook. The logbook contains the duration of time required by the patient and is equipped with data in the form of the weight of the fluid expelled by the patient. Periodic replacement of CAPD can result in swelling of the patient's body. This study aims to design a CAPD fluid replacement monitoring system connected to the internet. So that this prototype can provide information in real-time, which is visualized with excel data in CSV format to health workers. Thus, health workers can monitor the time and weight of the fluid released directly without consulting directly. From the results of this test, this prototype can transmit changes in fluid data per minute, and the measurement accuracy of the load cell sensor is 98%.

Keywords—CAPD, Monitoring, IoT

**Clustering Analysis of Occupant Groups Based on Wireless Signal Indicators in Under-Actuated Zones Using K-Means**

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Abstract—Analysis of the position and movement of occupants in the unpredictable Heating, Ventilation, and Air Conditioning (HVAC) zone can affect the efficiency of energy use in the HVAC zone. The usual analysis is carried out using the occupant's daily data variables. However, movements or positions cannot be ascertained only by using daily data, so data is needed that can be used in real-time to analyze the position or movement of the occupants. Therefore, the study analyzed to find data variables that can be used in real-time by using data from a Radio Frequency (RF), namely Wi-Fi to detect occupants. The analysis was carried out using the Multivariate Analysis method to analyze the relationship between data variables and the K- Means Clustering method to analyze the position of occupants with these data variables. The results obtained are known that the RSSI variable has a strong positive relationship with the RSSI-LV data variable in each ventilation data and the RSSI data variable has a strong negative relationship with the LIMIT data variable in each ventilation data. In clustering analysis, it can be validated that there is a set of data variables obtained. So it can be known that the RSSI variable can present the occupant position and the RSSI-LV and AP variables can present the spread of the occupant position in each HVAC zone. It can be considered to use these variables in the analysis of the position of residents in less actuated zones. In future research, it is advisable to add the use of other relationship and correlation analysis methods such as Regression Analysis, to be clearer about the variables and consider using other signal data such as Bluetooth for the analysis of usable variables.

Keywords—K-Means Clustering, HVAC, Signal Strength, occupants position, under-actuated zone, Multivariate analysis

**Social Robot Services to Substitute Humans as a Companion and Virtual Assistant**

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Abstract—Robot involvement in everyday human surroundings has expanded in recent years because of robots' continuing evolution and development. According to prior studies, a lonely person tends to connect, and social presence can be one of the elements. In this study, sequential equation modeling (SEM) was applied. Non-probability-purposive sampling with respondents who were aware of social robots and cited any cities in Indonesia resulted in 242 respondents whose data was gathered between December 22, 2022, and January 5, 2023. According to the results, the hypothesis's perceived ease of use for the Intention to use and perceived Enjoyment for the Intention to use were found to be two hypotheses that are not significant.

Keywords—Perceived adaptiveness, Perceived Sociability, Perceived Usefulness, perceived Enjoyment, Social Influence.

**Analysis and Implementation of Social Robots to Increase Language Learning Capability**

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Abstract—Learning a language might seem like a challenging task. Fortunately, social robots are becoming more popular in certain parts of the world, especially in education. Social robots are believed to accelerate language learning, ultimately increasing language learning abilities. Thus, the purpose of this research is to prove whether the implementation of social robots can potentially have a positive influence on the language learning process. Several factors will be tested to support the purpose of this research; this includes the perceived value of social robots, intention to use social robots, perceived usefulness, robots' service assurance, empathy of social robots, information sharing process, perceived ease of use, robots' tangibles, robots' engagement, disadvantages of using robots, and advantages of using robots. The sampling method used in this research is non-probability purposive sampling. One hundred fifty-five participants from the JABODETABEK area and nine outside of the area participated in this study. Study participants must fill in an online Google Form questionnaire, and the data will be analyzed

further using SMART PLS. The study results indicate that only six out of eleven hypotheses have a significant impact.

Keywords—social robots, language learning, perceived value, intention to use, perceived usefulness, service assurance, empathy, information sharing, perceived ease of use, tangibles, personal engagement, disadvantages, advantages

**A Review on Optical Coherence Tomography (OCT) Technique in Dentistry Application: Limitations and Challenges**

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Abstract—Optical coherence tomography (OCT) is a non-invasive and ultrafast imaging technique that generates high resolution images of the internal tissue microstructures. It is almost similar to ultrasound techniques which utilize the reflection of sound waves that carries the structural information of biological sample from the tissue. In contrast to ultrasound techniques, OCT employs light instead of sound waves. Doctors and technologists discussed various limitations and challenges of running the OCT technique in the field of dentistry. In this narrative review, the limitations and challenges of the OCT technique in dental diagnostics were briefly presented.

These include limitations on the imaging environment or equipment of OCT, limitations on imaging depth and penetration, low contrast images obtained, poor image resolutions, poor imaging quality, and the lack of skill necessary to operate OCT.

Keywords—dentistry, limitations, image, optical coherence tomography (OCT)

**Forest Fire Detection Techniques Based on IoT Technology: Review**

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Abstract—Protecting forests from fires is very important, as they are vast areas that contain many resources that serve life on Earth, as well as their impact on the climate. Despite all the strenuous attempts to reduce wildfires, they still persist and cause environmental disasters. In recent years, researchers have been interested in the early detection of forest fires by using different technologies, such as using satellite images and drones, in addition to using sensors and network systems (wireless sensor networks), and after the development of networks and the emergence of the Internet of Things technology, which has become the focus of researchers' attention, By linking it to other technologies. This article discusses the types of forest fires, their causes, and their effects on the environment, as well as a literature review of some researchers interested in detecting forest fires, in addition to some statistics on forest fires. Some of the techniques used to detect forest fires have been explained, as well as the methodologies used by these techniques to

detect wildfires, in addition to a comparison between them. A comparison discussion of the techniques used in detecting forest fires showed that the Internet of Things technology is the best in the early detection of fires and at the lowest costs, with the improvement of the sensor nodes localization, as well as the improvement routing of data transmission over the network by using optimization algorithms.

Keywords—forest fire, wildfires, IoT

**Critical Success Factor of Impulsive Buying in Short Video Platform**

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Abstract—Short video platforms become one of the marketing tools for a company to attract the buyer's attention to buy their product. However, marketing through short video platforms often leads viewers to impulsive buying behavior. Thus, this research assesses the critical success factor significantly influencing impulsive buying behavior in short video platforms. This research tested several factors to identify their influence on impulsive buying behavior, such as e- WOM, comment, scarcity persuasion, hedonic motive, parasocial interaction, urge to buy impulsively, FOMO, and perceived value. As for the respondents, this research has 256 respondents from the

JABODETABEK area using non-probability purposive sampling through Google Forms. Then, the data collected are processed using SEM-PLS in SMART PLS. The result shows that seven hypotheses have a significant impact, and one has an insignificant impact.

Keywords—WOM, scarcity persuasion, hedonic motive, parasocial interaction, urge to buy impulsively, FOMO

**Automated Counting System Based on Watershed Algorithm for Tilapia Fish Egg**

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Abstract—Aquaculture is a significant component of Malaysia's fishery sector and makes a substantial contribution to the country's economy. It is the source of income and employment for the nation. Tilapia fish is one of the main species cultured in the aquaculture industry, as eggs produced by this fish are considered very valuable both in terms of quantity and quality. A standard egg selection procedure to calculate the fish egg properly has not yet been implemented. The process of fish egg selection plays a vital role in determining the accurate count of fish eggs. This study focuses on developing an automated counting system for tilapia fish eggs using an image processing technique concentrating on the watershed algorithm. This algorithm enables the image of the fish eggs to be clustered in shaded colors, thus enabling the total number of fish eggs to be automatically counted. The results show that the automated counting system for tilapia fish eggs works successfully as the accuracy obtained was above 90%. It is believed that an automated counting system can help fish breeders to perform fish egg counting automatically and more effectively and efficiently.

Keywords— Image Processing, Automated Counting System, Watershed Algorithm, Fish Egg, Morphological Operation

**Comparative Analysis of Machine Learning Models for Relative Humidity Prediction in the Philippines**

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Abstract— Relative humidity is an important environmental parameter and is widely used in various fields. Prediction of humidity levels is crucial for climate modeling, heat stress, air quality forecasting, and public health. Machine learning techniques have shown potential for predicting humidity

due to their nonlinear nature. However, there is a research gap in humidity prediction in the Philippines, specifically the lack of studies utilizing the available parameters provided by PAGASA, presenting an opportunity for further investigation and development of models for predicting humidity levels in the country. In this study, the researchers used a publicly available dataset from PAGASA containing weather measurements from 2000 to 2022 in the Philippines. Various machine learning models were trained and tested, with hyperparameter tuning performed using Bayesian optimization. The Gaussian Process Regression model with optimized hyperparameters achieved the best performance in predicting relative humidity, with the lowest RMSE and highest R-squared values. This study provides a reliable way to predict humidity levels in the Philippines based on weather parameters.

Keywords—Gaussian Process Regression, machine learning, PAGASA, Philippines, relative humidity

**Designing Performance Dashboard for Monitoring Post-harvest Loss in Transportation**

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Abstract—A poultry company has a problem in monitoring the loss of its main raw material, namely, Soybean Meal (SBM), which was imported from e.g.

Brazil and Argentina to Surabaya. The material is lost while it is transported from port to the factory. The company created a monitoring system, called raw material transport which recorded the process in transported the SBM from port to the factory. This study aims to monitor the SBM loss due to transportation using the RMT data recorded. The monitoring process is developed using a dashboard, which is designed using PowerBI. The designed dashboard can answer the company needs for visualizing the RMT data and help the management to control and to evaluate the performance of each third party which is contracted to transport the SBM from port to factory.

Keywords—Dashboard, Post-harvest loss, Data visualization, Business Intelligent

**Industrial Revolution 4.0 Technology Application Capability: A Portrait of Higher Education Institutions' Readiness in West Java Province, Indonesia**

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Abstract—The digital industrial revolution 4.0 refers to the development of information technology that is disruptive to the way of how organizations operate. This study aims to examine the extent to which universities in West Java - Indonesia are preparing themselves to face the digital industrial revolution 4.0. The readiness of the higher education institutions is reviewed from the aspects of lecturers, study programs, and curriculum. The survey instrument was developed from literatures which discussed the topic of Industrial Revolution 4.0 technology on education and business. The snowballing method and an online survey using the Google form were used as the sampling method, form was distributed via WhatsApp groups and as many as 386 respondents were received. The results of the study show that lecturers are aware of the effect of RI 4.0 on education in study programs, but the majority of lecturers have not integrated the Industrial revolution 4.0 material into the curriculum or courses of their study programs. This study has implications for preparing strategies that must be followed by stakeholders so that study programs and graduates remain relevant to business and industry

Keywords—Industrial Revolution 4.0, Higher Education Institutions

**A-Qyu General Purpose Cloud-based Queue Management**

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Abstract—Queueing in a venue is a part of our everyday lives. Digital queues have been implemented with great success at multiple venues. However, there are several disadvantages to traditional queue management. As an example, the traditional queue management system (QMS) requires the participant to be present at the venue. Traditional QMS also usually uses specific hardware setup, a computer or an IOT device. This research analyzes general uses of QMS from several specific QMS with its respective strengths and weakness and then designs a general-purpose solution to QMS using cloud technology for storage that provides real time data. To evaluate the performance of the QMS, standard application testing is conducted with additional survey to assess system usability when faced with a general queue situation. The survey is done within a university setting with two classes of students. Survey results found that the proposed solution does provide better queue management for general purpose use.

Keywords— cloud application, mobile application, queue management

**A Real-Time Video Analysis With an Omni-Directional Camera for Multi Object Detection Using The Hough Transform Method**

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Abstract—Many computer vision applications require multi-object detection, such as robotics, surveillance, and autonomous vehicles. Hough Transform (HT) is a popular method for object detection in digital images, but its application to real-time video streams is limited. In this study, we propose a method for multi-object detection in the form of ball and goalpost using the HT algorithm on real-time video captured by an Omni-Directional camera. The proposed method consists of two main steps: the first step involves applying the HT algorithm to the video stream to detect potential object locations. The second step involves implementing a clustering algorithm to group candidate locations into object instances. Our method includes a pre-processing step to filter out the color of specific HSV objects and remove noise. Experimental results on real-time video can detect objects in the form of balls with an accuracy rate of 72.19% and goalpost with an accuracy rate of 80% in some random video streams with an Omni-Directional camera. So that in the future Omni-Directional cameras can become a valuable tool for various computer vision applications.

Keywords— Computer Vision, Hough Transform, Omni-Directional Camera, HSV Color Filtering, Multi Object Detection.

**A New Interactive Gaming Approach for Enhancing Math Learning Among Marginalized Communities**

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Abstract—Mathematics is often considered a boring and challenging subject, which makes it difficult for educators to attract marginalized children to learn and embrace it. Therefore, this article discusses the development and evaluation of a mobile game application called Math-Hero, designed to enhance marginalized children's mathematical skills through an interactive, engaging, and heartfelt learning environment. To examine the effectiveness of

Math-Hero, an online survey method was employed to collect data from 32 respondents. The evaluation model was developed following the Technology Acceptance Model (TAM). Three constructs - Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Intention to Adopt (ITA) - were examined quantitatively using descriptive statistics and correlation analysis. Additionally, qualitative data were analyzed using thematic and sentiment analyses. The results of quantitative analyses indicate that Math-Hero is easy to use, beneficial, and the users intend to use it in the future. Its ease of use has a positive correlation with usefulness and intention to adopt it. The sentiment analysis also supports the findings, as most of the users have a positive and neutral perception of Math-Hero. Although Math-Hero has shown promise in improving marginalized children's mathematical skills, there is still room for improvement to make it even more robust and effective in the future. Moreover, further research is necessary to empirically demonstrate the effectiveness of Math-Hero among diverse marginalized communities, beyond just Semai youngsters.

Keywords— digital solution, educational games, gamification, marginalized community, indigenous, mathematics

**Augmented Reality Indoor Navigation Using NavMesh**

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Abstract—Augmented reality has become an emerging technology that enables users to be assisted in navigating indoor environments. This technology offers a unique and immersive user experience as it combines real-world navigation with digital information overlay. Users can navigate indoor environments precisely and quickly with the aid of navigation solutions that use NavMesh and AR technology. This paper presents an implementation of AR indoor navigation using NavMesh on Unity AR Foundation Framework, focused on the 2nd floor Agape Building at Duta Wacana Christian University as the case study. The implementation includes designing the user interface, setting up NavMesh, and creating a 3D model of the building for the system. The system was tested using Android phones and the results of the evaluation using AR Checklist indicate that the AR indoor navigation system exhibited acceptable levels of efficiency, effectiveness, and user satisfaction among the participants. However, certain concerns pertaining to marker scanning or rescanning, the presence of magnetometer on a mobile device, and the optimization for devices with limited screen resolution should be addressed to enhance the system's usability in the future.

Keywords—augmented reality, indoor navigation, NavMesh, AR Checklist, Unity AR

**Quadcopter Design and Development for Precision Agriculture Implementation in a Rice Field**

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Abstract—The advantage of quadcopters in remote sensing is obtaining data more efficiently and affordable than conventional airplanes or satellites. However, there are still several challenges, including flight time, data accuracy, and payload capacity. In a case study involving a quadcopter designed for capturing images and geotagging data in a rice field, with an 800mm frame diagonal, 2.6:1 thrust-to-weight ratio, and inwardly tilted propellers at a 5-degree angle was built. The autopilot system utilizes a Pixhawk 6C controller and a 22.2V 13000mAH battery. Equipped with an Orange-Cyan-NearInfrared camera, the images were captured and then processed using the Agisoft Metashape and QGIS applications. With the quadcopter weight of 4,492 grams, achieved a flight time of 18.30 minutes and the navigation deviation ranges from 0.06 to 0.4 meters. Although the quadcopter's vegetation index allows for the classification of plants and inanimate objects, it is not sufficient for assessing the plants' health. On the other hand, the resulting geolocation data is fairly accurate, with an estimated total error of 0.73 meters in longitude, 0.79 meters in latitude, and 1.28 meters in altitude. However, the ground-level elevation has a root mean square error of 18.99 meters, indicating poor accuracy in this aspect.

Keywords— quadcopter, multispectral camera, vegetation index, geolocation, ground elevation model

**The Effect of Redundant Capacity Strategy on Supply Chain Resilience Using Simulation**

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Abstract—Supply chain resilience is an important adaptive capability and must exist in every supply chain network. Disruptions that occur in the supply chain will have a major impact on customer satisfaction. When customers are not satisfied, a company may start dealing with the effects of disruptions to its supply chain over time. Dissatisfied customers will issue fines or switch suppliers to meet their needs. Specific strategies need to be implemented to minimize the impact that occurs due to disruption, especially the impact on customers. The total cost and total recovery time will be affected by customer behavior when there is a disruption to the supply chain network. Structural simulation will use agent-based modeling by implementing a redundant capacity strategy at each production plant. The percentage of redundant capacity will vary with several different conditions. Recovery time and total cost from the disruption that occurs will be influenced by customer behavior. Customer behavior is divided into two categories: critical customers and cumulative customers. The two customer behaviors will have a different impact on the strategy chosen. A supply chain resilience assessment index will be obtained for time to recover, and the total cost caused by disruption. The selection of the best strategy must be known before the strategy helps the company analyze recovery times in a disruptive situation using a redundant capacity strategy.

Keywords— Supply Chain, resilience, disruption, simulation, agent-based modeling