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IEC-2024

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BOOK OF ABSTRACT

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Foreword:

The tenth International Conference on Engineering (IEC'2024) takes place from October 23rd to 24th, 2024, under the theme "Innovative Engineering Research for Sustainable Development." This year's conference is jointly sponsored by the Faculty of Engineering at Tishk International University (TIU) and Erbil Polytechnic University (EPU), in collaboration with IEEE and the IEEE Iraq section as technical partners.

IEC'2024 serves as an interdisciplinary platform for presenting groundbreaking advances and state-of-the-art research across various engineering fields and sub-domains. The conference spans a broad range of topics, including Construction Engineering, Structural Materials, Structural Engineering, Earthquake Engineering, Sustainable Construction, Composite Materials, and Construction Management. Furthermore, Environmental Engineering, Green Buildings, Smart Buildings, Restoration and Rehabilitation of Historical Buildings, Renewable Energy, Hydraulic Engineering, Sustainable Materials and Waste Management, Transportation Engineering, and Geo-technical Engineering are discussed. Emerging disciplines such as Surveying and Geomatics Engineering, Highway Engineering, Data Science, Big Data Analytics, Artificial Intelligence, Robotics, Communications, and Biomedical Informatics are also explored.

This year's program committee comprises 90 distinguished members, of whom 85% hold Ph.D.s in engineering fields relevant to one or more conference topics. Adhering to international conference standards, the event is held in accordance with guidelines agreed upon with our IEEE technical partners and the regulations established by the Kurdistan Ministry of Higher Education. All submissions undergo a rigorous double-blind peer review by at least three committee members to ensure compliance with essential quality standards. These include relevance, timeliness, novelty, technical correctness, presentation quality, and the suitability of references used.

The conference receives 82 submissions from several countries, including Iraq, Tunisia, Jordan, Iran, Syria, Malaysia, Germany, the Philippines, Pakistan, India, and the UK. The event is organized into six tracks: 1. Computer Engineering and Information Technology; 2. General Engineering and Applications; 3. Digital and Wireless Communication; 4. Construction Engineering; 5. Environmental and Hydraulic Engineering; and 6. Geotechnical and Transportation Engineering. The Computer Engineering and Information Technology track receives 29 submissions, with 18 papers accepted. The General Engineering and Applications track has 20 submissions, 15 of which are accepted. Digital and Wireless Communication sees 19 submissions, with 11 papers accepted. Construction Engineering receives 4 papers, of which 3 are accepted. The Environmental and Hydraulic Engineering track receives 8 papers, with 6 accepted, while the Geotechnical and Transportation Engineering track has no submissions. Ultimately, 55 papers are accepted across all tracks, leading to an overall acceptance rate of 74.3%.

During the review process, some submissions are either rejected or withdrawn based on reviewer recommendations or failure to meet pre-review standards, such as plagiarism or

falling outside the conference's scope. All manuscripts are screened using iThenticate plagiarism detection software, with only those registering less than 25% plagiarism proceeding to review. Compliance with IEEE and EAJSE journal template formats is also meticulously checked by the Technical Program Committee (TPC). Papers requiring minor or major revisions, as recommended by reviewers, are conditionally accepted, with authors given the opportunity to amend their manuscripts based on feedback. Once revised, these papers undergo additional scrutiny by the track chairs and TPC members to ensure compliance with reviewer recommendations. Final decisions on acceptance or rejection are made accordingly.

IEC'2024 is honored to host esteemed keynote speakers from different engineering disciplines. Prof. Dr. Ammin Abbosh, a renowned professor at the School of Electrical Engineering and Computer Science, Faculty of Engineering, Architecture, and Information Technology at the University of Queensland, Australia, delivers a keynote address on "***The Evolving Field of Electromagnetic Imaging (EMI) at Microwave and Millimeter-Wave Frequencies for Non-Destructive Testing and Imaging.***" Another distinguished keynote speaker, Prof. Dr. Abdelazim M. Negm, from the Department of Water and Water Structures Engineering at the Faculty of Engineering, Zagazig University, Egypt, presents on "***Towards a Competitive Water Industry in the Digital Transformation Era***." The final keynote speech, titled "***Making Business Easier with AI: What You Need to Know,"*** is delivered by Professor Bestoun S. Ahmed Al-Beywanee from Karlstad University, Sweden.

We express our gratitude to all participants, committee members, keynote speakers, and sponsors for their invaluable contributions to this conference. Through your support, IEC'2024 continues to foster innovation and excellence in engineering research, with a clear focus on sustainable development.

Assist. Prof. Dr. Abubakar M. Ashir

Chair of IEC-2024

Asst. Prof. Dr. Ganjeena J. Khoshknaw

Co-Chair of IEC-2024

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First Keynote Speech

THE EVOLVING FIELD OF ELECTROMAGNETIC IMAGING (EMI) AT MICROWAVE AND MILLIMETER-WAVE FREQUENCIES FOR NON-DESTRUCTIVE TESTING AND IMAGING

Prof. Dr. Amin Abbosh[1]

[1]*School of Electrical Engineering and Computer Science, Faculty of Engineering, Architecture, and Information Technology at the University of Queensland, Australia*

ABSTRACT

Structures like civilian infrastructure and human tissues have specific physical properties that are frequency dependent. Any changes in those properties due to health condition variations affect their response to EM waves transmitted from sensors or antennas in contact or proximity to the structure. An EMI system leverages these changes to detect and classify abnormalities, such as hidden cracks in a bridge or diseases in tissues. Prof. Abbosh has pioneered EMI systems with significant industry and societal impacts, from early medical diagnosis and therapy to infrastructure inspection. His 35-member team has developed numerous portable EMI prototypes, offering low-cost, real-time inspection and imaging. Being non-ionizing, non-destructive, and non-invasive, EMI can be used frequently for real-time monitoring.Building successful EMI systems posed challenges. Structures are generally lossy at microwave/mm-wave frequencies, safe EM power is low, and useful signals are often embedded in clutter. Limited sensors/antennas and frequency bands restrict useful information. To overcome these, Prof. Abbosh developed novel structures supported by AI techniques guided by applied EM principles, achieving reliable accuracy. This success was due to a multidisciplinary team with skills in electrical systems, AI, and signal processing, working collaboratively. In his talk, Prof. Abbosh will share his research journey on EMI, highlighting its potential and challenges in translating research into real-world innovation.

Second Keynote Speech

TOWARDS A COMPETITIVE WATER INDUSTRY IN THE DIGITAL TRANSFORMATION ERA

Prof. Dr. Abdelazim M. Negm[1]

[1]*Department of Water and Water Structures Engineering at the Faculty of Engineering, Zagazig University, Egypt*

ABSTRACT

The water industry is undergoing a significant transformation driven by advancements in digital technologies. This paper explores how digitalization is reshaping water management, distribution, and treatment systems, leading to increased efficiency, sustainability, and competitiveness. Key technologies such as smart sensors, Internet of Things (IoT), big data analytics, and artificial intelligence are enabling real-time monitoring, predictive maintenance, and optimized resource allocation in water infrastructure. The paper also discusses the integration of digital tools in addressing critical challenges such as water scarcity, energy consumption, and aging infrastructure, while highlighting the role of digital solutions in ensuring water quality, minimizing waste, and enhancing decision-making. Additionally, the paper addresses barriers to adoption, including regulatory hurdles, cybersecurity concerns, and the need for cross-sector collaboration. By examining global case studies and emerging trends, this paper provides a roadmap for achieving a more competitive and sustainable water industry in the digital transformation era.

Third Keynote Speech

MAKING BUSINESS EASIER WITH AI: WHAT YOU NEED TO KNOW

Professor Bestoun S. Ahmed Al-Beywanee[1]

[1]*Karlstad University, Sweden*

ABSTRACT

Artificial Intelligence (AI) is revolutionizing business landscapes by offering advanced solutions that enhance efficiency, automate repetitive tasks, and enable data-driven decision-making. This paper delves into the core AI technologies—machine learning, natural language processing, computer vision, and robotic process automation—and their transformative impact on key business functions such as customer service, supply chain optimization, human resources, and marketing strategies. It provides a comprehensive overview of how AI can streamline operations, improve predictive capabilities, foster innovation, and deliver personalized customer experiences. Additionally, the paper examines the integration challenges businesses may face, including data privacy concerns, ethical considerations, and the need for upskilling the workforce to fully embrace AI-driven strategies. By exploring real-world applications and case studies, this paper equips business leaders with the knowledge and tools required to harness the power of AI, driving long-term success and maintaining a competitive advantage in the evolving global market.

Fourth Keynote Speech

COGNITIVE SCIENCE AND ITS IMPORTANT APPLICATIONS IN COMMUNICATION AND INFORMATION SECURITY

Prof. Dr. Eng. Sattar B. Sadkhan

University of Babylon

IEEE Iraq Section

ABSTRACT

Cognitive radio system (CRS) is a radio system which is aware of its operational and geographical environment, established policies, and its internal state. It is able to dynamically and autonomously adapt its operational parameters and protocols and to learn from its previous experience. Based on software-defined radio (SDR), CRS provides additional flexibility and offers improved efficiency to overall spectrum use. CRS is a disruptive technology targeting very high spectral efficiency.

This Talk concerns mainly on the importance of the Cognition and its different applications, mainly in Communication and Information security fields.

Kurdish Handwritten Character Recognition System: Review of methods and progress

Islam A. Qader [1], Tarik A. Rashid [2]

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ABSTRACT

Kurdish handwritten character recognition (KHCR) is an emerging field, which deals with the complications brought forth in recognizing Kurdish handwritten text due to the peculiar characteristics of various scripts and dialects of Kurdish. A review on the status of KHCR was discussed here; important challenges in recognition were listed as data scarcity, intricacies in cursive writings, and variability in the individual's handwriting style. The existing works within this area have been involved in the development of neural network models and datasets; however, there are still a lot of limitations concerning the completeness of available datasets and the precision of the recognition system. The future directions in KHCR research put weight on developing large-scale and diverse datasets, including all forms of Kurdish letters, using advanced techniques in deep learning, and realizing real-time recognition systems. This research has come up with a hybrid model combining the traditional approaches of feature extraction with the modern methods of machine learning, including user adaptation in order to improve the accuracy, and dialectal variability of Kurdish handwriting-all these will be very important in the future. By focusing on these areas, KHCR can significantly enhance digital communication and accessibility for Kurdish speakers while facilitating the preservation and digitalization of the Kurdish language. This continuous research in the domain carries the potential to create an inclusive digital environment that will also enable further expansion in use and application related to Kurdish handwriting recognition technologies.

Keywords: Kurdish handwritten character recognition, optical character recognition, Kurdish script, deep learning, Convolutional Neural Networks, dataset creation, real-time recognition, digital accessibility

Evaluating the Impact of Layer Depth and Data Availability on Multi-Output Deep Learning Models

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ABSTRACT

Accurate age and gender estimation from skeletal radiographs is vital in medical diagnostics, enhancing patient management and treatment planning. This study evaluates the impact of layer depth and data availability on multi-output deep learning models, comparing a custom Convolutional Neural Network (CNN) and a custom DenseNet121. The dataset consists of 9,343 skeletal radiographs from healthcare facilities in Kurdistan, Iraq, encompassing diverse skeletal parts, age groups, and genders. Extensive preprocessing, including grayscale conversion, normalization, and augmentation techniques, was conducted to improve model robustness. The custom CNN, designed with six convolutional layers, incorporates batch normalization, dropout layers, and ReLU activation functions. DenseNet121 features dense connectivity, connecting each layer directly to facilitate efficient feature reuse and reduce parameter count. Both models were trained using the Adam optimizer with adaptive learning rates, employing checkpointing and early stopping. Evaluation metrics included Mean Absolute Error (MAE) for age estimation and accuracy, precision, recall, and F1-score for gender classification. Results show that the custom CNN achieved an MAE of 4.25 in age prediction, outperforming DenseNet121's MAE of 5.1. However, DenseNet121 excelled in gender classification with 92% accuracy compared to CNN's 90%.

Keywords: Age Estimation, Gender Estimation, Medical Imaging, Convolutional Neural Networks, Multi-Factor Classification

A Comprehensive Review of AI-Based Classification Approaches for Brain Cancer Detection and Diagnosis

Nayla Faiq Othman[1], Shahab Wahhab Kareem[2]

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ABSTRACT

The multiplication of cells that are accumulating faster than they should without control is the cause of brain tumors. Despite much effort, spending a lot of data and promising findings in segmentation and classification accuracy is still impossible. Imaging tools like computed tomography (CT) scans, Magnetic Resonance Imaging (MRI), and other modalities will enable the identification of brain tumors effectively and safely. This study aimed to look into several imaging techniques that currently are in practice for reliable detection of brain cancer, mainly focusing on the areas based on machine learning (ML) and deep-learning (DL) frameworks within computer-assisted approaches. This review discusses different types of brain tumors based on public datasets, methods for enhancing image quality, technologies to segment images into various regions, and primary feature extraction strategies among others, and inferred several recommendations about the use of artificial intelligence technology components as regards presentation towards identifying cancerous diseases affecting brains. In general, this review offers a brief overview of several findings based on various research that used AI-driven classification approaches for the aim of brain cancer identification and diagnosis. As have been are concluding this article it underlines the possible advancements that have been provided by artificial intelligence-based categorization approaches in terms of dementia diagnosis and treatment.

Keywords: brain tumors, Magnetic Resonance Imaging (MRI), computed tomography (CT) Scan, Computer-Aided Diagnostic and Detection (CAD), Deep Learning (DL), Machine Learning (ML).

Deep Learning-Based Control of Sensorless Drives for Robotics and Automation

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ABSTRACT

Permanent magnet synchronous machines are critical components in automation and robotics systems due to their compact size, high efficiency, and low maintenance requirements. However, these machines require complex control systems and precise rotor position detection. The signals generated by the rotor position sensor are used to switch the electronic components in the inverter of sensorless drive systems. Although conventional and adaptive controllers are commonly used, their performance can be impacted by changes in system dynamics, necessitating continuous updates to the controller parameters. This research aims to design an intelligent controller based on deep learning, which eliminates the need for a mathematical model of the drive system. The performance of the drive system with the deep learning-based controller will be evaluated and compared with other controllers, such as the adaptive neuro-fuzzy inference system (ANFIS) controller and the traditional PID controller. The obtained results indicate that the intelligent controller based on deep learning outperforms both the conventional and ANFIS-based controllers.

Keywords: Sensorless drive system, Robotics and automation, Conventional controller, Adaptive controller, Artificial Intelligence, ANFIS controller, Deep learning.

A Comparative Analysis of Data Mining Techniques for Fault Detection and Diagnosis

Hiba Jabbar Aleqabie[1], Heba Adnan Raheem[2], Zahraa Shihab AL Hakeem[3], Rusul Kadhim[4]

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ABSTRACT

Fault detection and diagnosis play crucial roles in various fields, such as manufacturing, engineering, and system monitoring. These processes are essential for maintaining the reliability and efficiency of systems by identifying and addressing issues before they escalate into significant problems. To address these challenges, data mining techniques have been widely adopted to analyze extensive datasets. Data mining involves extracting useful information from large volumes of data, which can then be used to detect patterns, anomalies, and correlations that may indicate faults. This study presents a comparative examination of three commonly used data mining techniques—classification, clustering, and association rule mining—for fault detection and diagnosis. Understanding the strengths and limitations of these techniques enables practitioners to make informed decisions when selecting the most suitable data mining approach for fault detection and diagnosis tasks. This comparative analysis contributes to the advancement of fault detection and diagnosis methodologies by highlighting the contexts in which each technique excels or falls short. Ultimately, this leads to more effective and efficient fault management in complex systems, enhancing overall system performance and reducing downtime.

Keywords: data mining, analysis, fault detection, diagnosis

A Comprehensive Review of Big Data through Adaptive Sharding and Federated Learning

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ABSTRACT

The advancement of big data has been moving fast, opening up vast opportunities and risks, especially within the medical field with the issues of privacy and decentralization. One is Federated Learning (FL), a modern machine learning approach that simultaneously allows distributed training on various devices or institutions without compromising the data. This paper aims to review Federated Learning and adaptive sharing in big data systems and the changes they bring to healthcare data processing. FL decentralizes data processing at the edge, protecting privacy while making real-time and large-scale analysis possible. This is complemented by adaptive sharding, which minimizes and efficiently organizes the distribution of extensive data across many locations. Altogether, the mentioned technologies provide a relatively solid foundation for Medicine, increasing diagnostic accuracy, operational effectiveness, and individualized approach to groups of patients. This review analyzes the FL and adaptive sharing technologies with a specific reference to big data, mainly in the healthcare sector. It also outlines their technical concept, major application areas, and future possibilities. Also, it reviews the problem of model poisoning attacks and offers preservation methods such as FL-WBC. These are the changes that laboratories are to implement in the future of healthcare with privacy, scalability, and data management challenges.

Keywords: Federated learning, adaptive sharding, big data, healthcare: privacy, and machine learning

Evaluating the performance of MANETs Routing Protocols AODV and DSDV using the NS2 Network Simulator

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ABSTRACT

An Mobile Ad hoc Networks (MANETs) is a collection of wireless mobile nodes that spontaneously join together to form a network; these networks do not rely on any preexisting infrastructure. It means that each node in the networks under consideration can switch position with any other node arbitrarily which implies that the topology of the multi-hop networks will be random and very dynamic. In an effort to enable communication among all nodes in MANET wireless networks, several routing protocols have been developed including AODV, DSR as well as DSDV. This paper provides a performance comparison and analysis of two routing protocols: the reactive AODV and the proactive DSDV. Throughput, energy consumption, average end-to-end latency, packet loss rate, and packet delivery ratio were some of the metrics used to evaluate their performance in the NS-2 network simulator. The study's limitations include bandwidth and energy constraints, storage limitations, mobility challenges, and variations in link capabilities. In comparison to DSDV, AODV achieves better packet delivery ratios and lower end-to-end delays, according to the simulation results. However, in energy consumption and packet loss rate, DSDV show the better performance as comparing with AODV. Furthermore, the work on comparing the proposed algorithm focuses that the throughput of both AODV and DSDV are almost equivalent. Secondly, the work implies that when the number of nodes is not so large, for example, if it is a small MANET, DSDV is more suitable, at the same time, if this is a relatively large network, for example, if it is a MANET with more nodes, AODV could be more suitable.

Keywords: Network Simulator NS2, Routing Protocols, AODV, DSDV, energy consumption.

Erbil Public Transportation Tracking: An IoT-based Solution for Urban Mobility Enhancement

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ABSTRACT

Erbil, the capital of the Kurdistan Region of Iraq, is expanding and accommodating more residents. These changes require a better public transportation system. To address this issue, this paper presents the "Erbil Public Transportation Tracking" system. The system employs IoT and machine learning to create a real-time tracking solution for Erbil's public transport requirements in the form of mobile app. The presented app is based on Flutter and uses GIS and machine learning to provide real-time data and predictive guidance regarding bus and minibus routes and schedules in the city of Erbil. The app uses a machine learning algorithms to predict delays, suggest the best routes, and personalize commuter experience. The results indicate that 70% of the respondents use public transportation and 86% of the surveyed commuters showed willingness to adopt the presented system to help them make better informed decisions about their routes and daily commutes.

Keywords: Public Transportation Tracking; Information systems; Internet of Things (IoT); Machine Learning; IT; Urban Mobility in Erbi.

Cloud Storage Security Based on Blockchain: A Survey

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ABSTRACT

Blockchain technology and cloud storage security have advanced significantly as a result of privacy and data security concerns. answer the growing concerns about data privacy and safety. Cloud storage can improve data integrity and secrecy by utilizing Blockchain's decentralized and irreversible capabilities. Blockchain offers a more reliable option that reduces the chance of theft, even though encryption techniques still provide some security. Access control, transparency, and data integrity are all intended to be improved by this integration. The risks of typical cloud storage are discussed in this paper, with a focus on file uploads, which are prone to theft and unauthorized access. We investigate how data integrity and secrecy in cloud storage systems might be improved by blockchain's decentralized and irreversible properties. Our approach entails a thorough analysis of the body of research on blockchain applications in cloud storage, with a particular emphasis on encryption, decentralized storage, and access control techniques. The findings show that by using tamper-resistant techniques that lower the risk of theft and improve data integrity, blockchain technology offers a more dependable substitute for protecting cloud storage. However, there are hazards involved that cloud service providers and specialized blockchain security companies need to consider, including issues with scalability, regulatory compliance, and implementation difficulty. Finally, our results demonstrate the exciting new directions and insights that blockchain-based cloud storage security solutions present. By offering insights into the application of blockchain technology to improve data integrity, transparency, and access control, this research adds to the body of knowledge already in existence and helps scholars and practitioners in their search for blockchain-powered secure cloud storage solutions..

Keywords: Blockchain, Cloud Storage, Encryption, Decryption, Security.

Machine Learning Methods in Cyberbully Detection: A Concise Review

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ABSTRACT

Cyberbullying is an online crime committed against a victim of harassment and hostility. Despite the development of several techniques for detecting cyberbullying, many studies have mostly relied on textual and specialized user features that were created by the system's designer. This review paper aims to explore cyberbullying detection developed for social platforms using machine learning classifiers, such as Logistic Regression (LR), Random Forest (RF), and Support Vector Machine (SVM). A comparison was also conducted on the performance of the reviewed algorithms in terms of accuracy and precision to determine the classifiers' recognition rates in identifying cyberbullying on multiple social platforms. Subsequently, the results highlighted the hybrid model as the best method to identify the incidences, whereby the integration of SVM and Convolutional Neural Network (CNN) model. This integration between SVM and CNN has achieved the best accuracy of 89.9% for the detection of cyberbullying texts on social media. Nonetheless, many SVM models were developed to identify cyberbullying activities. Therefore, further research in this area is required to create more precise and efficient methods to identify and prevent online abuse and harassment and improve internet inclusivity among various types of users.

Keywords: Cyberbully Detection, Machine Learning, Artificial intelligence.

Ultimate Arabic News Dataset: A New Efficient Dataset for Arabic Text Classification

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ABSTRACT

The rapid growth of the internet in recent years and the huge increase in the number of internet users has been accompanied by a huge increase in the number of data being shared at every moment, especially text data. With such a large amount of data, text classification (aka categorization) has become one of the most active research topics in recent years. Text classification is one of the most common natural language processing (NLP) tasks where unclassified texts are categorized into predefined categories. Many studies have been conducted in the field of text classification, but research on Arabic text classification has been very limited due to many reasons, including the complexity of the Arabic language and the absence of publicly available, high-resolution Arabic datasets. In this study, a new huge Arabic news dataset called "Ultimate Arabic News Dataset" is presented. The data was collected with high accuracy and efficiency from different Arab news sources, and the documents were divided into ten different categories. The dataset contains four different versions ranging from the original data, without any processing techniques, to the versions on which all pre-processing techniques were applied for the researcher to choose the appropriate dataset for their studies. The different versions of the dataset were evaluated using four classifiers and three term weighting methods and the dataset, in all its versions, provided very good results. With the good results shown by the new dataset, which will be presented and discussed in the experimental study section, it is expected that this dataset will effectively contribute to helping other researchers and developing research dealing with the tasks of natural language processing and classification of Arabic text data.

Keywords: Arabic natural language processing; Arabic text; Data collection; News articles; Term weighting; Text classification.

Image Steganalysis Scheme based on Fusion of CNN and BiLSTM

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ABSTRACT

In the field of information security, steganography and steganalysis play crucial roles. Steganography refers to the technique of hiding secret information within other non-suspicious data, often within images, while steganalysis is the process of detecting and extracting these hidden messages. The ability to accurately identify images that conceal encrypted or hidden data has become increasingly important in today's digital landscape, particularly in areas such as cybersecurity and secure communication. This study focuses on enhancing the detection of such hidden messages by utilizing advanced deep learning techniques, specifically (CNN) and (BiLSTM) networks. This fusion approach involves merging the strengths of both CNNs and BiLSTMs, which leads to better performance compared to using either technique in isolation. The combined model's accuracy is notably higher than that of previous works, as demonstrated in comparisons on trained datasets.To train these models, the study employs Adam's optimization algorithm, a widely used and efficient method for training deep learning models. To ensure the robustness and reliability of the proposed model, the researchers utilize K-Fold cross-validation with k=2, which allows for better dataset utilization and reduces the risk of overfitting. The proposed techniques were evaluated using three well-known datasets in the steganography and steganalysis community: HILL, BOSSbase 1.01, and providing a solid benchmark for testing the effectiveness of the model. The results indicate that the proposed methodology not only outperforms existing approaches but also provides a highly efficient solution for detecting hidden data in images, with minimal computational overhead.

Keywords: Data Hiding, Image Security, Image Steganography, Image Steganalysis, Convolution Neural Networks, BiLSTM, Fusion, Deep learning.

A Review of Students Attendance Management Systems

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ABSTRACT

The utilization of paper and pen for recording student attendance is a conventional method which is prevalent across a plethora of educational institutions. However, this technique is fraught with various challenges and inefficiencies, primarily owing to the extensive duration required in its execution. Additionally, it necessitates a secondary phase of data entry for report generation. This method is also susceptible to malpractices such as proxy attendance, where students may sign on behalf of their peers. Consequently, this mode of attendance documentation lacks security and is less favored. Scholars have, over a substantial time span, presented an assortment of alternative paradigms for managing student attendance. The pertinent academic literature on automated attendance systems can be dichotomized into two broad categories: those that employ biometric technologies and those that do not. Biometric systems are contingent on physiological attributes for authentication, by juxtaposing the captured data with pre-existing records. The incorporation of biometric verification in affirming identity and authorizing access to automated systems has gained traction and is now ubiquitous. Conversely, a segment of the academic community has explored non-biometric attendance systems, employing an eclectic mix of techniques. This manuscript undertakes an exhaustive analysis of over forty empirical studies and proffers a new taxonomy for student attendance management systems.

Keywords: Students Attendance management system, Fingerprint, Face Recognition, class attendance, QR code, mobile attendance, Taxonomy of Attendance.

Machine and Deep Learning Impact on Energy Consumption Enhancement in IoT Systems

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ABSTRACT

In the recent years, the Internet of Things has grown incredibly and become a benchmark in many systems and frameworks. In addition, energy consumption optimization and management have become globally significant inevible issues to be solved, particularly in developed countries. Recently, researchers have consistently sought to identify valuable approaches and solutions related to the integration of Machine Learning and Deep Learning into IoT-driven systems to enhance energy efficiency and sustainability. This study aims to show how important Machine Learning (ML) and Deep Learning (DL) are in systems that use the Internet of Things (IoT) for energy efficiency. It concentrates on the newest advancement in this field, exploring the contributions of 20 indexed references from Scopus and Web of Science databases over the last half-decade. It is concluded that supervised learning techniques, particularly ANN and DNN algorithms integrated with the LSTM method, are the most compatible with IoT-based systems for better energy efficiency.

Keywords: Machine Learning, Deep Learning, Energy consumption, IoT-based, energy efficiency.

Enhancing Classification Performance Through Employing Feature Selection Algorithms

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ABSTRACT

An approach is presented in this research to improve classification accuracy in order to obtain a more accurate output. Five distinct algorithms of feature selection are used for the purpose of feature selection and then five different classification algorithms are used to classify the data, using this approach in order to improve the classifiers' accuracy. The derived method can be applied in a variety of fields. In this approach, feature selection algorithms such as the Las Vegas Filter (LVF), Sequential Floating Forward Search (SFFS), Branch and Bound (B&B), Quick Branch and Bound (QBB), and Focus are used to select features, which are then classified using five different classification algorithms of machine learning such as Nave Bayes (NB), Sequential Minimum Optimization (SMO), Decision Table (DT), Random Tree (RT), and Stacking algorithms. The classifiers are chosen from different classification families and the proposed algorithm is put to the test on a variety of datasets. Finally, a combination of the best performing feature selection algorithm and the most accurate classification algorithm is chosen to be employed for classification purposes in various fields.

Keywords: Data Classification; Feature Selection; Naïve Bayes; Decision Tree; Sequential Minimum Optimization; Random Tree; Stacking.

Machine Learning-Driven Intrusion Detection Systems: Reducing False Alarms and Enhancing Accuracy

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ABSTRACT

The increasing sophistication of cyber threats presents ongoing challenges for securing modern networks, particularly in addressing the limitations of Intrusion Detection Systems (IDS). Traditional IDS solutions often suffer from high false-positive rates and limited accuracy in detecting novel or unknown attacks, leading to inefficiencies in security management. This paper explores the use of multiple Machine Learning (ML) algorithms to improve IDS performance, focusing on models such as Artificial Neural Networks (ANN), K-Nearest Neighbors (KNN), Decision Trees (DT), Naive Bayes (NB), Logistic Regression (LR), and Support Vector Machines (SVM). The research employs the KDD Cup 1999 dataset, a well-known benchmark for intrusion detection, to evaluate the effectiveness of these models. The study also investigates the role of Principal Component Analysis (PCA) improves model efficiency by reducing the dimensionality of the feature set. Experimental results demonstrate that the integration of ML algorithms significantly improves IDS accuracy while reducing false alarms. This research offers valuable insights into addressing key IDS limitations and provides a comprehensive performance comparison to identify the most suitable model for real-world application.

Keywords: Intrusion Detection System, Machine Learning, KDD Cup 1999, Hybrid IDS, Anomaly-Based Detection, Signature-Based Detection

Robust Fractional Order Sliding Mode Control against Parameter Variations with Application to SCARA Manipulator Robots

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ABSTRACT

This paper investigates the application of Fractional Order Sliding Mode Control (FO–SMC) for achieving robust motion trajectory regulation in dynamic robot systems operating under parameter uncertainties, including conditions of charge variation and overload. The proposed control strategy leverages fractional calculus to upgrade the robustness and performance of the control framework. A thorough analysis using Lyapunov's method is carried out to validate the asymptotic stability of the feedback control system. The analysis demonstrates that the proposed FO–SMC controller ensures that the tracking errors approach zero, even when faced with inherent uncertainties and disturbances in dynamic robotic environments. Simulation results demonstrate the efficacy of the suggested method in achieving precise trajectory tracking and robust performances, particularly under challenging operational conditions such as varying charge levels and overload scenarios.

Keywords: Fractional Order Sliding Mode control, Robot Manipulator, Stability Analysis, parameter uncertainties

Deep Learning for the Detection of Skin Cancer: A Comprehensive Review

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ABSTRACT

Since skin cancer is a common and sometimes fatal illness, prompt diagnosis is essential to providing the best possible care. In times the application of learning methods has demonstrated to be highly beneficial, in the fields of medical image analysis particularly, in the detection of skin cancer. In this review our aim is to provide an overview of how deep learning method are utilized in the diagnosis of skin cancer. We will summarize the methods, challenges and advancements, in this field. After that it proceeds to elaborate on the concepts of learning and why it is suitable, for assessing dermatological image analysis. In the paper various architectures of networks are examined, demonstrating their remarkable effectiveness, in tasks such, as segmenting lesions classifying them and determining their location. These consist of networks (CNNs) recurrent neural networks (RNNs) and variations of them. The research paper also explores the significance of datasets, in developing and evaluating algorithms well as their crucial role in training deep learning models, for skin tumor diagnosis. It delves into the importance of utilizing domain adaptation techniques transfer learning as well as data augmentation methods to increase the performance and resilience of models. The paper also talks about the concept of interpretability. Explores the challenges of using learning models, in dermatology. It emphasizes the importance of having comprehensible methods, in settings. Combining the power of learning with the field of dermatology presents prospects, for improving the timely identification, prediction of outcomes and overall wellbeing of patients undergoing treatment, for skin cancer.

Keywords: Skin Cancer, Deep Learning Models, CNNs, RNNs, Detection.

Copper Slag Materials Waste from Philippine Industries for Various Engineering Applications

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ABSTRACT

The construction industry is crucial for a country's socio-economic progress, but it is also a significant contributor to environmental pollution. Concrete, the primary construction material, relies heavily on fine aggregates (FA), constituting approximately 30% of its composition, typically sourced through quarrying, an environmentally harmful open-pit mining process. This practice harms rivers, deteriorates water quality, accelerates erosion, and depletes aggregate resources. Copper slag (CS), a by-product of copper manufacturing, is often treated as waste due to excess production. However, it finds utility in cement, sandblasting, and reclamation. This study assesses CS's suitability as a FA replacement. Physical properties such as unit weight, gradation, absorption, and compressive and flexural strengths of CS-based concrete were evaluated, following American Society of Testing and Materials and American Association of State Highway and Transportation Officials standards. Replacement ratios, ranging from 20% to 100% CS, were considered. The results demonstrated that the physical characteristics of CS satisfied the minimum requirements set by ASTM and AASHTO. The compressive strength varied between 30 and 37 MPa, and the flexural strength ranged from 3.8 to 4.0 MPa. In conclusion, CS can effectively substitute for traditional fine aggregates in concrete construction, offering a sustainable solution that mitigates the environmental impact associated with quarrying and waste disposal. This research underscores the potential for environmentally responsible practices within the construction industry.

Keywords: construction material, copper slag, fine aggregate, industry waste, substitution.

A Study Related to Eco-Friendly Production of Lightweight Concrete by Using Expanded Polystyrene

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ABSTRACT

The extensive use of conventional concrete has a negative impact on sustainable use of materials, resources, and environment. The introduction of aggregates of the recycled materials will of no doubt be beneficial to certain extent. The lightweight concrete (LWC) can be an alternative material to the conventional concrete to be used in the building industry. The life spam of any built environment is limited to many decades, thus the availability of aggregates of recycled materials by utilizing waste products from demolished building, together with the Expanded Polystyrene Beads (EPS) that is abundant in an oil producing country like Iraq can be constructed, six mixes of LWC-EPS (0%,20%, 40%, 60%, 80%, and 100%) were constructed and tested in this study. The research methodology consisted of investigating the fresh features of LWC due to the impact of utilizing various EPSs percentages on LWC, while the second part concentrated on testing LWC mixtures that had been hardened for compressive strength, splitting tensile strength, dry density, water absorption, and air void content. The findings of this study revealed that while compressive and splitting tensile strengths decreased, the fresh characteristics of LWC were only marginally improved by the inclusion of EPSs. As EPS tends to form larger clumps, absorb water, and dry out the mix, the study also showed that the LWC created with these waste materials lowered the density (lightweight) of the concrete mixes. This available investigation shall be of a use by architects, building engineers, researchers, and academics

Keywords: Light Weight Concrete, LWC, EPS, Expanded Polystyrene, Compressive, Tensile, Water Absorption, Casting, Curing.

Strains in steel reinforcement and CFRP sheets in CFRP- strengthened reinforced concrete beams

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Abstract

Results of an experimental program, published by the author on reinforced concrete beams strengthened with Carbon Fiber Reinforced Polymer CFRP laminates, were analyzed in this work in terms of the strain development in tensile steel bars and CFRP laminates until extreme loading that cause failure. The outcome of this work may help in investigating the ductility of such beams. It may be concluded that although strengthening with CFRP enhances the carrying capacity of beams, they require special consideration for ductility.

Keywords: CFRP laminates; strengthening of beams; strains

Cryptanalysis of RSA Based on Parallel Factorization Method

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ABSTRACT

The paper aims to break the RSA cryptosystem in the shortest possible time. The basic idea is based on factorizing N in a parallel way. Firstly, the solution search space of N was determined. Secondly, limited points K for this space were computed using a specific mathematical formula. Thirdly, these were used as start points for new small solution search spaces. The search for factors of N will be achieved in parallel in all minor solution search spaces using K computers. Whenever factors appeared on one of K's computers, execution on all computers was stopped. This method has been compared to methods V-factor, TDM, MFF, MFF2, MFF3 and MFF4. Results showed that it is superior to the mentioned methods in terms of elapsed time, iterations, and speed up. It solved the problem of the V-Factor. Results showed that the proposed method effectively factored numbers with convergent or divergent factors. The success in analyzing numbers in the shortest possible time threatens the security of cryptosystems based on factorization of N, such as RSA.

Keywords: cryptanalysis, security, factorization, MFF, RSA

Intelligent Battery Management System Using Machine Learning and Dynamic Capacitor Techniques

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ABSTRACT

This paper details on the design of an IBMS an artificial neural network and fuzzy systems, dynamic capacitor techniques using variable duty cycle Pulse Width Modulation (PWM) is integrated to enhance battery performance and its lifespan duration. The special part of IBMS architecture is a capacitor circuit, which controls energy storage components by a variable duty cycle of PWM The PWM contains the main elements, including the inductor, capacitor, and switches (S1 and S2). Rich algorithms such as SVM, RF, DT, Bagging, and XGBoost use battery previous performance history data to predict near real-time duty cycles for Battery Management to effect the equalization in the batteries accordingly. The used technique included data gathering and preparation that included voltage, current, SoC and SoH – historical as well as real-time. Simulations in MATLAB/Simulink showed significant improvements: with the screw operating at 20% duty cycle, 95. 5% equalization was done in 500 seconds and at 50% a 30mV voltage difference was acquired in 500 seconds, while at 80% a 2. The condition of the experiment whereby 2mV voltage difference was obtained was done in 125 seconds. These results showed the expected performance to be better than the traditional fixed switched-capacitor designs. In practice, the resource confirmed the focus of the system and its versatility for use in renewable energy systems and electric vehicles. This work provides a solution that is flexible, robust, and capable of being implemented in contemporary energy storage demands and proves the significant enhancement in battery management techniques.

Keywords :Intelligent Battery Management System (IBMS), Machine Learning Integration, Dynamic Capacitor Techniques, Variable Duty Cycle PWM, Energy Storage Optimization.

An Evaluation Model For Measuring The Usability of The Bologna Management System In Iraq (Student, Teacher, And Management Perspective)

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ABSTRACT

User acceptance and satisfaction with a management information system depend entirely on the quality, importance, and freshness of the data that the system provides to its actual users. System usability and system usefulness, as well as system availability, are considered the most important factors in the evaluation of an information system. Lately, scientific and engineering specializations at Iraqi public and private universities have adopted the Bologna path, providing a new experience to revitalize the country's education system. An essential part of the requirements for implementing the Bologna Process is the existence of an integrated website called the Bologna Management System used to manage the Bologna Process. However, measuring the usability of the system has become a necessity since the website contains three main users (the student, the professor, and the administration). This paper investigates the evaluation of the usability of the intended website by proposing an evaluation model based on the Technology Acceptance Model. Four universities (two public and two private) have surveyed. To measure the usability of the intended system, an online questionnaire (a seven-point Likert scale) has systematically designed and formalized as an instrument to measure the intended system's usability. The selected sample included 870 students and 78 university lecturers, as well as 12 top management members from the targeted universities. The obtained results have indicated that the Bologna management system in Iraq is highly usable and workable in practice. Including some recommendations and proposals that improve the performance of the intended system.

Keywords: usability, usability measurement, technology acceptance model, management information system, Bologna process, component, formatting, style, styling, insert

Federated Learning Scheme for Physical Layer Authentication in Industrial IoT Application

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ABSTRACT

With the recent advancements in communication technology and the advent of Internet of Things (IoT) devices, developing lightweight authentication methods for IoT systems is an essential requirement as these devices are resource-constrained. The new directions are towards using physical layer characteristics for authentication. With the advent of artificial intelligence, the task of authentication has become a significant burden on the authenticating device. In this paper, the use of federated learning to learn the physical layer attributes to provide lightweight collaborative authentication has been investigated. In this research, a measured channel state information dataset is used to evaluate the effectiveness of the proposed model based collaborative physical layer authentication approach on authentication accuracy. Although the CSI dataset represents a harsh industrial environment, the federated learning based physical layer authentication approach achieves more than 90% of authentication accuracy for various scenarios investigated in this research.

Keywords: physical layer, collaborative authentication, security, federated learning, channel state information.

Multicarrier waveforms Modulation In Context Of Vehicular wireless communication Systems

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ABSTRACT

In comparison to present mobile communications systems, modern wireless communication technologies like 5G are anticipated to provide a greater range of scenarios. Vehicle to vehicle communication is one of the key 5G network applications that increases vehicle road safety, improves travel time and traffic, and offers passengers and drivers convenience and comfort. However, enabling high mobility on the air interface is challenging. Multicarrier modulation is thus employed as a multiple access method to improve vehicle communication and address this issue. To solve this issue, multicarrier waveforms must be used, such as orthogonal frequency division multiplexing. The high Out of Band and the high Peak to Average Power Ratio are issues that arise while employing OFDM. Two multicarrier modulations are modelled in this paper. The first is known as orthogonal frequency division multiplexing, and the second is known as filter bank multi-carrier with offset quadrature amplitude modulation. The outcomes of the simulation show that each waveform's BER performance is equal

Keywords: V2V, OFDM, Multicarrier, 5G, FBMC

Improve the FBMC-OQAM optical chain utilizing equalizers with M-BPS

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ABSTRACT

One of the important concerns in 5G and 6G research is “filter bank multi carrier with OQAM”. excellent spectrum efficiency, little side lobe leakage, zero cyclic prefix (CP), and multiphase filter design suit multi-carrier approaches. Large optical fiber network subcarrier designs need FBMC-OQAM. Laser phase noise occurs when the laser output phase drifts over time, may significantly reduce fiber-optic communication system throughput. Space division multiplexing or wavelength division multiplexing using frequency combs may be linked to this degradation in multichannel fiber-optic systems that share lasers. For this research, we employ optical communication system within FBMC OQAM that uses parallel Analysis Filter Banks (AFBs) as “equalizers” receiver to adjust for phase noise, and chromatic dispersion. Modified Blind Phase Search tracks and compensates carrier phase in the received signal after CD compensation equalization. In order to determine how successful these procedures are, they are mathematically and graphically evaluated and simulated. 64-OQAM is used to compare FBMC efficiency across equalizers. We measured performance using BER, OSNR, Q-Factor, and MSE. A comparison was made between MBPS, ISDF with the suggested Parallel Analysis Filter Bank (AFB), and single-tap and multi-tap methods (N=3). The research presents an innovative equalization method that integrates parallel AFB (Analysis Filter Bank) and MBPS (Modified blind phase search) equalization to concurrently mitigate chromatic dispersion (CD) and phase noise (PN) in FBMC-OQAM systems. This approach represents an improvement over standard single-tap equalization,

Keywords: FBMC, phase noise, multi carrier modulation, equalizers, compensation, nonlinear effect

Cyber Warfare Techniques - Status, Challenges and Future trends

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Abstract

The area of cyber warfare is vast, with several subtopics attracting interest from researchers. We start with the obvious fundamental question that is: what is cyber warfare? We compare definitions that already exist to see where there is agreement or disagreement. We notice that there is no commonly recognized definition and that the terms "cyber war" and "cyber warfare" are not properly distinguished.

In order to address these challenges, we present a defining model to help describe both cyber warfare and cyber war. Following that, the paper identifies nine cyber warfare research challenges and reviews current research in each. Finally, we make recommendations for how future initiatives in the field might best advance the subject.

Keywords: Cyber-attack., Cyber Warfare, Cyber War

Cognitive warfare- Statuse, Challenges and Future Trendse

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Abstract

In cognitive warfare, the human brain becomes battleground. The goal is not only to change people's minds, but also to change the way they think and act. If implemented successfully, it shapes and influences the beliefs and behaviors of individuals and groups in favor of the attacker's tactical or strategic goals. In its extreme form, it possesses the power to rip and divide entire societies, so that it no longer possesses the collective will to resist the intentions of its opponents. Adversaries can conquer society without resorting to force or compulsion. Cognitive warfare objectives can be limited to very short time horizons. Or it could be a decades-long strategic campaign. A single campaign could focus on limited goals, namely preventing military exercises from going as planned or forcing changes in public policy. The long-term goal of disrupting an entire community or coalition by raising doubts about governance, undermining democratic processes, inciting civil unrest, or inciting separatist movements, can start several times in a row. This paper presents a NATO military and cognitive cyber security framework for simulating the human cognitive behavior and in the long term capability development, Cognitive Networks (CN) are seen as a promising solution for intelligent, self-learning and reliable networking.

Keywords: (Cognitive warfare, NATO military, cyber security, artificial intelligent, machine learning, Cognitive Networks).

Enhance Channel Selection in Cognitive Radio Networks by using Fuzzy approach

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Abstract

The great increase in devices (laptops, smartphones, etc.) during the last decade that uses wireless communication as communication technology has increased the need for different spectral frequencies, for their use by these devices. This demand has led to a phenomenon called spectrum scarcity. Statistics issued by the Federal Communications Commission (FCC) have shown inefficiency in allocating fixed spectrum. To solve this problem (spectrum scarcity) the concept of cognitive radio is proposed. One of the promising responses to use the available (unused) spectrum is the so-called cognitive radio (CR), which was developed to enable secondary users (SUs) to exploit the spectrum holes in authorized channels. Secondary users should quickly clear the channel and change to another available channel if access to the primary user is sensed. One of the most important measures of the efficiency of spectrum use by secondary users is the continuous reduction of channel exchange.

This paper proposes the use of artificial intelligence algorithms to improve the selection of the best available channels. The metrics to evaluate the artificial intelligence algorithms are channel switching, throughput, and delay time.

The simulations were done using MATLAB Simulator. Neural network algorithms have shown promising results compared to some FIS (TSK, Mamdani). Also, the ANFIS algorithm showed superiority compared to the FIS algorithms in the throughput of data.

Keywords: Cognitive Radio, Channel selection, FIS, ANFIS.

Channel Allocation Approaches Proposed for 5G Cellular Networks: A Review

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Abstract

The cell phone wireless communication infrastructure has undergone a major shift and change over the last few decades in which the generation of cell phone wireless is very rapid fast in terms of speed. Nowadays, even the wired telephone is getting past. There are numerous limitations to explaining the 5G solutions that are used for 5G improvement, but this research provides a general overview of 5G including opportunities, new services, bandwidths, system architecture, multiple access techniques, and modern cellular network design strategies and some of the main and key new technologies that help to develop the system architecture and satisfy the requirements of all consumers who want to communicate sufficiently with technology. This paper discusses fundamentals that have been explored in numerous articles and research papers related and connected to 5G technologies.

Keywords: 5G, 5G System Architecture, Multiple Access techniques

Network Traffic Assignment Model for Vehicle to Vehicle Communication

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Abstract

Autonomous vehicles (AVs) are projected to transform driving attitudes. This sort of vehicle has recently gotten a lot of interest from the media and experts. Every year, millions of car accidents occur throughout the world. Rear-end collisions, side collisions at junctions, and collisions that occur when automobiles change lanes or slide into a lane are among the most dangerous. Avoiding all auto accidents is the goal of traffic safety. To that purpose, major automakers, governments, and universities are developing systems that enable cars to interact with one another and with the surrounding infrastructure (V2V/V2I). Because of their potential to improve road safety, save energy, reduce vehicle emissions, increase road capacity, and stabilize traffic, automated vehicles (AVs) are commonly seen as playing a critical role in future transportation systems. To realize these highly anticipated AV potentials, a thorough study of AV influences on traffic flow is required. This paper examines existing V-involved traffic flow models at various levels of detail in a thorough and methodical manner. To understand recent developments and ultimately inspire new research ideas on this important topic, the advantages and disadvantages of existing models and methodologies are critically addressed, and future research prospects are also presented. People are driven to buy personal AVs for a variety of reasons, including convenience, dependability, affordability, and prestige. The traffic assignment under the user equilibrium (UE) concept, known as network equilibrium, is discussed as one methodological technique for investigating network traffic patterns.

Keywords: Automated vehicles, Traffic assignment model, V2V/V2I, Traffic flow, User equilibrium

The spatial variation of the colon bacteria (Ecoli) in the water of the Mishkab District Center

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ABSTRACT

Escherichia coli (E. coli) is a gram-negative bacterium commonly found in the human intestines, where it typically exists without causing harm or symptoms. However, health issues can arise when certain strains acquire genes that allow them to invade cells, cause damage, or produce toxins within the body. These bacteria can also spread to other areas of the body, leading to complications. The purpose of this study is to investigate the spatial and temporal variations of E. coli concentrations in the water of the Mishkab District, examining potential environmental and seasonal factors that contribute to bacterial proliferation and the associated public health risks. Water samples were collected from 30 different locations across the study area, including the main river (Shatt Al-Mishkhab) and its tributaries. The sampling occurred across four seasons (summer, winter, spring, and autumn), revealing notable seasonal variations in E. coli concentrations, ranging from high to medium and low. The highest concentrations were observed during winter and spring, while summer showed medium to low levels. In autumn, most sites exhibited low concentrations of fecal coliform bacteria, including E. coli.

Keywords: Escherichia coli (E. coli), Gram-negative bacteria, Seasonal water sampling, contaminated River and canals, public health impact.

Numerical Simulation of Sediment transport in the Euphrates River Within Ramadi City, Iraq

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ABSTRACT

The sedimentation and erosion along the river's bed and banks are two major factors affecting the Euphrates River's morphology. Sediment transport could be the primary goal of the design engineer while building a hydraulic structure, such as a dam or irrigation channel. Euphrates River, Iraq's largest, is of great interest due to its strategic location and environmental implications for the design of water resources projects, hydropower, agriculture, and industrial applications. The study of riverbed movement, as well as riverbed features, is thus highly important to lessen issues caused by variations in the morphology of the river. The river reach has been chosen in the province of Al Anbar, located west of Iraq, upstream of the Ramadi barrage. The flow and sediment transport at the river were simulated using the HEC-RAS model, and the model's output was calibrated using data from the field. We discovered a good convergence between them, allowing the model to be applied to predict sedimentation amounts upstream of Ramadi Barrage. According to the model's output, Ramadi Barrage upstream holds onto 2749 tons of sediment every day. The coefficient of determination, R2, between simulated and measured value of sediment transport showed a good agreement when the Engelund-Hansen formula are used with R2 = 0.9877.

Keywords: Euphrates River, Ramadi Barrage, sediment transport, HEC-RAS model

Analysis of heavy elements in Al-Sadeer Stream water

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ABSTRACT

The studies dealt with an environmental evaluation of the characteristics of Al-Sadeer Stream water in order to know its suitability for various uses (drinking water - irrigation - animal drinking). The study relied on the analysis of heavy elements of Al-Sadeer Stream water, including 10 samples from 10 sites and one model from each site. Copper, cadmium, iron, chromium was also analyzed, and then these results were matched with international and Iraqi specifications to find out their suitability for various uses. It dealt with the abstract, the introduction, the problem of the study, its hypothesis, its importance and its limits, while it dealt with an analytical study as well as the qualitative characteristics of Al-Sadeer Stream water, which include (the characteristics of the heavy elements of Al-Sadeer Stream). Evaluation of Al-Sadeer Stream water for various uses, represented by the civil use of drinking water, the agricultural use of irrigation and the drinking of animals (poultry).The study relied mostly on field work by collecting water models and using a set of tools and supplies, a GPS device and a camera, as well as water model analysis devices, as well as the adoption of maps to represent the phenomenon studied .The study has reached some main conclusions, which are that the characteristics of Al-Sadeer Stream vary spatially according to the variation of natural and human conditions. The study also found that Al-Sadeer Stream water varies in its suitability for drinking water and agricultural use according to global and Iraqi environmental determinants and that this variation is spatial.

Keywords: Al-Sidir Creek, Water Quality, Heavy Metals, Environmental Standards, drinking water

Monitoring and Mapping of Batura Glacier in Northern Pakistan's Gilgit Baltistan Region: A Geospatial Approach

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ABSTRACT

Pakistan is home to some of the world's richest natural resources, including glaciers, which are vital assets. To ensure sustainable use, these resources require effective mapping, monitoring, and strategic planning. Modern geospatial technologies such as remote sensing and Geographic Information Systems (GIS) provide efficient and convenient methods for monitoring and mapping key natural resources. The Batura Glacier, one of the major glaciers in Pakistan's Himalayan region, plays a significant role in the region's hydrology. This study used remote sensing and GIS-based techniques to assess changes in Batura Glacier's area following ice melt and to analyze the spatiotemporal dynamics of its snow cover area (SCA) over the past 25 years (1998–2023) during the winter season. By applying the Normalized Difference Snow Index (NDSI) to Landsat satellite imagery from December 1998 to November 2023, the study revealed that the lowest SCA was recorded in December 2008 (39.83 %), while the highest SCA (49.15 %) was observed in November 2013. In conclusion, the use of geospatial technology proved to be highly effective in assessing and monitoring the glaciated areas of Batura Glacier and can be applied to real-time monitoring efforts in similar regions.

Keywords: Geospatial Technology, Batura, Snow Covers Area, NDSI, Landsat, Himalayan Region

Dynamic Analysis of Pore Water Pressure Variation and Stability in Earth Dams During Rapid and Slow Drawdown: Khassa Earth Dam as a Case Study

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ABSTRACT

This study uses static and transient models to investigate the variation of pore water pressure (PWP) along the base of an earthen dam over 30 days. The analysis was performed at four elevations (Y = 10, 20, 30, and 40 m) to capture the pressure distribution throughout the dam body. A detailed finite element mesh was used to ensure highresolution results, with pore pressure variation recorded at ten-time scales, focusing on both rapid and slow drawdown conditions. The rapid drawdown analysis indicated that pore water pressure dissipated rapidly near the top face, resulting in steep hydraulic gradients, large pressure drops near the core of the dam, and the formation of negative pressures downstream. In contrast, slow drawdown showed a more gradual dissipation of pore water pressure, especially at greater depths, driven by soil permeability. Shear strength values increased as pore water pressure dissipated, peaking at 110 m from the top face, where hydraulic gradients were highest. The factor of safety, which was initially 1.4 under steady-state conditions, decreased to 0.9 during rapid drawdown, but increased to 1.5 after 20-30 days as PWP levels stabilized, indicating a restoration of stability. These results underscore the urgent need for controlled drawdown rates to manage PWP dissipation and ensure dam stability, especially in areas with low-permeability soils.

Keywords: Dam Stability, Earth Dam, Finite Element Analysis, Hydraulic Gradient, Pore Water Pressure (PWP); Rapid Drawdown, Safety Factor, Shear Resistance, Slow Drawdown, Soil Permeability.

Analyzing the Effects of Slope and Flow Rate on Fluid Dynamics with Cubic Obstacles in Open Channels

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ABSTRACT

This study investigates the impact of cubic obstacles on the velocity behavior of water flow in open channels under varying conditions. Utilizing three different channel slopes ($\boldsymbol{S} = \mathbf{0}\,^{\circ}$, $\mathbf{1}.\mathbf{02}^{\circ}$, $\boldsymbol{and}\ \mathbf{1}.\mathbf{4}\,^{\circ}$) and three distinct flow rates ($\boldsymbol{Q} = \mathbf{0}.\mathbf{0035}\ \boldsymbol{m3/sec}$, $\boldsymbol{Q} = \mathbf{0}.\mathbf{004}\ \boldsymbol{m3/sec}$, $\boldsymbol{and}\ \boldsymbol{Q} = \mathbf{0}.\mathbf{0045}\ \boldsymbol{m3/sec}$) the research focuses on the dynamics of flow separation and reattachment induced by the presence of obstacles. The methodology involves both experimental works and computational fluid dynamics simulations to analyze the flow patterns, drag forces, and the resulting velocity profiles. Results reveal significant alterations in streamlines, with the cubic obstacles affecting not only the velocity distribution but also the overall stability of the flow. The findings highlight the critical role of slope and flow rate in influencing the interaction between fluid dynamics and channel geometry, providing insights for optimizing the design and functionality of open channels in urban drainage systems.

Keywords: Open channel flow, cubic obstacles, flow separation and reattachment, velocity distribution, drag force, channel slope, flow rates computational fluid dynamics.

Limiting Field Strength and Electron Transport Coefficients of TMS vapor using Boltzmann Equation Method

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Abstract

The electron transport parameters in TMS vapor were calculated by using two-term solution of Boltzmann equation method for the range E/N of 1-1000 Td, (1Td= 10-17 V.cm2) at temperature 300 K. The effect of reduced field strength (E/N) on swarm parameters are studied. Calculations are in best agreement compare with previous experimental and theoretical values. Negative differential conductivity (NDC) regions have been found for each case. The EEDF, which represents the distribution of energy for electrons, was found to be non-maxwellian for the range E/N> 50 Td, at high electric field due to inelastic collision the EEDF shape tends to convex. Furthermore, limiting field strength (E/N)lim and energy lost in various inelastic collision types were also computed and analyzed over a wide range of E/N for the first time. Many industrial processes and applications might benefit from TMS vapor, particularly plasma-assisted thin-film deposition.

Keywords: TMS, dielectric strength, electron swarm coefficients, cross-section, Boltzmann equation, plasma properties.

Radiological assessment of radon and thoron concentration and its radionuclides daughters of the smoke Hookah using RAD-7 and estimation its health risks

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Abstract

Concentration of Radon/Thoron and their radionuclide progenies have been evaluated from the smoke of Hookah inside a fabricated chamber using passive detector of RAD-7. The results provided that the radionuclides of radon and thoron gases increase with the increasing of smoke density relativity. The accumulated alpha particles that are emits from the radionuclides of both radioactive gases variable with the rate of indoor air moving (ventilation rate). So, highly deposition of alpha particles on the trachea and lungs make high radiation -tissue damage for the exposed people

Keywords: radon, thoron, hookah, RAD-7, Po-218

Maximizing Oil Well Production in the Buzurgan Oil Field with an Optimized Gas Lift: A Simulation Analysis Utilizing PROSPER

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Abstract

As oil wells age, reservoir pressure decreases, impacting natural flow. The study aims to maximize oil production in an aging oil well using an optimized gas lift technique, focusing on efficiency, stability, and reservoir management. With 1.3 trillion barrels of proven reserves, crude oil remains crucial for industrialized nations. Artificial lift, especially gas lift, is employed when natural pressure becomes inadequate. Gas lift mimics natural flow, effectively boosting fluid transport. Engineers deploy strategies to sustain output, considering reservoir characteristics and facility constraints. The gas lift compressor aerates crude oil, reducing fluid density in the tubing, thereby increasing well output. The goal of the study was to increase the amount of oil produced from an aged oil well (MB21), whose productivity was dropping because of large water cuts of up to 25% and a diminishing reservoir pressure. To increase the production of this well, we have used the gas lift technique. The oil production rate for well (MB21) increased from 0 STB/day to 359.2 STB/day using the gas lift technique and an injection rate of 8 MMscf/day, by lowering the fluid density in the wellbore, the bottom hole flowing pressure (BHFP) decreases, allowing the reservoir pressure to overcome it and push fluids to the surface . This well was successfully "reborn" by the gas lift technique, which turned them from being non-producing oil wells back into active ones. The outcomes show how effectively the gas lift optimization strategy works to increase production from aging oil wells that are experiencing significant water cuts and diminishing reservoir pressure. This method worked successfully for bringing inactive wells back to life and increasing their useful life.

Keywords: Gas lift, Buzurgan Oil Field, PROSPER software

Application of the TOPSIS Algorithm in Screening EOR Methods for Iraq Oil Reservoirs

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Abstract

As global oil production declines and many reservoirs reach advanced stages, employing enhanced oil recovery (EOR) techniques becomes essential for maintaining production. Selecting the most effective EOR method requires a thorough screening process. This study introduces a new EOR screening method using the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) algorithm. Nine input criteria—API Gravity, Oil Saturation, Formation Type, Net Thickness, Viscosity, Permeability, Temperature, Porosity, and Depth—are used to evaluate 16 potential EOR methods, including Miscible CO2, Miscible Hydrocarbon, Miscible WAG, Miscible Nitrogen, Immiscible Nitrogen, Immiscible CO2, Immiscible Hydrocarbon, Immiscible Hydrocarbon + WAG, Polymer, Alkaline Surfactant Polymer (ASP), Surfactant + P/A, Combustion, Steam, Hot Water, and Miscible Hydrocarbon. The TOPSIS algorithm is applied manually to screen 12 oil reservoirs in Iraq and determine the most suitable EOR approach. Surfactant + Polymer/Alkaline emerged as the top candidate with a weight of 50%, followed by Immiscible CO2 injection with a weight of 25%., while steam injection was the least favorable. The TOPSIS-based evaluation aids in identifying the best EOR methods for Iraq's oil fields.

Keywords: TOPSIS, EOR, Iraq reservoirs, Screening criteria, Miscible CO2, Reservoir characteristics

Design of a Nanorobots for an Early Detection of Alzhimer's Disease

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Abstract

Alzheimer's disease is characterized by two Key pathophysiological features, which are neurofibrillary tangles and senile plaques. In this study, we propose a novel nanorobot model aimed at the early detection of Alzheimer's disease. As an initial step, we conducted an experimental investigation into the polymorphism of the TREM2 gene's exons to determine allelic and genotypic frequencies, highlighting its correlation with Alzheimer's disease. Our case-control study involved a sample of 124 Tunisian subjects, divided into two groups: 64 patients diag- nosed with Alzheimer's and 60 age-matched controls, averaging 67 years. Each participant underwent a comprehensive neurolog- ical examination, neuropsychological assessment, brain imaging, and molecular analysis. For the genetic component of our study, we employed PCR and sequencing techniques, identifying the rs2234253 variant in exon 2 and a novel intronic variant in intron 4. Our findings indicate that the TREM2 gene significantly contributes to the risk of developing Alzheimer's disease. Based on these results, we present our proposed nanorobot model designed for the early detection of this condition, detailing its potential applications in monitoring and diagnosis.

Keywords: Alzheimer's disease, gene mutation, nanorobots, data transfer, biocompatibility, human safety.

Some Design Considerations of Runoff Farming in Erbil Plain and Its Peripheral Areas

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Abstract

Water harvesting has been recognized as a proxy for ensuring water availability for improving crop production in regions with low rainfall and frequent drought. Therefore, the current study was initiated to obtain some design considerations for runoff harvesting through generation of continuous surfaces for ratio of catchment to cultivated area under winter cropping over Erbil and its peripheral areas. To target the above objectives, recorded data were obtained on rainfall data and other meteorological elements from 19 meteorological stations spread over the study area covering a time span of 25 years (1998-2022). After identifying the hydrologic soil groups, runoff coefficient, crop water demand over the study area and deriving the design rainfall at each station, special formula was applied to determine the ratio of catchment to cultivated area(C:CA) at different locations under different land slopes. Thereafter, continuous surfaces were generated for C:CA using best interpolation method using the results which indicated that annual rainfall varies greatly in space exhibiting high spatial variability and winter cropping is subjected to dry spells during the spring season. The ratio of catchment to cultivated area varied from a minimum of -3.18:1 to a maximum of 28.73:1 and the most of subareas have a ratio of less than 5:1. Moreover, this ratio is significantly affected by land slope and tends to increase gradually from north to south and from east to west. It is recommended to practice the runoff farming on slopes in the range of 6-10% to lessen scarified lands and to control erosion.

Keywords: Erbil plain, Design rainfall, ratio of catchment to cultivated area, runoff farming.

The apsidal motion and O-C plot of V2815 Orion Algol Binary Stars

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ABSTRACT

The initial photometric light curve investigation was focused on the eccentric orbit eclipsing binary V2815 Orion, which was recently discovered. The light curves for the B, V, and R systems were identified, and new minimum times (TOM) were calculated. The analysis was conducted with the aid of the Wilson-Devinney (W-D) program. The mass-luminosity relationship for main sequence stars was employed to determine the absolute parameter. Apsidal motion elements were calculated, and the O-C plot of V2815 Ori was assessed using all legitimate minimum timings. In order to ascertain the apsidal motion parameters (U, Ps, ω0, ω), as well as the variation in the apsidal motion period, we analyze the rate of variation over time (dP/dt), orbital characteristics of the third stars (A3, M3, f(m3), P3), and light curves from the O-C graphs.

Keywords: Binaries stars; Light curve; Light photometric; Roche loop; O-C plot; Apsidal motion

Effects of static magnetic field on whole blood transmittance: In vivo

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Abstract

In this work, transmission behavior of whole blood was investigated in-vivo experiments using spectrophotometer. Female albino rats were exposed to 2.4mT of static magnetic field for a period of four selective weeks (1hr, 2hrs, 4hrs, 6hrs and 8hrs per day). The optical properties of blood were plotted between the incident wavelength and the transmission percentage of photon through 1ml of blood withdrawn from animals at the end the exposure. One hour exposure for 1 week increased the transmittance percentage up to 50% and shifted the peak with about 20nm. At the 4hrs of exposure per day, only four weeks of exposed animals sifted the transmission curve upward. A similar variation observed due to the 6hrs and 8hrs/day exposure during 3 weeks. Therefore, other exposure periods declined the transmittance line below the control value. The 8hrs/day post exposure changed the curve line comparable to the exposed curve line except the 3 weeks exposure in which both exposure and post exposure curve are aligned up with the same scale. We believe that the reason for shifting transmission curves is due to change in distribution pattern of the main blood cells as they respond to the magnetic field.

Keywords: Static magnetic field; Spectrophotometer; Transmittance

PHYSIOTHERAPY ESTIMATION FOR DISABLED INDIVIDUALS IN ERBIL CITY

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Abstract

According to the 2023 WHO report, Iraq has over three million disabled people. Mines, terrorist attacks, unexploded bombs from previous wars, and coalition weapons pollution cause abnormal births and disabilities in Iraq. Medical errors, senility, chronic illnesses, and traffic accidents cause other impairments. These factors, along with the aging population and non-communicable diseases, increase disability rates. We conducted the study in Erbil, Kurdistan Region, Iraq, to investigate the advantages and disadvantages of physical therapy for individuals with disabilities. The study involves creating and distributing a questionnaire to Erbil City physiotherapy centers. The questionnaire sought to identify disability causes, disabled people's needs, and their physiotherapy experiences. The study provides important insights into the difficulties experienced by disabled people in Iraq and the efficacy of physiotherapy as a rehabilitative treatment by gathering data from a broad set of participants. A 17-item accessibility questionnaire for physical rehabilitation was developed, and its psychometric properties were evaluated using a study sample of 54 individuals with disabilities who completed the questionnaire. All the patients had positive responses to the physiotherapy sessions, but the stage of the improvements in the disability was varied according to the situation. The findings of this study can provide healthcare professionals, policymakers, and rehabilitation specialists in Iraq and other similar contexts with information about the needs and preferences of disabled people, enabling the development of more focused and successful physiotherapy interventions to enhance this population's quality of life.

Keywords: Physiotherapy; Paralysis; Disability; Rehabilitation Robot; Questionnaire; Erbil.

Finite Element Analysis of a Hybrid Linear Actuators for a Resedential Elevator System

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Abstract

Hybrid linear actuators (HLAs) are versatile devices capable of high ratio extensions. Although HLAs have been utilized in some industries, civilian applications are still limited. In this paper, an HLA is presented as the main actuator for a home elevator system, instead of traditional actuators. The application focuses on the employment of HLAs for operating a two- or three-floor residential elevator for homes in the Iraqi Kurdistan region. A design of the elevator system is proposed and then tested through Finite Element Analysis (FEA). The results of the analysis indicated the ability of the actuator to withstand the weight of subjects and goods (400 Kg) and the ability of the guard cage to withstand forces of over 980N. The use of HLAs as an alternative actuator provides a simpler and low-cost alternative to current residential elevator systems.

Keywords: Hybrid Linear Actuators (HLAs), Finite Element Analysis (FEA), Civilian applications

Investigation of Tensile Properties in SiC-Dispersed Friction Welded 6063 Aluminum Alloy Joints

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Abstract

The most common issue encountered in engineering assemblies is reducing the mechanical and metallurgical properties of joints, which reduces the efficiency of the weldment machining parts. Therefore, the aim of this study is to improve the tensile strength of friction welded joints reinforced with aluminum alloy with SiC particles (AA 6063-SiC). Thus, the Al-SiC composite surface was manufactured by adding the SiC particles at different volume percentage into the AA 6063 joint interface through the drilled holes. The obtained tensile test results showed that the ultimate tensile strength increased with increasing the volume percent of SiC particles until 9%, which was the maximum attained value (199MPa). Generally, it was revealed that the tensile strength of friction welded 6063 aluminum alloy with added composite particles has been improved compared to friction welded material without SiC particles. However, the tensile strength of both frictions welded joints with and without adding SiC was lower than the tensile strength of base metal (without weld and dispersing SiC).

Keywords: SiC- reinforcement, Friction Welding, Aluminum Alloy, Tensile Strength.

New Parameters on the Conjugate Gradient Method Based on the Quadratic Model

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Abstract

In the optimization of conjugate gradient method, as is well-known, the conjugacy formula plays a central role when study this methods. In this paper, we derive the new parameter based on the quadratic model and the conjugacy condition. Effectiveness of formula by using objective function information can be improved by suitable conjugate gradient methods. Under appropriate conditions, we prove that the proposed method is globally convergent Comparison to conjugate gradient method method, the proposed algorithm shows significant improvements in numerical results.

Keywords: Conjugate gradient method, Parameter on the conjugate gradient, Convergence property. Numerical results.

Applying Pourreza Transform to Solve Volterra Integro-Differential Equations of the 2 nd Kind

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Abstract

This paper's primary goal is to investigate and resolve the linear Volterra integro-differential equations of 2 nd kind with a convolution kernel. Here we present the HY transform called the Pourreza transform for determining the resolution of linear Volterra integro-differential equation of the 2 nd kind. One can represent in integral form a variety of subjects, including electromagnetic, radio physics, coagulation, meteorology, and population dynamics: biotechnology, radiation transfer, superfluidity, mining engineering, and acoustic engineering. The Pourreza transform has been applied to address several numerical problems; it can be converted into algebraic equations and solved in a few steps, demonstrating its versatility. Numerical problem results show how successful the Pourreza transform is in getting the accurate solution of linear Volterra integro-differential equation of 2 nd kind.

Keywords: Convolution, Inverse Pourreza Transform, Pourreza Transform, olterra Integro-Differential Equation.

Solving Linear Fractional Programming Problems Via Revised Simplex Method

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Abstract

When using fractional programming, the numerator to denominator ratio serves as the goal function. Due to the challenges' application in finance and Business Scheduling, manufacturing scheduling., hospital and health care preparation, and other areas, there has been a great deal of study and interest in these kinds of issues. Under a set of linear constraints, linear fractional programming, or LFP, aims to maximise a quotient of two linear functions. Many methods for resolving linear fractional programming issues possessed been developed in the past few years. In this research, we defined the updated simplex technique, used it to resolve linear fractional programming issues, and proposed an algorithm for it. We also employed the modified method to solve LFP problems. To demonstrate the effectiveness of the approach, many numerical cases are resolved, shown, and the outcomes are compared. Results from the updated simplex approach were shown to be more rapid and efficient than those from the modified method.

Keywords: fractional programming problem, modified simplex method, revised method.

Extension of Time Claim Management Using Building Information Modeling

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Abstract

Delays are an integral part of construction project and result in a multitude of adverse effects on project performance leading to dismays among the stakeholders. In the case of delays caused by reasons beyond the construction contractor's control, the contractor is entitled to an Extension of Time (EOT) after the approval by the stakeholders involved. EOT claim generation is a lengthy process that involves specialized skills and knowledge of construction contracts. Building Information Modelling (BIM) is a well-established field at the crossroads of simulation, modelling and analysis of construction projects. This study focused on developing a software solution for EOT claim management, capable of calculating delays and EOT entitlement to contractors as per the 'As Planned vs. As Built' method of delay analysis. The developed tool allows the calculation of EOT delay along with its visualization in 3D and 4D environments. The approach aimed at digitalizing the process of EOT claim management by minimizing human efforts.

Keywords: Building Information Modelling (BIM), Digitization, EOT Claim Management, 3D Simulation

Improvement Level of Service and Capacity for Shorish Road in Erbil City Using HCS7 and HCM2010

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ABSTRACT

The core of highway design, planning, management, traffic control, capacity forecasting, and determining level of service is built on understanding the relationships between speed, flow, and density factors. The classification of urban streets into a number of street classes and speeds into different levels of service categories is well defined in HCM 2010 and well applicable in homogenous traffic flow conditions. The Kurdistan Region is situated in northern Iraq, with Erbil serving as its capital city. This study attempted to find LOS using HCM 2010 method and Highway Capacity Software 7 (HCS7) then compares these two models. Methodology that is used in this research is to apply HCM 2010 method for Shorash street in Erbil city. Also, two methods were utilized that are video photography and moving vehicles method. The speed ranges for urban streets in Erbil city context need to be defined according to demand on the roads because of high demand on this road. clarify is to acquire speed data using a video camera and how useful it is in determining the speed ranges of LOS groups that apply to the current situation. The LOS that was obtained by video camera technique and HCS7 was the same group, LOS = F. The results show, factors including traffic density, speed limits, the frequency of crossings, the existence of bus stops, onstreet parking, roadside commercial activity, and pedestrian activity have a significant impact on service levels for main roads connected to 60, 40, 30, 100 m ring road in the city.

Keywords: Peak-hour factor (PHF), Capacity and Level of Service (LOS).

Mechanical properties and durability of asphalt–concrete mixture modified with recycled concrete and porcelain aggregates

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ABSTRACT

Asphalt–concrete mixtures have various applications in engineering construction projects, with their performance influenced by external, internal, and environmental factors. Several studies have focused on modifying their required properties and performance. Researchers have utilized recycled concrete as an additive or replacement for natural aggregate in asphalt and cement concrete mixtures, yielding acceptable results. This research introduces another waste construction material, porcelain waste, as aggregates replacing recycled concrete aggregates in different proportions to modify the mechanical properties and durability of a binder–asphalt concrete mixture. This is an additional effort to save the environment from different waste construction materials. Following the Marshall requirements, the properties of the samples with optimized quantities were investigated using wheel trucks and Bohme abrasion tests. The modified mixture exhibited an increase in bulk specific gravity by 6% to 2.24, enhanced the Marshall flow from 3.5 to 4.6 mm, and an increase in the stability by 5%, yielding the highest value of 33 kN. Subsequently, the mechanical properties and durability of the mixtures were affected with an increase in the rutting resistance. The highest abrasion resistance and service life were obtained when 25% porcelain replaced the recycled concrete aggregates, but the mixture became more temperature susceptibile. Therefore, this study achieved economical, environmentally-friendly, and safe pavements.

Keywords: mechanical property, abrasion resistance, rutting resistance, porcelain waste, asphalt–concrete mixture, Marshall test