IEEE 3rd International Conference on Signal, Control and Communication

SCC 2023

December 1-3, 2023 Hammamet, Tunisia

Abstracts of regular Papers

Technical Session 1

Friday, December 1, 2023 (11:30 - 12:30)

Topic 1: Control Systems

Amphitheater Paradis I Google Meet Link **meet.google.com/xdz-xnqb-esd**

Paper ID 12
Paper Title: FOPID corrector tuning with optimization algorithms applied on high order systems
Authors: Bilel Kanzari Adel Taieb, Abdelkader Chaari
Abstract
In order to stabilize a particular class of higher order systems, this work contrasts algorithmic optimization with analytical/classical Ziegler-Nichols techniques for optimizing the fractional order FOPID controller. The technique is based on extending Zeigler-Nichol's methods to assimilate the open loop response of a higher order system to a first order system with delay. The parameters of the fractional FOPID correctors will then be ascertained. Then, optimization methods such as Genetic Algorithm (GA), Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO), and Ant Colony Optimization (ACO) were used. In order to compare the simulated results, nonintrusive performance indices based on integral errors (ITAE) were developed. These indices were used to analyze and choose the best performance. A numerical simulation must ensure and validate the nearly zero overshoot and the stabilization time. In order to verify the robustness of the fractional regulator as optimized by the most suitable approach, a random variance will be applied to the parameters of the selected process.

Paper ID 27
Paper Title: Fuzzy Fractional PI Controller for uncertain Fractional System**.**
Authors: Ramzi Bouzaiene, Sami Hafsi, Faouzi Bouani
Abstract
In this paper, we are interested in fuzzy fractional and classical PI controllers for linear fractional systems subject to uncertain parameters. In our work, we have developed a fuzzy supervisor to adjust, online, the parameters of the fractional PI controller. Performance criteria such as response and rise times and the control sequence variance are analyzed for the proposed control structure and compared with those provided by classical PI controller. Disturbances are also added to the outputs of the chosen systems to test the capacity of the proposed controller in the face of these new situations. Besides the nominal model, two other operating points are considered where the system parameters change by an increase of 20% or a decrease with 20%. Simulation results are presented that show the efficiency of the fuzzy PI controller compared to conventional PI in terms of the response time at 5%, the rise time, and the control variance.

Paper ID 99
Paper Title: Design of Robust PID Controllers Based on the Scenario Approach
Authors: Ahcene Triki, Ahmed Maidi and Jean-Pierre Corriou
Abstract
In the present paper, the scenario-based optimization approach is used to design a robust controller for linear uncertain systems with bounded parameter uncertainties. The controller structure is assumed to be known. The design methodology is based on the optimization of the integral squared error. Thus, using the Laplace transform properties, the assumed performance

index is expressed as a function of the controller parameters and the system uncertainties, and the design problem is written as a robust semi-infinite optimization problem. Then, the scenario approach, which is based on random sampling of constraints, is applied to convert the NP-hard semi-infinite optimization problem into a standard finite nonlinear programming problem. The resulting non-linear optimization problem is then solved by means of a stochastic optimization method. The proposed design approach is illustrated in three application examples by considering both constrained and unconstrained control parameters cases.

Topic 2: Electronics and Communication Engineering

Room Paradis II Google Meet Link **meet.google.com/mdk-btex-cmr**

Paper ID 04
Paper Title: A Novel CMOS High Frequency Frequency Divider
Authors: Yahya Ben Jaoued, Lazhar Fekih-Ahmed and Faouzi Bouani
Abstract
We propose in this paper an ultra-high speed buffer-latch divider. The use of a single buffer instead of a D-latch reduces the equivalent capacitance, and hence increases the speed of the divider. The free-running divider frequency is almost twice as that of the conventional DFF divider. Moreover, the new divider consumes almost the same power as the conventional one, realizing a good compromise between power and speed. Analytical expressions of the locking range, amplitude, and frequency are given, and validated using simulations.

Paper ID 85
Paper Title: Design of Compact Dual-Band Smartwatch Antenna for Biomedical Applications
Authors: Rania Rabhi, Hamid Akbari-Chelaresi, Ali Gharsallah and Omar M. Ramahi
Abstract
A circular dual-band smartwatch antenna operating at the 2.4 GHz Wi-Fi/BT and 4.7 GHz (5G) frequency bands is presented and studied in this work. The proposed antenna was analyzed both in free space and when it was worn on a human hand. Furthermore, the impact of smartwatch operation on antenna performance was also investigated. The antenna demonstrated high and stable performance in all scenarios. The specific absorption rate (SAR) was also analyzed for health risk concerns, and the obtained values ensure the wearer's safety. Ultimately, the dual-band antenna proves to be a promising candidate for biomedical applications.

Paper ID 16
Paper Title: On The Performance of Beamforming Techniques Based On 3D Predefined Codebook Designs in 3GPP Mobile Communication Systems
Authors: Sameh Mabrouki, Iyad Dayoub and Marion Berbineau
Abstract
The next-generation wireless technology is meant to deliver more connectivity, higher data rates, reliability, massive network capacity, higher performance, and less delay. The millimeter-wave bands are considered as a solution that gives new facilities with a tremendous amount of spectrum to the fifth generation and beyond communications. However, the path loss increases significantly with the mmWave frequencies. To compensate the path loss, the transmit power should be increased by using directional beamforming techniques. Recently, many codebook designs and beam selection methods have been proposed to achieve an efficient beamforming process. In this paper, we will analyze the impact of the codebook design and the selection technique on the performance of the 3GPP mobile communication systems in terms of spectral efficiency and complexity. Simulation results show that an increase in the size of the codebook

can improve the spectral efficiency with higher training overhead. Moreover, the local search technique can achieve comparable data throughput to the exhaustive search with lower complexity.

Topic 3: Computational Intelligence and Machine Learning

Room Firdaws Google Meet Link **meet.google.com/bpv-wyuo-fnf**

Paper ID 03
Paper Title: Gastrointestinal Endoscopic Image Classification using Transfer Learning.
Author: Surajsingh Dookhee
Abstract
The diagnosis of gastrointestinal abnormalities is time-consuming as each wireless capsule endoscopy examination produces an extensive number of images of the digestive tract. In this context, the use of deep learning for medical image classification can be an efficient solution to detect early signs of intestinal diseases such as polyps and ulcerative colitis. This can also be helpful to enhance patients' treatment progress and make informed decisions about surgical planning. However, most studies with significant performance do not generalize well. It is therefore necessary to propose a method that shows a higher validation accuracy than training accuracy. In this study, the performance of 11 pre-trained convolutional neural networks was evaluated on the Kvasir v2 dataset to classify 8,000 endoscopic images into 8 classes. Data augmentation technique was applied to increase the diversity of the images, and results showed that DenseNet169 achieved the highest accuracy of 87.25% and F1-score of 0.87 when trained with Adam optimizer. The proposed method generalizes well on unseen data and could be used to improve the task of medical professionals and optimally monitor abnormalities.

Paper ID 34
Paper Title: Automatic Breast Cancer Exploration using Pre-trained deep Convolutional Neural Networks (CNNs)
Authors: Marwa NAAS, Hiba Mzoughi, Ines Njeh and Mohamed Ben Slima
Abstract
Breast cancer, one of the most common types of cancer among women, has seen an increase in incidence and mortality rates over the years. Its development typically takes several months or even years, underscoring the importance of early diagnosis for effective treatment and improved outcomes. In this paper, using the concept of transfer learning, we present a novel Deep Learning (DL) framework for breast cancer classification using ultrasound (US) images. The proposed framework investigates several pre-trained Convolutional Neural Networks (CNNs) on the large-scale ImagesNet dataset, including Residual Networks101, AlexNet, Inception-ResNetv2, and Inception_v3. Various metrics, such as accuracy, f1_measure, Kappa, and Roc_area, have been used for performance evaluation of the studied transfer-learning approaches. Simulation results, using the publicly available BUSI dataset, reveal that ResNet 101 outperforms the other tested DL networks, achieving an overall accuracy of 0.948 over the testing dataset. Even with a small dataset, the proposed method delivers competitive results.

Paper ID 44
Paper Title: Optimization Techniques for Indoor Localization: A Multi-Objective Approach to Sampling Time and Error Rate Trade-off
Authors: Hamaad Rafique, Davide Patti, Maurizio Palesi, Gaetano Carmelo La Delfa and Vincenzo Catania

Abstract
Magnetic fingerprint-based indoor localization systems are a promising alternative to GPS in indoor environments by using magnetic fields (MFs) to determine accurate indoor locations. However, the optimal number of MFs required for precise location prediction on the client side (CS), i.e., mobile phone, remains a critical yet unanswered question. Hence, resource constrained devices face limitations in terms of computational power and energy supply. Therefore, this study aims to optimize prediction error and prediction time at CS with minimal MF samples during the online location prediction phase. This study tackles this challenge by employing efficient clustering techniques and machine learning classifiers to minimize prediction error and prediction time on client devices using multi-object optimization instead of single-objective optimization. Our research findings reveal an optimal sample size of 14 per second that provides an ideal balance, offering precise accuracy while reducing the computational burden and energy consumption, thus contributing to the advancement of efficient indoor positioning systems.

Technical Session 2

Friday, December 1, 2023 (14:00 - 16:00)

Topic 4: Control Systems

Amphitheater Paradis I **Google Meet Link** **meet.google.com/fpv-pymk-vzr**

Paper ID 115
Paper Title: Plug-and-Play MARL for SoC and Power Balance Regulation of Heterogeneous BESSs.
Authors: Mudhafar A. H. Al-Saadi and Michael Short
Abstract
Intelligent management of power flow and storage balance has proven its worth in supporting economic, sustainable operation of microgrids powered mainly by intermittent renewable energy resources. In particular, the introduction of Multi-Agent Reinforcement Learning (MARL) to solve power management and storage balance problems has been very successful. MARL primary-secondary control was the subject of a recent application in solving power storage flow problems in battery-based micro- and smart-grids, focusing upon vehicle-to-grid applications under realistic environmental considerations such as infrastructural influences. Such influences can worsen the accuracy of plug-and-play batteries' charge-discharge synchronization and hence control stabilization, power flow balance, batteries' health/life, and energy efficiency. This paper proposes a solution to this issue in a DC autonomous microgrid with multiple, heterogeneous batteries. Multiagent-neighbor-to-neighbor information is exploited to enhance the real-time balance of the load participation, and a real-time decentralized infrastructure compensation and power flow organization consumption/loss is established to compensate for infrastructural/environmental influence on the control. Moreover, implementation in a realtime economic sustainable participation policy on each BESS in a test microgrid is explored. The results verify improved synchronization of the batteries' power flow with reduced plugand-play time by (4.16%), enhanced output voltage balance by (2.76-8%), reduced power consumption by (1.908-2.94%), improved power flow balance by (2.765-6.486%), and better power flow efficiency by (0.9196-2.626%) when compared to a baseline MARL implementation.

Paper ID 49
Paper Title: Design of a low-cost IoT-based wearable system for cardiovascular disease detection and monitoring in Rwanda.
Authors: Kellen Sumwiza, Celestin Twizere, Gerard Rushingabigwi, Pierre Bakunzibake, Farian S. Ishengoma
Abstract
This paper addresses the problem of inadequate and costly cardiovascular disease monitoring in lowand middle-income countries, such as Rwanda. The proposed solution is an innovative, low-cost Internet of Things-based wearable system that enables non-invasive monitoring of patients' health. This wearable sensor device measures heart rate, blood pressure, and blood oxygen saturation levels, providing real-time data through wireless transmission to a mobile application, which is further sent over WiFi for storage. When the data deviates from predefined thresholds, it triggers realtime alerts, connecting patients with the appropriate medical support. The system's primary objectives are to enhance affordability, accessibility, and energy efficiency while reducing treatment delays for cardiac patients. This technology has the potential to make a significant impact on healthcare in low- and middle-income nations by offering real-time, costeffective care in patients' homes. The hardware components, including an OLED 0.93 display module, Arduino (NODE MCU V3) as the central processing unit, and the MAX30102 sensor, provide accurate data at a total cost of approximately 23.11.

Paper ID 111
Paper Title: Robust Sliding Mode Control of Uncertain Actuated Exoskeleton Arm Subjected to External Disturbances.
Authors: Mouna Dali Hassen, Nasreddine Bouguila, Hassani Messaoud
Abstract
Uncertain robotic manipulator systems, known for their high nonlinearities, unmodeled dynamics, and uncertainties, are the subject of this paper. Based on the terminal sliding mode control algorithm and its nonsingular design method, a new robust control scheme is introduced to ensure fast and finite time convergence to the desired state. The upper bounds of unknown system uncertainties are estimated using adaptive control. The stability of the proposed control strategy is confirmed by the Lyapunov theory, and its effectiveness is tested on a two-degrees-of-freedom robotic manipulator. Robustness and rapid convergence, as well as reducing the controller's high-frequency commutation effect, are proved.

Paper ID 55
Paper Title: Fuzzy Control of Mobile Robot Speed for Safe and Adaptive Navigation.
Authors: Ahlem Maghzaoui, Emna Aridhi, Abdelkader Mami
Abstract
The present paper employs fuzzy logic to control the speed of a mobile robot to ensure its safe and efficient navigation in complex and dynamic environments. We discussed the main components of the fuzzy control system, including fuzzification, inference rules, and defuzzification concerning the dynamic, kinematic, and topography models of the robot. The simulation results show the effectiveness of the proposed fuzzy controller in ensuring adaptive and collision-free robot navigation, contributing then to the advancement of intelligent robots and their use in diverse applications.

Paper ID 56
Paper Title: RISE control of Patient-Upper-Limb-Exoskeleton for Passive Rehabilitation.
Authors: Afef Hfaiedh, Nahla Khraief, Safiya Belghith

Abstract
In this paper, we propose a robust passive rehabilitation control approach. The main objective of this study is to control the flexion and extension motions of both the shoulder and elbow joints. The system is composed of both the patient upper-limb (PUL) model and the two degrees of freedom (2-DoF) exoskeleton. The proposed control deals with disturbances and bounded dynamic uncertainties of the nonlinear considered system. The Lyapunov theory is used to proof the stability of the closed-loop system. Simulations were carried out to evaluate the effectiveness of the proposed controller in accurately tracking desired passive arm movements. A comparative study is conducted to evaluate the performance of the proposed schema in comparison to the computed torque (CT) control.

Paper ID 58
Paper Title: Modeling and speed control of a DC motor using an FPGA circuit for a small robotic prosthesis.
Authors: Emna Aridhi, Kaouther Laabidi, Abdelkader Mami
Abstract
Field Programmable Gate Arrays (FPGA) circuits are characterized by low consumption and rapid response. For this reason, they present an attractive solution to design and control small autonomous prostheses used to recover lost mobility. These prostheses are essentiall1y based on DC motors. In the present paper, we perform a hardware design using the HDL (Hardware Description Language) Coder Tool of Matlab and implement it on a Xilinx Spartan 3A/3AN FPGA board. The design includes a DC motor model and a Proportional Integrator (PI) controller that determines the speed control signal, which is generated then by the FPGA through an integrated digital-to-analog converter. The simulation and implementation results show that the hardware design allows for reaching the desired speed and generating the corresponding control and pulse width modulation (PWM) signals that supply the motor.

Topic 5: Electronics and Communication Engineering

Room Paradis II **Google Meet Link** **meet.google.com/xoz-surr-xxo**

Paper ID 26
Paper Title: Refinement of the Side Information of Distributed Video Coding with Deep Learning
Authors: Djamel Eddine Boudechiche and Said Benierbah
Abstract
Due to the simplicity of its encoder, distributed video coding (DVC) is a very promising solution for wireless applications. The quality of the side information (SI) produced by the decoder has a significant impact on how effectively a DVC system works. Motion-compensated temporal interpolation of nearby reference frames is a popular method for creating and refining SI. In this work, we introduce a method for refining SI, after partial decoding, using deep neural networks. Specifically, we used a UNet model that exploits the partially decoded data to improve SI for the remaining decoding operations. After decoding the DC band, we exploited it to improve the SI frames in order to provide new ones that are more similar to the coded Wyner-Ziv frame. The proposed method can enhance the rate-distortion performance of DVC, according to the test results.

Paper ID 53
Paper Title: Underwater Acoustic Channel Enhancement based on Diversity and Coding.
Authors: Bara'ah T. Hawari, Aser M. Matarneh and Saqer S. Alja'afreh
Abstract:
In this paper, diversity techniques combined with the convolutional coding technique will be investigated in an underwater acoustic (UWA) environment. The proposed solution aims to mitigate the severity of UWA, leading to a reliable communication system suitable for many applications. The analysis based on the Signal to Noise Ratio (SNR) and Bit Error Rate (BER) to build a robust communication link is introduced using both modulation techniques Quadrature Phase Shift Keying modulation (QPSK) and 16-Quadrature Amplitude Modulation (16- QAM). The results show that at 10-5 BER, coded maximal ratio combining (MRC) achieves a 5.5 dB gain compared to selection combining (SC), and an approximately 16 dB gain is achieved over the uncoded and nondiversity curves.

Paper ID 57
Paper Title: Timestamp Accuracy of 10BASE-T1L for TSN Applications.
Authors: Kilian Brunner Luis Da Silva Miranda and Martin Ostertag
Abstract
Time Sensitive Networking (TSN) is a technology for deterministic networking that constantly gains momentum. Precise time synchronization is a prerequisite for TSN systems. This paper presents results of research on timestamping accuracy with 10BASE-T1L PHYs on their MII and RMII interfaces. Various sources for constant and dynamic time error superimpose in real systems, resulting in time stamp inaccuracies of several hundred nanoseconds in the worst case. Asymmetry and measured link delay may vary between successive link establishments. Measurements with existing 10BASE-T1L PHY components from two different vendors show that timestamping on the MAC-PHY interface with components available today is not sufficient to meet the requirements of IEEE 802.1AS2020 (gPTP). 10BASE-T1L is a very useful technology, but system designers should be aware of shown limitations in this paper.

Paper ID 87
Paper Title: Design and analysis of a flexible wristband antenna for the internet of medical things (IoMT) applications.
Authors: Rania Rabhi, Hamid Akbari-Chelaresi, Ali Gharsallah and Omar M. Ramahi
Abstract
This paper introduces a flexible wristband antenna designed for Internet of medical Things (IoMT) applications. The antenna operates simultaneously at both 3.5 GHz (5G) and 5.8 GHz (Wi-Fi) frequency bands, making it compatible with various smart devices. The proposed antenna has dimensions of 62×14 mm² and is designed on a flexible leather substrate with a dielectric constant of 2,72 and a loss tangent of 0,02. Since this antenna is intended for wrist-worn applications, it was studied both in free space and on numerical hand conditions, demonstrating impressive and robust performance. Moreover, the impact of wristband bending on the antenna's performance was investigated for practical applications. The SAR analysis confirms that the wristband antenna complies with wearer safety limits and regulations, exhibiting a maximum SAR of 0.113 and 0.182 W/kg for 1-gram tissue. Altogether, these features make the proposed wristband antenna an excellent candidate for wearable applications.

Paper ID 76
Paper Title: Wideband Filtering Rectangular Dielectric Resonator Antenna (FDRA) for Modern Wireless Applications.
Authors: Nisrein M. Mar'ei, Saqer S. Alja'Afreh, Amjaad T. Altakhaineh, Aser M. Almatarneh and Eqab Almajali

Abstract
A New filtering rectangular dielectric resonator antenna (FDRA) is proposed. This FDRA is fed by a crosscoupled mechanism, consisting of a microstrip-coupled slot at the bottom and a thin metallic strip on the side of the DRA. This design excites the y TE1δ1 and y TE2δ1 modes, which provide a -10 dB operational bandwidth about 900 MHz (5.3-6.2 GHz). The wideband filtenna is optimized by creating a tunnel and modifying the feeding slot with two pairs of perpendicular slot lines, resulting in two radiation nulls at the band edges. Simulation results show that the FDRA has a fractional bandwidth of 15%, an average realized gain of 4.8 dBi, and stable radiation patterns, Thus, this FDRA design is suitable for recent wireless applications.

Topic 6: Computational Intelligence and Machine Learning

Room Firdaws **Google Meet Link** **meet.google.com/xcy-wmkd-fjm**

Paper ID 93
Paper Title: A New Approach for Real-Time Camera-Object Distance Measurement through Computer Vision.
Authors: Boulbaba Guedri, Naji Guedri and Rached Gharbi
Abstract
Accurately determining the distance between a camera and an object is of paramount importance in a multitude of computer vision applications, such as those found in robotics and industrial automation. This article highlights a revolutionary method that allows real-time distance measurements between a camera and an object, taking advantage of advances in computer vision. This method offers an innovative solution to solve this complex challenge and opens up exciting new perspectives in the field of distance measurement. With the developed algorithm built into the smart camera, it is possible to perform two-dimensional distance measurements between the point of the camera lens and an object. This object can be a 2D label stuck on an exterior surface of a 3D object. This feature allows you to determine the precise distance and even when this object has complex three dimensional shapes. As an object moves through space, the camera can make real-time measurements to determine its speed. The method employed relies on image processing using the Python programming language, using the powerful OpenCV library, running on the Raspberry Pi board. This approach combines visual computing with the flexibility and computing power to achieve our goals. The results obtained are very effective compared to measuring the distance carried out manually with a meter. The instrument for measuring the distance and speed of an object in space that we used has proven to be extremely precise and efficient compared to the traditional method, which requires the use of a tape measure or other means of measurement. This improvement in efficiency can provide significant benefits, both in terms of accuracy and speed, across a wide range of applications.

Paper ID 72
Paper Title: Intelligent Visual Tracking Robots Using Cascade PID Controllers.
Authors: Rihem Farkh, Ghislain Oudinet, Florian Sananes, Sultan Alzahrani, Saad Alhuwaimel and Thibaut De leruyelle
Abstract
A tracking system is useful for a variety of robotic applications, including obstacle detection, autonomous path planning and surveillance. One of the most difficult issues in computer vision is visual object tracking, which involves estimating the position of a target in an image series. Utilizing color information for visual tracking poses a formidable challenge due to variations

in illuminant, shadows, shading, specular highlights, cameras, and object geometry. Consequently, color measurements exhibit significant fluctuations throughout an image series. A camera is frequently used for object tracking to acquire information on construction robot motion, which may subsequently be used in coordination controls. The paper presents a mobile robot vision system that allows the robot to recognize and track objects based on their color. A new approach is proposed for stable tracking of mobile robot using combined algorithm based on computer vision techniques and a cascade proportional integral derivative controllers (PID). Within a system designed for controlling the speed of a DC motor, the goal of a PID controller is to maintain speed at a specified reference value while dynamically accepting new set point values. The combination of feedback encoder and PID controllers can be employed to control motor speeds in the presence of noise and load disturbances

Paper ID 32
Paper Title: Detection of Breast Cancer Using Machine Learning Approach.
Authors: Nagesh Sharma and Sandeep Singh Kang
Abstract
Breast cancer affects a substantial portion of the global female population and ranks as the second leading cause of female mortality. However, the potential for successful treatment increases significantly with early detection and effective intervention. Early identification not only enhances prognosis but also elevates survival rates by facilitating timely therapeutic measures. Additionally, accurate categorization of benign tumors might save patients from receiving needless therapies. This research focuses on leveraging the Wisconsin breast cancer dataset for data visualization and performance evaluations across multiple ML algorithms, specifically Logistic Regression, Support Vector Machines (SVM), Decision Trees, and Random Forest. The primary objective is to rigorously assess the precision, recall, accuracy, and F-1 score of each algorithm, gauging their effectiveness and efficiency in accurate data classification.

Paper ID 41
Paper Title: Adaptive transmit power control as a mitigation technique of rain attenuation in the tropics.
Authors: Wafula Herman, Alowo Kelly, Mark Ssemuju, and Abel Kamagara.
Abstract
Millimeter wave (mm-Wave) communication is a promising technology for high-speed wireless communication like 5G. However, it is highly susceptible to numerous perturbations that cause significant signal loss especially rain attenuation [1]. In this paper, we investigate the use of adaptive transmit power control as a mitigating technique for rain attenuation in mm-Wave communication. We compare the performance of this technique to that of adaptive coding and modulation using simulations of a point-to-point communication link over distances of 10m to 1000m [2], with transmit power varying from 100mW to 1W [3]. Virtual experimental results show that adaptive transmit power control provides better performance than adaptive coding and modulation in mitigating rain attenuation in mm-Wave communication. This is promising for 5G technology implementation and commissioning in the tropics where rainfall is prevalent all year round.

Paper ID 94
Paper Title: Enhancing Biometric Authentication Efficiency: A Hybrid Approach Exploiting Iris Modality and Leveraging One-Class SVM.
Authors: Hadil Eltaif, Yacine Yaddaden, Raef Cherif and Yacine Benahmed
Abstract

Biometric characteristics play a vital role in the authentication and identification process, particularly in developing resilient and secure systems with the main objective of safeguarding private data and ensuring secure access. Typically, two different modalities are commonly utilized: behavioural and physiological. Within the realm of physiological modalities, the iris stands out prominently due to its exceptional uniqueness and stability, rendering it exceedingly valuable in the context of security. This paper introduces a novel biometric-based authentication system that utilizes the iris as a modality. The proposed system is hybrid as it combines a pre-trained Convolutional Neural Network for feature extraction with the efficiency of a One-Class Support Vector Classifier. To optimize the classification task and generate relevant features, Linear Discriminant Analysis is also employed. We evaluated the performance of the proposed system using publicly available benchmark datasets. The system yields promising performance and demonstrates state-of-the-art performance, achieving an accuracy of 99.07% and 99, 68% with the CASIA-Iris-V1 and CASIA-Iris-Interval datasets, respectively.

Paper ID 79
Paper Title: Design and Implementation of a Digital Twin Testbed for Smart Warehouse Operations.
Authors: Siraj Eddine Aouani, Dorsaf Daldoul, Lokman Sboui and Amin Chaabane
Abstract
This paper explores the dynamic landscape of warehouse management; the integration of advanced technologies is essential. The main problem we aim to address is the need for accurate product traceability, smart automation, and seamless collaboration between robots and human operators. Our approach aims to remedy this situation by seamlessly integrating RFID and RTLS for real-time tracking and digital matching. The study describes the implementation of these technologies, from the initial deployment of RFID to real-time tracking facilitated by electronic cards. We use AnyLogic simulation to illustrate how these components work together to optimize logistics operations. The synergy between these technologies not only improves precision and efficiency, but also fosters collaboration between robots and human operators. The proposed approach represents a transformative change in warehouse management. By combining the physical and virtual domains, it enables more efficient industrial operations. Furthermore, as we look ahead to the integration of AI and blockchain, our project lays the foundation for even smarter and more efficient logistics systems in the future.

Technical Session 3

Friday, December 1, 2023 (16:30 - 17:50)

Topic 7: Computational Intelligence and Machine Learning

Amphitheater Paradis I **Google Meet Link** **meet.google.com/nxn-bhxz-zbs**

Paper ID 46
Paper Title: Towards a pre-trained Question-Answering language model for Kinyarwanda
Authors: Diane Tuyizere, Felicien Ihirwe, Remy Ihabwikuzo, Guda Blessed and Edith Luhanga
Abstract
Kinyarwanda, as one of the official languages of Rwanda plays a significant role in the country's cultural, educational, and administrative domains. With the increasing demand for information retrieval and natural language understanding in Kinyarwanda, the development of

robust Question Answering (QA) systems becomes imperative. Pretrained Language Models (PLMs) have demonstrated remarkable success in various natural language processing tasks, but their potential to address the specific challenges of Kinyarwanda QA remains largely unexplored. In this paper, we present a novel and comprehensive investigation into the feasibility and effectiveness of utilizing PLMs to tackle question-answering tasks for the Kinyarwanda language. We begin by curating and annotating a large-scale dataset of Kinyarwanda questions and corresponding answers, specifically tailored to the nuances of the language. The datasets utilized were from the sports and entertainment domain collected from several Kinyarwanda newspapers. Our approach relied on existing popular and robust Multi-Lingual language models. We developed various improved language models specific to Kinyarwanda QA tasks based on different models such as BERT, DistilBERT, and Roberta. Through extensive experimentation, we assessed their performance on question understanding, context comprehension, and answer generation. Our findings had shown that the pre-trained language models exhibit promising potential in advancing Kinyarwanda QA with an F1 score of 50%.

Paper ID 81
Paper Title: SVM model-based digital system for malaria screening and parasite monitoring.
Authors: Ivanie Stella Umuhoza and Carine Mukamakuza
Abstract
Malaria remains a persistent health challenge demanding innovative solutions. We introduce a digital approach using Support Vector Machines (SVM) for malaria screening and diagnosis, aiming to enhance diagnostics in the face of this urgent issue. Conventional malaria diagnosis is slow and reliant on expertise. Our SVM-based model addresses this by efficiently processing extensive malaria datasets, providing healthcare professionals with a tool to analyze essential data. It excels at classifying complex blood smear images, automating parasite identification, and distinguishing infected cells from healthy ones. Our evaluation showcases promising outcomes. The model excels at differentiating four malaria parasite types: pm, pv, po, and pf, achieving a 72% accuracy rate. This capability holds the potential for improved malaria diagnostics, especially considering resource limitations. Our user-friendly SVM model pioneers accurate malaria diagnosis, merging technology with healthcare in the battle against this ailment. It empowers healthcare professionals and contributes to the global fight against malaria.
Paper ID 88
Paper Title: Angle-Based Dictionary Learning for Outlier Detection.
Authors: Denis C. Ilie-Ablachim and Bogdan Dumitrescu
Abstract
We present an extension of the Angle-Based Outlier Detection (ABOD) method by designing an inlier base using the vector atoms obtained from a Dictionary Learning (DL) problem. The method performs the computation of the dictionary D and measures the angles between the data points in the feature space and the obtained atoms. We demonstrate that using a dictionary in the ABOD method can improve the results. Most of the time, the atoms can capture the inliers' direction, better isolating the outliers.

Paper ID 02
Paper Title: Advancing Continuous Authentication Using Smart Real-Time User Activity Fingerprinting.
Authors: Mehdi Mekni and Charles R. Barone.
Abstract

Continuous authentication enables a system to continuously verify a user's identity throughout an active session, eliminating the need for a one-time login. One effective approach to continuous authentication is real-time user activity fingerprinting. It analyzes a user's behavior, including keystroke patterns, mouse movements, and browsing habits, to create a unique user profile or "fingerprint." Real-time user activity fingerprinting offers multiple advantages over traditional authentication methods like passwords or tokens. It enhances security by making it difficult for attackers to imitate a user's behavior, while also providing the convenience of eliminating the need to remember passwords or carry physical tokens. In this paper, we present Gargoyle Guard, an intelligent software solution that we design, develop, and integrate. We also provide a comprehensive software development methodology encompassing requirement analysis, software architecture, and design. Gargoyle Guard utilizes a machine learning (ML) model that we develop, train, and verify. This ML model dynamically assesses the performance of the smart continuous authentication system, determining error rates and accuracy factors.

Topic 8: Electronics and Communication Engineering

Room Paradis II **Google Meet Link** **meet.google.com/jsm-cbdq-ndq**

Paper ID 09
Paper Title: Microwave Absorbers Based on Aluminum Shavings
Authors: Olga Boiprav, Sana Ahmed Abdaljlil, Amer Zerek and Vladislav Chelyadinsky
Abstract
The aim of the research work, the results of which are presented in the current paper, was experimental substantiation of the prospects of aluminum shavings using to obtain new cost effective microwave absorbers of the metamaterial type. To achieve the aim, the following objectives have been solved: 1) manufacturing the samples based on aluminum shavings and binder (samples differed by the volumetric ratio of the aluminum shavings and binder: 10.0 % : 90.0 %, 30.0 % : 70.0 %, 50.0 % : 50.0 %.); 2) measuring electromagnetic radiation reflection and transmission coefficients values in the frequency range 0.7–17.0 GHz of the manufactured samples; 3) calculation electromagnetic radiation absorption coefficient values in the frequency range 0.7–17.0 GHz of the manufactured samples; 4) conducting the comparative analysis of frequency dependences of electromagnetic radiation reflection, transmission and absorption coefficient values of the manufactured samples. In course of the objectives solving the optimal volumetric ratios of the aluminum shavings and binder in the studied microwave absorbers were established. Such ratios correspond to the maximum possible values of electromagnetic radiation absorption coefficient and effective absorption band of these absorbers. These ratios are 30.0 %: 70.0 % and 50.0 %: 50.0 %. The studied absorbers characterized by the indicated volumetric ratios of the components are multi band ones. Their electromagnetic radiation absorption coefficient values in the frequency range of 0.7–17.0 GHz achieves value 0.9. Their maximum width of the effective absorption band in the specified frequency range is 10.0 GHz. The presented absorbers could be used for protection radio electronic devices from active and passive electromagnetic interferences.

Paper ID 116
Paper Title: Novel Approach to Enhance Spectral Width of the Interrogating Signal for Reading Ultrawideband Chipless RFID Tags**.**
Authors: Rathod Rajender, Gabriele Ciarpi and Daniele Rossi.
Abstract
In the state-of-the-art, the spectral width of the interrogating signal in frequency-domain RFID readers is the same as that of a voltage-controlled oscillator (VCO). The amount of information

extracted from the tag is limited by the bandwidth of the VCO. However, VCOs with wider bandwidth are an expensive solution. In this paper, we propose a novel RFID reader approach that utilizes only a 1.2-3.6 GHz VCO in conjunction with two mixers to generate an interrogating signal with a frequency range of 1.2-10.8 GHz. This way, it achieves an interrogating signal fractional bandwidth of 160% thus providing a low-cost solution for commercial applications. A 24- bit lumped circuit model of a microstrip chipless RFID tag is exploited to illustrate the effectiveness of the proposed reader approach. The fractional bandwidth of the interrogating signal is analytically derived and compared with the current state-ofthe-art.

Paper ID 75
Paper Title: Smart Anchor Buoy: Design and Implementation
Authors: Januš Likozar and Aleš Jaklič.
Abstract
Time Sensitive Networking (TSN) is a technology for deterministic networking that constantly gains momentum. Precise time synchronization is a prerequisite for TSN systems. This paper presents results of research on timestamping accuracy with 10BASE-T1L PHYs on their MII and RMII interfaces. Various sources for constant and 6dynamic time error superimpose in real systems, resulting in time stamp inaccuracies of several hundred nanoseconds in the worst case. Asymmetry and measured link delay may vary between successive link establishments. Measurements with existing 10BASE-T1L PHY components from two different vendors show that timestamping on the MAC-PHY interface with components available today is not sufficient to meet the requirements of IEEE 802.1AS2020 (gPTP). 10BASE-T1L is a very useful technology, but system designers should be aware of shown limitations in this paper.

Paper ID 108
Paper Title: A Novel Compact Microstrip Antenna for UAV's Real Time Applications Using Millimeter-Waves Band
Authors: Abderraoufe Zerrouk, Mohamed Lamine Tounsi and Mustapha Yagoub
Abstract
In this paper, a novel millimeter-wave microstrip antenna array is presented. Designed to improve the communication link of an Unmanned Aerial Vehicle in terms of streaming video applications, the proposed 2x4 compact array has a size of 21.89 mm x 10.63 mm. Operating in the band 52-62 GHz with a return loss of -31.59 dB, a maximum gain of 14.3 dBi and a beam width of ± 15o, it can be implemented in a MIMO system.

Topic 9: Optimization of Industrial Systems

Room Firdaws **Google Meet Link** **meet.google.com/oia-hcdv-wfo**

Paper ID 52
Paper Title: Forecasting Laptop Prices in the Tunisian Market through Machine Learning Techniques.
Authors: Balti Ala, Manai Yassin and Lakhoua Mohamed Najah.
Abstract
The laptop industry has undergone swift expansion and technological enhancements, resulting in a diverse array of laptop models and capabilities to cater to a broad spectrum of consumer demands. However, for businesses, the task of identifying the most suitable laptop that aligns with specific requirements can be quite formidable. To tackle this challenge, this study introduces a solution centered around predicting laptop prices through the application of supervised machine learning, with a particular focus on utilizing the Gradient Boost method.

The system attains an impressive predictive accuracy of 94% when compared against actual market prices. Moreover, this investigation delves into the connections between laptop prices and various attributes including model, RAM, storage types (HDD/SSD), GPU, and CPU. By making use of this system and comprehending these correlations, enterprises can streamline the laptop selection process. This research significantly contributes to the domain of laptop price prognostication, providing enterprises with the tools to make well-informed decisions and optimize their laptop acquisition strategies.

Paper ID 77
Paper Title: Schematic Diagnosis Applied on a PV Irrigation System Design Demeanor Optimization.
Authors: Siwar Bellahirich, Dhafer Mezghani and Abdelkader Mami
Abstract
Agriculture is a main individuals prosperity pillar especially in food sufficiency and economical activities evolution. Unfortunately, agricultural field id straightly linked to natural trade in addition to scientific and technological progress that emphasize its concern to harmful damages caused by greenhouse gases continuous increase and functional failures threatens. This work proposes a schematic diagnosis of a photovoltaic irrigation system aiming to its performances optimization. Thanks to the Bond Graph tool, a robust and affordable parametric failures supervision is ensured by generating 14 residuals equations, 50 detectable components and 14 isolatable components. Hence, a secure and efficient photovoltaic pumping.

Paper ID 47
Paper Title: Modified hybrid PSO–FL MPPT for Photovoltaic Systems Under Partial Shading Conditions
Authors: Mahbouba Brahmi, Chiheb Ben Regaya, Afef Marai Ghanmi, Hichem Hamdi, Abderrahmen Zaafouri
Abstract
Under Partial shading conditions (PSC), traditional MPPT methods such as P&O and FL, cannot track down the Global MPP,the energy conversion efficiency will be reduced. In order to overcome the performance problem of a photovoltaic system,we proposed a modified MPPT PSO_FL control. The simulation results carried out under various partial shading patterns showed that the modified Hybrid PSOFL gives very satisfactory performances: an improvement of the response time, a total elimination of the undulations, and a good tracking of maximum power point.

Technical Session 4

Saturday, December 2, 2023 (09:00 - 10:00)

Topic 10: Electronics and Communication Engineering

Amphitheater Paradis I **Google Meet Link** **meet.google.com/dyc-thyr-xox**

Paper ID 134
Paper Title: Field Strength Averaging Schemes Performance Quantification in the Nearfield for FM Frequencies
Authors: Bader Fetouri
Abstract

This study evaluates the performance of averaging schemes used for field strength assessment in the near-field region of FM antennas placed on pylons. Realistic near-fields are recreated using a near-field generator then validated. Three performance indicators are used to quantify averaging schemes' field strength closeness to the electric field calculated over the entire human body volume. The tests were performed on a high number of unique near-fields. Results show that the tall 9 points averaging scheme has the best performance.

Paper ID 30
Paper Title: Analyzing BER Performance of 2x2, 3x3 and 4x4 MIMO Concatenated 8-PSK with and without TCM Coding over Fading Channel Using Simulation Method.
Authors: Sana A. Abdaljlil, Amer Zerek, Olga Boiprav, Albatool Elmezwghi
Abstract
M-ary Phase Shift Keying (M-ary PSK) is a critical digital modulation scheme used in modern wireless communication systems. It is considered one of the most important M-ary carrier techniques, as it efficiently transmits digital data over wireless channels. The utilization of a single symbol to encode multiple bits of data is instrumental in achieving enhanced data rates and spectral efficiency. This attribute plays a pivotal role in bolstering system performance and optimizing data rates without the need for expanding channel bandwidth. A modern technique employed in wireless communication systems, specifically multi-input multioutput (MIMO) systems, involves the use of orthogonal space-time block codes (OSTBC) to accomplish this objective. This work focuses on 2x2, 3x3 and 4x4 (MIMO systems concatenated with 8- phase shift keying (8-PSK) modulation, with and without trellis-coded modulation (TCM) coding. The performance of these systems is evaluated using simulation method. The results can guide the development of more efficient and reliable wireless communication systems. Therefore, the achieved outcome of 8-PSK modulation with TCM demonstrates superior Bit Error Rate (BER) performance when compared to employing uncoded 8-PSK.

Paper ID 114
Paper Title: IoT design and water monitoring of an aquaponic system
Authors: Takrouni Hedfi Asma, Houmia Mohamed and Laabidi Omri Kaouther
Abstract
The concept of smart agriculture involves integrating fish and plants in the same environment. This paper showcases an aquaponics system that utilizes an Arduino board, sensors, and hardware devices for its design and monitoring. The system is a closed-loop ecosystem that combines fish farming (aquaculture) and soilless plant growing (hydroponics). This innovative approach is beneficial for both the aquaculture and horticultural sectors as it enables the permanent reuse of water for breeding and reduces the use of chemical inputs in crop production management. The aquaponic system is self-regulating and can adjust itself when the pH, temperature, and water level sensors indicate that they are out of range. This is accomplished by combining the concept of embedded systems with the IOT (Internet of Things).

Topic 11: Control Systems

Room Paradis II **Google Meet Link** **meet.google.com/fmi-citb-wfd**

Paper ID 78
Paper Title: A comparative Study of Energy Control Strategies for Photovoltaic-Battery Systems.
Authors: Afef Marai Ghanmi, Mahbouba Brahmi, Chiheb Ben Regaya, Abderrahmen Zaafouri
Abstract

In this paper, two algorithms have been developed: a Perturb and Observe (P&O) algorithm and the Particle Swarm Optimization (PSO) control algorithm to ensure optimal operation at the maximum power point of a photovoltaic (PV) system under changing climatic conditions. In recent years, there has been a significant focus on the integration of PV systems with energy storage solutions, especially lithium-ion batteries. This integration has garnered considerable interest due to its promise of improving energy management, bolstering grid resilience, and optimizing the utilization of renewable energy sources. To achieve this, a proportional-integral controller is implemented to independently regulate active and reactive power components. The utilization of batteries for energy storage within photovoltaic systems has emerged as a progressively favorable approach for enhancing energy quality in terms of both current and voltage. The simulation outcomes are generated using MATLAB/Simulink tools.

Paper ID 80
Paper Title: Output-Feedback Sliding Mode Control for Systems with Uncertainty.
Authors: Sana Belguith, Borhen Torchani, Anis Sellami, Germain Garcia
Abstract
In this article, sliding mode control (SMC) with output feedback has been considered for uncertain multivariable continous linear systems. It is assumed that uncertainties include external disturbances on the system state and control input. The modeling and design of the control system are carried out systematically by applying the equivalent control method. The application of this control is performed through the simulation of differential deflection angles of the tail and canard of an aircraft. The control demonstrates effective regulation of these angles and stabilizes the system under various uncertainties.

Paper ID 84
Paper Title: Predictive control of an orthosis based on the Laguerre model and the Hildreth algorithm.
Authors Hmida Hmaied, Sami Hafsi, Faouzi Bouani
Abstract
This article introduces a predictive controller applied to a robotic therapy device. The research focuses on developing a Model-based Predictive Controller (MPC) while incorporating Laguerre functions and Hildreth's quadratic algorithm. Laguerre functions are proposed to facilitate and improve the influence of the control horizon by creating a more concise control trajectory, which in turn reduces the computational resources needed for finding the optimal control solution. Additionally, these findings are validated through simulations conducted on robotic devices and compared with traditional MPC methods.

Topic 12: Smart Grids and Power Systems

Room Firdaws Google Meet Link **meet.google.com/wgb-ijkh-ypz**

Paper ID 65
Paper Title: Islanded Microgrid Frequency Control in Presence of HVDCConnected Marine Power Plant Coordinated with Optimal Fuzzy-PID and Hybrid Energy Storage Devices.
Authors: Nour El Yakine Kouba and Slimane Sadoudi
Abstract
This article purposes a new optimal dynamic frequency control of islanded microgrid including hybrid marine power plant and multiple energy storage devices feeding islanded loads through a High Voltage Direct Current link (HVDC). The used isolated microgrid incorporate a hybrid marine power generation. The marine power plant involves both offshore wind farm (OWF)

and Wells turbines (WTs) to respectively capture wind energy and wave energy from wind and ocean wave. Moreover, a hybrid storage devices have been employed to avoid load shedding and improve the overall microgrid frequency dynamic performances. This Hybrid Energy Storage devices includes: Superconducting Magnetic Energy Storage (SMES), Redox Flow Batteries (RFBs), and Fuel Cells (FCs). The frequency was analyzed through the application of a new optimal Fuzzy-PID controller using the recently developed Water Cycle Algorithm (WCA). The WCA algorithm was employed to find the best values of fuzzy logic and PID controllers parameters. The main purpose was to develop and manage a hybrid marine power generation system which can meet the load needs with and without consideration of HESS. A comparative study has been carried out to show the robustness of the proposed method. It can be concluded from the simulation results that the proposed hybrid marine generator (HMG) OWF/WT coordinated with HESS and controlled via an optimal LFC loop can stably operate to achieve system stability.

Paper ID 66
Paper Title: Technologies and Configuration of Charging infrastructure for battery electric vehicles- An overview.
Authors: Yassine Trabelsi, Bilel Touaiti and Hechmi Ben Azza.
Abstract
This paper proposes an overview of charging infrastructure for battery electric vehicles (EVs). The transportation system-based EV uses electric motors (EMs) or the combination of EMs and Internal combustion engine (ICE). The batteries in EVs provide energy storage needed for travel in an EV. In this study, we present the EV drive technologies, configuration and comparison. The EV cable charging is studied and a Wireless Power Transfer (WPT) is investigated. The circuit of Inductively Coupled Power Transfer (ICPT) is analyzed and the different parameters of model are presented in order to analyze the efficiency of WPT charging infrastructure.

Paper ID 100
Paper Title: Behavior of DFIG based Wind Turbine during Symmetric dips with crowbar and sliding mode control solution.
Authors: Bechir Fatnassi, Borhen Torchani, Anis Sellami and Germain Garcia
Abstract
This article presents the study of a variable speed wind turbine during symmetric voltage dips. The power conversion system is based on a double-fed induction generator (DFIG). Firstly, a conventional sliding mode control (SMC) was applied to rotor and grid side converters. This paper aims to analysis the behavior of a 2 MW wind turbine which is affected by a symmetric voltage dips so the crowbar is installed at the rotor terminals in order to protect the system from the overcurrents and overvoltages caused by the loss of control during dips, after that a sliding mode control was adopted to ensure control of the reactive power and the electromagnetic torque taking into account the disturbance. The behavior of the system during severs grid voltage dips, is shown by a simulation in Matlab/Simulink software. In fact, the results obtained verify the performance of the crowbar to protect the system and also the performance of the SMC to eliminate the effects of the disturbance.

Technical Session 5

Saturday, December 2, 2023 (11:30 - 12:30)

Topic 13: Optimization of Industrial Systems

Amphitheater Paradis I **Google Meet Link** **meet.google.com/gjf-iefn-oti**

Paper ID 98
Paper Title: Enhancing State of Charge Estimation in Ni-MH Batteries through a Hybrid Approach Incorporating RRBF and K-means.
Authors: Jaouher Chrouta, Donya Souidi and Achraf Jabeur Telmoudi
Abstract
The accurate prediction of the State of Charge (SOC) in batteries is crucial for optimizing their usage and extending their end of life. In this paper, we focus on the utilization of two neural network architectures, namely Radial Basis Function (RBF) networks and Recurrent Radial Basis Function (RRBF) networks, for predicting the SOC of Ni-MH (Nickel-Metal Hydride) batteries. RBF networks are commonly employed in static modeling tasks but struggle to capture the temporal dependencies present in many dynamic modeling problems. RRBF networks have been specifically designed to overcome this limitation through their recurrent architecture, which allows them to incorporate data history and model temporal dependencies. Additionally, in this conference, we introduce the k-means clustering algorithm to optimize the parameters of Gaussian functions used in RRBF and RBF networks. The kmeans clustering groups the training data into clusters, enhancing the prediction quality of SOC by utilizing specialized subnetworks for each cluster.

Paper ID 118
Paper Title: Data acquisition system for hydroponic culture: A Comprehensive Study and Implementation of Scale Model.
Authors: Radhwen Ben Kahla, Feiza Ghzail and Imen Harbaoui
Abstract
The development of an intelligent monitoring system suitable for hydroponic greenhouses allows the control of climate parameters and nutritive ingredients, making it possible to grow many plants in urban areas all year round by using intelligent industrial techniques, such as the Internet of Things, cloud computing, big data, and artificial intelligence. In this field, we are working on the development of a fully controlled system for greenhouses, in order to provide an intelligent adjustment of climate parameters and nutrient solution ingredients based on artificial intelligence techniques. In the current paper, the aim is to evaluate the criteria for low cost environmental parameter sensors, and to detail our scale model. Then, a description of the climate parameter sensors, the nutrient solution sensors, the acquisition board, and the data logging methodology is provided.

Paper ID 128
Paper Title: Multi-Objective Optimization of a Hybrid system feeding a large scale SWRO desalination plant.
Authors: Mohamed Hamdi, Oumayma Gtari, Majdi Hazami and Daoued Mihoubi
Abstract
In our daily life, fresh water is a necessity. Due to global population expansion and climate change, its availability is dwindling. Water scarcity is definitely one of the most challenging issues facing society today. Seawater desalination facilities are thus being employed increasingly frequently around the coasts. However, these initiatives use a lot of energy, and they're not always in the best places for access to renewable energy sources. In this study, we have considered the specific consumption in order to determine the best architecture and evaluate the dependability of the hybrid energy generator feeding a large scale desalination unit. Economic optimization has been performed using HOMER optimization environment tool.

Different hybrid power system combinations with and without batteries were tested and examined in on- and off-grid scenarios. Results showed that, for a 25-year project life cycle, the most cost-effective option for environmental protection results in water production costs of 0.414$/m3 versus 0.585$/m3 for current usage. The study's findings provide an important feasibility analysis to support future decisions on the use of hybrid renewable energy sources for supplying desalination plants and will allow manufacturers and engineers to better the plant's operational conditions.

Topic 14: Computational Intelligence and Machine Learning

Room Paradis II **Google Meet Link** **meet.google.com/jjp-sufx-fpu**

Paper ID 101
Paper Title: Development of a Fall Detection System Based on a Tri-axial Accelerometer
Authors: Samer Lahouar, Mounir Mansour, Mohamed Hadj Said.
Abstract
In this paper, we present a threshold-based fall detection system that uses data from a tri-axial accelerometer to differentiate falls from activities of daily life (ADL). Many previous studies on the subject use the sum vector (SV) of acceleration to identify the fall events. However, the SV curves of some daily activities (like jumping and running) are found to be like those of a fall. Therefore, a second parameter, which is attitude variation, is considered here to better distinguish a fall from an ADL. To evaluate the system's performance experimental data is used. The data is composed of acceleration signals collected from 21 falls and 21 ADL. Based on this data, the system's sensitivity is found to be around 95.23% and its specificity around 100%, which makes the proposed system successful in distinguishing falls from ADL. The results found in this study reveal that the proposed system's performance is comparable to previous studies found in the literature.

Paper ID 95
Paper Title: Machine Learning-Based Pre-Diagnosis Tools in Emergency Departments: Predicting Hospitalization, Mortality and Triage Acuity.
Authors: Yacine Yaddaden, Yacine Benahmed, Marc-Denis Rioux and Mariem Kallel
Abstract
With demographic growth, aging populations, and the recent advent of the Covid-19 pandemic, emergency department staff are increasingly overwhelmed, leading to a decline in the quality of patient care and an alarming rise in hospital mortality rates. Thus, there is a growing need for accurate and reliable pre-diagnostic tools to optimize patient flow and improve the quality of care. While many artificial intelligence based tools have been tested for pre-diagnosis in emergency services, they are still not effective enough. Moreover, exploring the use of additional indicators to enhance preliminary diagnosis should also be considered. This paper aims to predict the Emergency Severity Index—a standard reference for triaging patients—along with other indicators that clinicians can use to refine preliminary diagnoses, particularly regarding patient hospitalization and mortality. To achieve this, we utilized the MIMIC-IV (Medical Information Mart for Intensive Care) and MIMIC-IV ED (Emergency Department) datasets, applying several machine learning techniques. We propose a new pipeline for these prediction tasks, employing Polynomial Features for feature extraction and Principal Component Analysis for dimensionality reduction. Our proposed methods achieved high accuracy rates, with hospitalization prediction reaching 97.00%, mortality prediction at 86.41%, and triage acuity prediction scoring of 99.80% using Logistic Regression, Random Forest, and Decision Tree classifiers.

Paper ID 96
Paper Title: A Hybrid Approach based on CNN and Extremely Randomized Trees for the Diagnosis of Alzheimer's Disease Stages from MRI Images.
Authors: Mahdi Baccar, Yacine Yaddaden, Mohamed Arbane and Raef Cherif
Abstract
Alzheimer's disease, a widespread form of dementia, impairs the nervous system and leads to the decline of various brain functions, including memory loss. Early detection of Alzheimer's disease is an area of significant research interest, as early diagnosis plays a crucial role in improving patient care and treatment outcomes. In this paper, we propose an approach that combines a pre-trained Convolutional Neural Network model, namely Inception-V3 for feature extraction with a supervised machine learning technique, specifically Extremely Randomized Trees, is employed for classification purposes. This classifier enables the differentiation of various stages of Alzheimer's disease. The obtained results are promising and demonstrate the effectiveness of our approach when evaluated with two benchmark datasets. The accuracy is estimated to 92.31% and 98.57% with ADNI and MIRIAD dataset, respectively.

Topic 15: Control Systems

Room Firdaws **Google Meet Link** **meet.google.com/wpt-irgw-qyx**

Paper ID 50
Paper Title: A Hybrid Set-theoretic Method for Guaranteed State Estimation of Nonlinear Discrete-time Systems.
Author: Jian Wan
Abstract
This paper proposes a hybrid set-theoretic method to implement guaranteed state estimation for nonlinear uncertain discrete-time systems. The proposed method represents a polytopic set exactly at each time instant by the intersection of intervals or boxes and then to propagate these intervals or boxes via zonotopic set computation for guaranteed state estimation of nonlinear discrete-time systems. Such a hybrid set-theoretic approach integrates interval, zonotopic and polytopic set-theoretic methods and makes full use of their specific advantages. The proposed method can be extended for high-dimensional systems due to the use of intervals or boxes rather than parallalotopes for exact set representation. The effectiveness of the proposed hybrid set-theoretic method for guaranteed state estimation of nonlinear uncertain discrete-time systems has been demonstrated via an illustrative example.

Paper ID 104
Paper Title: MPC-Based Efficient Energy Control and Cost Estimation of HVAC in Buildings
Authors: Saad Abobakr, Mahmoud Alosta, Mohamed Amine Abdelkefi, Amine Elkaouachi, Lokman Sboui**.**
Abstract
The resistor-capacitor network (RC models) is a common approach to model thermal systems in buildings that proves advantageous in improving a building's energy efficiency. This paper presents a framework for energy consumption cost estimation and power efficient control in buildings-based model predictive control. The proposed framework calculates the electricity cost for dwellings based on their sizes using RC models. Additionally, it ensures consistent thermal comfort within the controlled building even during performance issues. The calculation of the cost of energy consumption takes into account the electricity tariff provided by Hydro-Quebec, Montreal, Quebec, Canada. Model Predictive Control (MPC) along with two backup

controllers (ON/OFF control and Proportional-Derivative-Integral (PID) control) optimize the thermal model in a building, ensuring the desired indoor temperature efficiently with low cost. The Simulation results conducted on the Matlab/Simulink platform demonstrated that MPC control outperforms the other controllers in terms of energy consumption minimization and cost.

Paper ID 83
Paper Title: Analysis and Characterization of Electromagnetic Reverberation Chamber with Metamaterial Walls.
Authors: Jeudy Kean, Nathalie Raveu, Hamza Kaouach, Sokchenda Sreng and Kosorl Thourn
Abstract
This paper presents the effect of metamaterial walls on the Lowest Usable Frequency (LUF) of a Reverberation Chamber (RC). First, the metamaterial walls are modeled as surface impedance. Then, sensitivity analysis is performed to choose the appropriate surface impedance using the Modal Expansion Theory (MET) to reduce the LUF. Finally, the metamaterial unit cell has been designed and characterized to achieve the impedance requirements. When metamaterials are implemented on two parallel walls of the RC, the LUF can be reduced by almost 5 times compared to the perfect metallic wall reverberation chamber according to simulation.

Technical Session 6

Saturday, December 2, 2023 (16:30 - 17:50)

Topic 16: Control Systems

Amphitheater Paradis I **Google Meet Link** **meet.google.com/wuw-ikby-ovh**

Paper ID 132
Paper Title: A comparative study between multiple affine models and nonlinear model in Predictive Control.
Authors: Houda Mezrigui and Wassila Chagra
Abstract
This paper presents a new methodology using multiple affine models to represent a nonlinear SISO system. Two Model Predictive Control strategies are compared. The Nonlinear Model Predictive Control (NMPC) and the Linear Model Predictive Control (LMPC) applied to multiple affine models. The NMPC scheme uses two optimization methods in convex and non-convex cases. The enhancements offered by LMPC based on affine models are illustrated through simulation results.

Paper ID 131
Paper Title: Metaheuristic methods for determining the low order controller's gain.
Authors: Maher Ben Hariz and Faouzi Bouani
Abstract
This paper deals with the synthesis of a controller that ensures the desired closed loop performances such as overshoot and response time. The controller is completely obtained using two steps. The first one consists of determining the controller's parameters by solving a non-convex optimization problem using the Generalized Geometric Programing method. The second step involves calculating the static gain of the closed loop transfer function in order to

have a zero static error. In this work, we propose two metaheuristic methods to solve the second problem. The Particle Swarm Optimization (PSO) and the Harris Hawks Optimization (HHO) are the considered methods in this paper. Simulation results propose a comparison between these two optimization methods.

Paper ID 117
Paper Title: A Comparative Study Between Fuzzy Logic and Particle Swarm Optimization Based on MPPT Algorithms
Authors: Houssine El Hammedi, Jaouher Chrouta, Hechmi Khaterchi, Abderrahmen Zaafouri
Abstract
This paper conducts a thorough comparison of two popular Maximum Power Point Tracking (MPPT) algorithms: Fuzzy Logic Control (FLC) and Particle Swarm Optimization (PSO). The purpose is to compare and contrast their performance in optimizing photovoltaic (PV) systems for maximum energy extraction. The research includes modeling tests with real-world PV system data, considering various environmental variables and load profiles. Tracking speed, convergence accuracy, and robustness to environmental changes are all examined. The findings give useful insights for PV system designers, assisting them in selecting the best MPPT algorithm to improve renewable energy conversion efficiency.

Paper ID 40
Paper Title: Modeling and Simulation of Smart Home Appliances Energy Consumption.
Authors: Naziha Labiadhm, Imen Amdouni and Lilia El Amraoui
Abstract
Houses represents one of the greatest power consumption potentials in advanced countries. For this reason, the main objectif of this paper is to study the energy consumption profile by day for each home appliance: controllable appliances (washing machine, heating, ventilation and air conditioning) and uncontrollable appliances (refrigerator, lighting and electric cooker). Appliances models are developed and simulated in Matlab/Simulink software.

Topic 17: Computational Intelligence and Machine Learning

Room Paradis II **Google Meet Link** **meet.google.com/jrh-hczj-enh**

Paper ID 133
Paper Title: Protecting Patient Privacy with Encrypted Federated Learning Models.
Authors: Tarhouni Mounira, Fedwa Mansouri, Bechir Alaya, Salah Zidi
Abstract
Preserving the privacy and security of medical data is of utmost importance, given its sensitive nature. To address these concerns, federated learning has emerged as a valuable approach. This technique distributes training data across multiple machines, enabling collaborative learning while protecting individual data privacy. However, deep learning models are susceptible to privacy attacks, especially in medical data applications. Safeguarding the models themselves is crucial. An effective solution involves utilizing homomorphic encryption to protect models from adversarial attacks. This paper introduces an innovative privacy-preserving federated learning algorithm for medical data, incorporating homomorphic encryption. The study assesses the algorithm's effectiveness with a real-world medical dataset, emphasizing model performance and its resilience against privacy attacks.

Paper ID 102
Paper Title: Probabilistic Roadmap-Based 3D Path Planning of Autonomous Underwater

Vehicles.
Authors: Ali Arifi, Soufiene Bouallegue and Julien Lepagnot
Abstract
In this paper, a Probabilistic RoadMap (PRM) technique for path planning of Autonomous Underwater Vehicles (AUVs) is proposed and successfully applied. Different diving scenarios with increased complexity, i.e. growing number and dimensions of the 3D environment's static obstacles, are considered to test the PRM capabilities in collision avoidance and path shortness. The paper firstly explains the fundamental concepts of the PRM algorithm and provides a detailed flowchart for software implementations. Two performance metrics for path length and time consuming, namely StraightLine Rate (SLR) and Computational Time (CT), are considered for planning capabilities quantification. Demonstrative results and ANOVA-based comparisons, with the most used state-ofthe-art Rapidly-exploring Random Tree (RRT) algorithm, are presented and discussed to show the effectiveness and benefits of the PRM type of sampling-based path planning approaches.

Paper ID 112
Paper Title: Application of Extreme Learning Machine for Shunt Faults Detection and Classification in Three-phase Transmission Line Systems.
Authors: Khaoula Assadi, Jihane Ben Slimane and Salah Salhi
Abstract
The electrical power transmission lines play a crucial role in maintaining a continuous electricity supply. However, the exposed environment of these lines increases the risks of faults occurrence that must be detected quickly, classified, and cleared within a particular time. Given this, a methodology to detect and classify fault types in a three-phase transmission line system using the Extreme Learning Machine (ELM) was proposed in this study. A 220 kV, 300 km three phases transmission line system was simulated in MATLAB/Simulink software, where the current and voltage signals were generated under different fault conditions including fault types, fault inception time, and fault resistance. The fundamental components of these signals were used as inputs in the ELM model. Different shunt fault types, such as line-to-ground, line-to-line, double-line-to-ground, triple-line, and triple-line-to-ground were applied for fault detection and classification framework. Furthermore, the optimum number of hidden neurons in the ELM model was investigated in this study. In terms of the Mean Squared Error (MSE) and correlation coefficient, four ELM variants based on Sine, Sigmoid, Radial Basis, and Triangular Basis transfer functions were assessed for each module. The outcome of these metrics indicates that the ELM with the sigmoid model demonstrated superior performance compared to the other ELM models. Based on statistical metrics MSE, Root Mean Squared Error (RMSE), and Mean Absolute Error (MAE), and also the computational time, the efficiency of ELM-Sigmoid and state-of-the-art methods of Multi-Layer Perceptron Neural Network (MLPNN) and Radial Basis Function Neural Network (RBFNN) were compared and analyzed during training and testing phases. The results obtained revealed that the ELM-Sigmoid model outperforms the other models in the detection and classification of shunt faults with significant accuracy and fast computational speed.

Topic 18: *Electronics and Communication Engineering*

Room Firdaws **Google Meet Link** **meet.google.com/bdw-whwr-yoo**

Paper ID 37
Paper Title: A Study Analysis of VoIP Traffic Between RIP and OSPF Using OPNET.
Authors: Raja M. Shihoub, Sana Ahmed Abdaljlil, Fatima Laassiri and Amer R. Zerek.

Abstract
With its affordable price, VoIP, a technology that facilitates communication calls over the internet, is poised to revolutionize the world of communication. However, the quality of VoIP audio is primarily affected by factors such as jitter, delay, packet loss, and various other elements. In order to gain insights into VoIP behavior and quality across different routing algorithms, we have conducted a case study by simulating a VoIP network. Furthermore, it has extensively researched every potential factor that can adversely impact VoIP quality. This article offers a comprehensive explanation of VoIP network, delving into numerous design and technical considerations pertaining to VoIP implementation. The main objective is to identify the most effective protocol for VoIP networks, and to accomplish this, we have performed a meticulous analysis to evaluate the advantages and disadvantages of each protocol.

Paper ID 51
Paper Title: Task Offloading and Processing Optimization in Blochchain-Fog Computing Network.
Authors: Walaa Abdelatti and Nada Elshiekh
Abstract
Fog Node (FN) mostly communicates with IoT Devices (IDs) via mobile communication technology, Bluetooth or Wi-Fi, and other wireless connection techniques. Fog Computing Networks (FCN) provide decentralized computing processing and storage in real time applications where the time of offloading and processing is critical. This paper, studied the optimization issue of task offloading and processing time in fog computing network based on blockchain technology. We firstly considered putting the whole stack of computing capabilities in a transaction pool each transaction contain specific information from the blockchain network, the pool is divided into number of blocks by a certain factor. Stackelberg game theory model is then built around a master node as leader and many miner nodes as followers to jointly maximize the utility. The analysis of simulation results demonstrates that the proposed algorithm is efficient and verify the effectiveness of the proposed algorithm of task offloading optimization in blockchain-fog computing network

Paper ID 103
Paper Title: WSN-Based Data-Driven Digital Twin for Energy Efficient HVAC Systems.
Authors: Mahmud Alosta, Saad Abobakr, Amine Elkaouachi and Lokman Sboui
Abstract
Efficiently managing of energy consumption while ensuring a comfortable indoor environment is a crucial challenge in Heating Ventilation and Air Condition (HVAC) system control. Traditional approaches rely on physical models, while effective to some extent, entail laborious, time-consuming processes and lack scalability, imposing a substantial burden on HVAC system controllers. In this paper, we propose a data driven approach combined with Wireless Sensor Network (WSN) and Digital Twins (DT), allowing for the representation of system components in both the physical and virtual worlds. More specifically, a Long Short-Term Memory (LSTM) is integrated to enable in-advance modeling and prediction of indoor temperature for a potential Model Predictive Controller (MPC). The LSTM model is trained and validated using a dataset collected from sensors deployed in a candidate building. Several benchmarks were evaluated to ensure the efficiency of the proposed system model.

Paper ID 42
Paper Title: EMF Compliance Distance Calculation Enhancement for Multi-Technology Mobile Site.

Authors: Mohammed S. Elbasheir, Rashid A. Saeed, Salaheldin Edam, Othman Khalifa, Nidhal Odeh and Zeinab E. Ahmed

Abstract
Mobile networks are growing rapidly, particularly in light of the advent of the 5G New Radio (NR). This growth requires installing more base stations (BSs) that increase overall electromagnetic field (EMF) emission. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has set maximum limits to control EMF levels. This paper studies the compliance boundary for a single site running with multiple technologies including the 2G/3G/4G/5G colocated in the same tower. An enhanced formula is proposed and used with a typical site configuration setup for the boundary calculations in the form of Compliance Distance (CD). Also, the study investigated the CD for the Macro site that is commonly used in live networks. Additionally, this paper investigated the power density (PD) and total exposure ratio (TER) for occupational workers (OW) and the general public (GP) at the site. The results show that the enhanced formula gives shorter CD distances when the power reduction factor is considered, and 5G has the highest contribution to TER.

Technical Session 7

Sunday, December 3, 2023 (09:00 - 10:00)

Topic 19: Control Systems

Amphitheater Paradis I **Google Meet Link** **meet.google.com/yhs-kcke-kmo**

Paper ID 54
Paper Title: Energy Management System of the Plug-in Hybrid Electric Vehicle PHEV
Authors: Dalinda Dhifaoui, Houda Jouini, Abdelkader Mami

Abstract
With the objective of reducing petroleum consumption and mitigating vehicle emissions, several solutions have been proposed, among which the rechargeable hybrid electric vehicle based on renewable energy stands out as the most promising choice. The goal of this paper is to model and control a plug-in hybrid electric vehicle relying on renewable energy sources. Our work is divided into two main parts: the first involves modeling the plug-in hybrid electric vehicle in a series-parallel architecture (comprising a thermal engine, two electric machines, and a battery). The second part focuses on the development of flowcharts for the vehicle's energy management strategies, battery charging mode, and Home-to-Vehicle mode. Subsequently, we conducted simulations using the Matlab Simulink environment. Finally, we implemented our model on an electronic embedded board based on STM32F4, yielding promising results.

Paper ID 64
Paper Title: Control of Patient-Upper- Limb-Exoskeleton: Stability and Robustness Analysis.
Authors: Afef Hfaiedh, Sana Bembli, Nahla Khraief and Safya Belghith

Abstract
This paper proposes a new model based robust integral sign of the error (RISE) approach for patients undergoing passive rehabilitation. Using the Patient-Upper-Limb Exoskeleton (PULE) model based on the anthropometric parameters of the subject, the aim of this study is to guarantee that the shoulder and elbow track a desired periodic time-varying trajectories in spite of matched and unmatched uncertainties. The control strategy is proposed to take benefit from

the advantages of the nonlinear robust RISE controller and feed-forward(FF) term for improved performance and desired gravity compensation. The stability analysis based on Lyapunov theory proved that the tracking error asymptotically approaches zero. The effectiveness of the proposed controller has been validated by simulation. A comparative study based on Monte Carlo robustness analysis is conducted between the proposed approach and the standard RISE control.

Paper ID 71
Paper Title: Analyzing and comparative study of the efficiency of Maximum Power Point Tracking (MPPT) techniques in photovoltaic systems under variable irradiance and temperature.
Authors: Houssine El Hammedi, Jaouher Chrouta and Abderrahmen Zaafouri
Abstract
This study allowed us to analyze three different maximum power point tracking (MPPT) control techniques in Photovoltaic (PV) systems. These MPPT methods designed by Incremental Conductance (INC), Particle Swarm Optimization algorithm (PSO), and Adaptative Particle Swarm Optimization algorithm (APSO) have been simulated to obtain the various system responses. A comparison between the performances of these MPPT algorithms have been completed to confirm the best characteristics of APSO method in terms of rapidity, accuracy and simplicity. Therefore, a different review angle is created in this work to provide a clear image of the technology of MPPT. To simulate various MPPT algorithms in Photovoltaic (PV) systems a MATLAB/Simulink power system toolbox is used.

Topic 20: Electronics and Communication Engineering

Room Paradis II **Google Meet Link** **meet.google.com/bfk-ocpw-oum**

Paper ID 18
Paper Title: Numerical Investigation of a New SnS absorber film based on back grooves and metallic nanoparticles strategies.
Authors: Hichem Ferhati and Fayçal Djeffal
Abstract
In this paper, a new absorber film based on SnS thin-film decorated with metallic nanoparticles (MNPs) and back grooves texture is investigated. Numerical models based on FDTD method are developed to assess the optical performance of SnS absorber layer. A comparative study between the use of MNPs and back-grooves in SnS thin-film is carried out by estimating the key optical parameters associated with both structures. Particle Swarm Optimization (PSO)-based metaheuristic approach is implemented to boost up the optical performance of SnS thin-film over a broadband spectral range. It is found that the SnS absorber layer with optimized spatial distribution of gold NPs offers the best total absorbance efficiency of 75% as compared to that of SnS thinfilms with and without grooves texture (62% and 68%, respectively). This is mainly attributed to plasmonic and the enhanced light scattering effects promoted by the optimized MNPs. Therefore, this interesting optical behavior can open new perspectives for the design of alternative photovoltaic devices based on SnS thin-film.

Paper ID 39
Paper Title: Synergetic Control for DC- Link Voltage Regulator of Three Phase Inverter Grid-Tied PV System
Authors: Fethi Messaoudi, Fethi Farhani and Zaafouri Abderrahmen
Abstract

The context of energy in which this work is written is fairly broad, which is the renewable energy, in particular photovoltaic energy, where this connection to the grid is highly requested. Therefore, we introduce in this work a method for controlling the DC link voltage of PV systems connected to the grid: the fractional nonlinear synergetic controller. The primary goals of this controller are to improve transient response, improve the reference power injected to the inverter, and keep the grid-injected current's total harmonic distortion (THD) at a minimal level., even when there are variations in irradiance. To validate the efficacy of this controller, a comparative analysis is conducted using Matlab/Simulink, contrasting it with both the nonlinear synergetic and PI control strategies. The results of the simulations unequivocally show that the suggested fractional nonlinear synergetic controller outperforms the PI control.

Paper ID 122
Paper Title: Study and design of an adaptor stage to extract maximum power from a PV module.
Authors: Zied Khammassi, Med Hedi Moulehi, Jaouher Chrouta, Abderrahmen Zaafouri
Abstract
This work focuses on designing of an adaptator stage aimed at extracting the maximum power PMPP generated by a photovoltaic module, regardless of varying climatic conditions like temperature and irradiance. it is enclosed within a casing and comprises a boost converter controled by microcontroller unit.This configuration enables the implementation of various control algorithms (maximum power point tracking, or MPPT). These algorithms share common input parameters, as the module voltage VPV and current IPV, while the output parameter is a duty cycle corresponding to a pulse-width modulation signal. This signal regulates the converter to attain the voltage VMPP corresponding to the PV module's maximum power PMPP.

Topic 21: Optimization of Industrial Systems

Room Firdawes **Google Meet Link** **meet.google.com/iad-pdvg-zdh**

Paper ID 73
Paper Title: Periodic Vehicle Routing Problem with time windows for Home Dialysis Care.
Authors: Haifa Nouira, Sondes Hammami, Gilles Goncalves, Adnen Elamraoui, Hanen Bouchriha
Abstract
In this paper we address a particular issue dealing with the problem of building periodic tours for the delivery of consumables required for home dialysis, taking into account the patient's storage capacity and the time windows for patient visits. The aim is to visit patients according to their preferences while respecting storage capacity and minimizing the costs incurred by the association responsible for delivery. To solve the problem, we proposed exact solution methods. For the optimal solution we have given two distinct mathematical formulations, the first considers hard time window constraints and the second considers them as flexible by adding a delay penalty in the objective function. A comparison of the two models on an instance of 9 patients enabled us to verify that the two models would lead to the same solution in the case of wide time windows. A second comparison was carried out on the same instance with tighter time windows, showing that the model with hard constraints failed to find a solution, unlike the model with soft ones, which provided a solution with a delay penalty.

Paper ID 120
Paper Title: The production tracking process in a real textile company.

Authors: Souha Ben Amara, Mariam Hammouda, Nada Kharroubi and Sondes Hammami

Abstract

This paper presents a case study on the Improvement of production tracking techniques in a manufacturing environment. The study aims to analyses the effectiveness of current production tracking process. Failures modes related to the use of the ERP software are detected and improvement on the implementation of the ERP software are investigated. The findings highlight the significant impact of improvement in production tracking on enhancing productivity, and facilitating timely decision-making.

Paper ID 123

Paper Title: Towards baseline sustainability scenario development for the agri-food supply chain in the Mediterranean area.

Authors: Safa Chabouh, Lilia Sidhom and Abdelkader Mami

Abstract

Agrifood supply chain (AFSC) viability is being threatened by several crises such as COVID-19 and Russian/Ukrainian war. In this context, it is required to move toward resilient and sustainable AFSC. Scenario identification serves for defining a realistic vision for the value chain and a basic strategy for achieving that vision to which AFSC stakeholders adhere. The aim of this paper is to define baseline sustainability scenarios for AFSC in the Mediterranean area. To do so, AFSC Key factors for sustainable AFSC as well as their possible options were identified. Moreover, surveys and interviews with AFSC actors and experts in four Mediterranean countries were conducted. On this basis, four sustainability baseline scenarios were defined showing disparities between these countries in terms of sustainability considerations.

Paper ID 24

Paper Title: Dynamic Economic Load Dispatch Problems in Microgrid with Renewable Energy Sources Using Tunicate Swarm Algorithm.

Authors: Larouci Benyekhlef and Kasdi Merbah

Abstract

Dynamic Economic Load Dispatch (DELD) is a significant problem in microgrids with renewable energy sources (RESs), where the aim is to minimize the overall cost of the system while ensuring that the power demands of the consumers are met. However, with the added complexity of RESs, conventional optimization techniques may not be able to provide optimal solutions. This is where bio-inspired algorithms come into play, which are optimization techniques inspired by natural phenomena such as biological, nature, and animal behavior. This document covers a new bio-inspired algorithm called “Tunicate Swarm Algorithm” used for solving DELD in microgrids with RESs and with considering the variable power output of renewable energy sources (wind and solar energy). The algorithm should also incorporate various constraints such as power balance and generation limits. Two cases of DELD with and without RES are treated. The results are compared to other recently developed bioinspired algorithms for validation. We demonstrate the superiority of the proposed approach over various other optimization techniques used.