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Table of Contents

MULTICLASS CLASSIFICATION USING ARCTANGENT ACTIVATION FUNCTION AND ITS VARIATIONS

Talya Tümer Sivri, Nergis Pervan Akman and Ali Berkol

***Abstract*—Deep learning have been applied in life changing areas. Wide range of areas shows how successful deep learning is. There are several reasons why deep neural networks works well. The most importantly, activation functions since they are very powerful for solving non-linear problems. For that reason, it became a focus point for artificial intelligence researchers who want to improve the performance of neural networks. This document is written for comprehensive explanation and comparison of activation functions which mainly focuses on arctangent and its' variations defined in the paper. Experimental results are showed that variations which are obtained using irrational numbers pi and golden ratio, and also self-arctan, give promising results. Especially arctan with golden ratio have given better results. Multi-class classification problem was taken consider in the paper.**

Keywords—deep neural networks, activation functions, multi-class classification, Reuters data

LTPS - SERVICE FOR LONG-TERM PRESERVATION OF DIGITAL SIGNATURES

Ștefan-Ciprian Arseni, Mihai Togan, Iulian Aciobăniței, Emil Bureacă and Mihai Coca

***Abstract*—Digital transformation of public or private services, although it brings many improvements for our societies, it also raises security issues, mainly when focusing on the migration of physical signed documents in the digital environment. Digital signatures have proven to be reliable, thus they have seen a higher adoption in the last few years, especially in the context of the Covid-19 pandemic. Yet, a disadvantage is that digital signatures are volatile, being valid only for a maximum of a few years, depending on the validity of the asymmetric private key used to create that digital signature. Thus, validating a signed document after a few years could prove to be troublesome. In order to solve this problem, legislative and standardization efforts have been made and the legal and technical frameworks for long-term preservation services have been issued. In this paper we focus on the presentation of our implementation of a long-term preservation service for digital signatures, that is part of an entire long-term preservation system composed of multiple services, as mentioned in the paper. Our implementation is compliant with ETSI standards and uses the capabilities of current PKI infrastructures, while also adding in the resilience and trust of the blockchain.**

Keywords—long-term preservation, digital signatures, signature augmentation, signature validation, ETSI standards

ENERGY EVALUATION OF BUGS VS BIRDS PATH PLANNING STRATEGIES FOR ROBOTS

Bogdan-Adrian Enache, Sorin Dan Grigorescu, Florin Ciprian Argatu,

Felix Constantin Adochiei, Irina Vilciu and Teodor-Iulian Voicila

***Abstract*—The paper analyzes two path-planning strategies from the optimal energy perspective. The first strategy is reactive navigation and is very similar to a bug trying to find food, while the second is based on a map like navigation imitating birds' movement. Both approaches are evaluated in environments with and without obstacles, and their energy consumption profile is extracted.**

Keywords—autonomous robots, path-planning, energy efficiency, reactive navigation, map navigation

ON THE CONTINUOUS DEVELOPMENT OF IOT IN BIG DATA ERA IN THE CONTEXT OF REMOTE HEALTHCARE MONITORING & ARTIFICIAL INTELLIGENCE

Elena-Anca Paraschiv, Cristian-Mihail Petrache and Ovidiu Bica

***Abstract*—The constant improvements in life expectancy have led to a considerable growth in the ageing population which significantly impacts the deliver of healthcare services and costs as well as an increase the medical professionals' burden. However, the most recent digital progresses have revealed a tremendous use of Internet of Things (IoT), Big Data and Artificial Intelligence (AI) towards the development of complex systems that can facilitate and support the elderly and the medical staff. In this context, the purpose of this paper is to firstly present the capability IoT can provide in order to ease the remotely monitoring of the healthcare status, the Big Data and AI developments for early disease detection and the enlarged capacity of integrating IoT, Big Data and AI in the healthcare sector. Secondly, the paper discusses RO-SmartAgeing, a remote healthcare monitoring system which aims to support and offer a good quality of life for the staying-at-home elderly patient. Its purpose is not only for data collection, processing and visualization, but also to create a complex and reliable system, augmented with AI capabilities. An application for demonstrating the use of IoT, Big Data and AI in the context of the RO-SmartAgeing system is proposed.**

Keywords—artificial intelligence, remote healthcare monitoring, Internet of Things, Big Data

USING MULTIPLE FREQUENCY SELECTION AT EACH MEASUREMENT CHANNEL TO ANALYZE BRAIN ELECTRICAL ACTIVITY

Daniela Andreea Coman, Silviu Ionita and Ioan Lita

***Abstract*—In this paper, we refer to the improvement of the analysis of the electrical activity of the human brain by the dynamic separation in frequency of the EEG signals at the level of each capture channel. This technique expands the possibilities of correlating different signals for real-time interpretation of the brain response, as well as diminishing the effect of noise and perturbations. Frequency selection of EEG signals is performed in the established bands of the wave types generated by the human brain: alpha, beta, gamma, delta and theta. Basically, this will expand the number of signals for each channel to 5 particular signals and provide an analysis space with 25 particular situations for every two channels considered. The advantages of the proposed method are evident in the post-processing stage of EEG recordings and can be exploited in BCI systems for more accurate identification of the perceptual-mental states of the human subject.**

Keywords—Brain signal processing, data correlation, EEG Event Related Potential

OFFSET VOLTAGE REDUCTION METHODS FOR A TWO-STAGE FOLDED CASCODE OPERATIONAL AMPLIFIER

Cristian Stancu, Dragoș Dobrescu and Lidia Dobrescu

***Abstract*—Low voltage operational amplifiers design uses diverse innovative techniques for increasing their performance. Offset voltage is a key parameter that must be constantly reduced. Two-stage folded cascode using a differential input stage and an AB class output stage is an advanced design solution in CMOS technology. This paper focuses the offset voltage of this type of operational amplifier and highlights mutual transconductance and threshold voltage as important factors that can be used to minimize the offset voltage as much as possible. Distinct reduction methods for this important parameter are also established.**

Keywords—operational amplifier, offset voltage, CMOS technology, two-stage architecture

MECHANICAL CHARACTERIZATION OF COMPOSITE MATERIALS WITH POLYMERIC MATRIX

Gheorghe Vasile and Cosmin Paunescu

***Abstract*—Polymer matrix composites are used in a large number of applications (eg airplanes, automobiles, cars) due to their superior mechanical properties, such as: strength, high specific stiffness, wear resistance, dimensional stability and low weight. Polyamide PA 66 and polyamide PA 66 - GF 30 are thermoplastic technical materials in which we find both mechanical properties and excellent physical properties. These properties are being used in the automotive engineering industry more and more often.**

Keywords—mechanical characterization, composite materials, polymeric matrix

DESIGN AND IMPLEMENTATION OF A NOVEL HYBRID BOTNET

Ioana Apostol, Alexandru-Dan Tica and Victor-Valeriu Patriciu

***Abstract*—In a world full of interconnected devices and ever-changing technologies, there is no wonder that threats prevail in cyberspace. Botnets represent one of the major Internet threats, as they are networks of infected devices that can be remotely controlled by attackers. To raise the level of preparedness against such threats by anticipating possible advanced botnets that may arise in cyberspace, this paper introduces a novel botnet architecture, based on a centralized structure in which the single point of failure problem is eliminated using a customized command and control protocol. The proposed architecture is considered hybrid, as it combines features of the centralized topology with features of the decentralized one. An implementation of the proposed botnet is also included, showing the efficiency of the botnet in commands dissemination and its recovery capacity.**

Keywords—botnets, hybrid botnet, advanced botnet design, cyberthreats, network attacks

A DECENTRALISED CONTROL METHOD FOR UNKNOWN ENVIRONMENT EXPLORATION USING TURTLEBOT 3 MULTI-ROBOT SYSTEM

Stan Alexandru-Calin

***Abstract*—The paper presents a case study of multi-robot coordination using a Greedy decentralized method for controlling a system of tree Turtlebot 3 mobile robots. The robots use Robot Operating System (ROS) as platform for develop control framework and simulations were performed in Gazebo. The case study is focus on developing a greedy frontier exploration method for the Turtlebot 3 multi-robot system with the scope of exploring an unknown environment. The experimental results are obtained by simulating the system evolution in Gazebo. The experimental results are analyzed and the findings are presented in the paper.**

Keywords—Multi-robot system, Decentralized coordination, Turtlebot 3 mobile robot, Gazebo, ROS

GREEN, AIR QUALITY MONITORING STATION BASED ON ARDUINO

Sorin Ionuț Conea and Gloria Cerasela Crișan

***Abstract*—Air quality is very important for people and monitoring it can prevent a number of respiratory diseases. Starting from this premise, we have developed an air quality monitoring system that has a very low risk of pollution because it uses photovoltaic energy.**

Keywords—Arduino, Air Quality, Green Energy

ANALYSIS OF MPLS TECHNOLOGY IN THE CASE OF VIRTUAL NETWORKS

Pica Aurel, Predusca Gabriel, Nicoleta Angelescu, Liana Denisa Circiumarescu and Dan Constantin Puchianu

***Abstract*—Multi-Protocol Label Switching is an example of a successful project in information technology reform. We can say that its goals, to streamline Internet traffic and facilitate traffic engineering, have been achieved - as evidenced by its use on an increasingly large scale. The type of data transferred over the Internet has varied from data traffic to real-time traffic, or even private traffic. Thus, the consequences of breaking a connection or breaking a router have become much more important. However, public IP infrastructure offers a low degree of error recovery compared to traditional telecommunications networks. Multi-Protocol Label Switching provides mechanisms for fast error recovery as well as security link management. This paper provides a testing and research basis for high-speed Multi-Protocol Label Switching networks because of which improved error recovery mechanisms can be developed using openSimMPLS software.**

Keywords—router, error, MPLS, openSimMPLS

OPEN-SOURCE TOOLS FOR THE CYBERSECURITY OF AN INTEGRATED INFORMATION SYSTEM

Adriana-Meda Udroiu, Ionut Sandu and Mihail Dumitrache

***Abstract*—This paper focuses on presenting the tools of ensuring the cybersecurity within an integrated information system for management of activities (IISMA). This system (IISMA) represents the product obtained within a research and development project in 2018-2021 period within the PN III Program, call SOLUTII. We focused in this paper on presenting how to achieve system security, using open-source tools because this method can be successfully applied to other applications / systems in the public entities (IISMA is a platform used by public entities, especially). The tools used, the proposed architecture and the interconnection with the other modules of the system allow us to state that it can be a reliable and inexpensive solution to ensure the cyber security of an integrated information system that manages the resources of an organization. The proposed solution respects the principles of the CIA triad (confidentiality, integrity, availability) of data and information in the system.**

Keywords—Security Onion, integrated information system for management of activities, security by design, security by default

A NEW AREA TOWARDS TO DIGITALIZATION OF ENERGY SYSTEMS: ENABLES, CHALLENGES AND SOLUTIONS

Doğan Çelik, Mehmet Emin Meral and Muhammed Waseem

***Abstract*—With the ever-increasing energy demand, the electric power sector and the energy industry are promoted to decentralization, decarbonization and digitalization. The digital platforms gradually become a megatrend for a clean energy system. Digitalization of the energy systems has conducted changes in various dimensions such as energy savings, sustainability and security. In this paper, the impact of digitalization on the electric energy systems, electric vehicles (EVs), sustainable development goal (SDGs) and greenhouse gas (GHG) emissions are analyzed and investigated. A systematic overview and discussions on the key drivers for digitalization and decentralization of energy systems are addressed. This paper provides significant insights for digitalization of the energy systems from a global perspective. Some enable, challenges and solutions are also handled to analyze the impact of digitalization.**

Keywords—digitalization, energy systems, electric vehicles, sustainable development goal

ENSURING THE COMPLETENESS AND ACCURACY OF DATA IN A CUSTOMIZABLE REMOTE HEALTH MONITORING SYSTEM

Marilena Ianculescu, Dragos Nicolae Nicolau and Adriana Alexandru

***Abstract*—Providing health care with the extensive support brought by Remote Health Monitoring Systems (RHMS) is compulsory relied on a comprehensive and strict management of health data, due to its sensitive feature, amount, complexity and heterogeneity. As the quality, responsiveness, efficiency and reliability of the associated medical outcomes basically depends on the quality and accessibility of health data, specific attention must be paid on ensuring its completeness and accuracy. RO-SmartAgeing system is such a RHMS in which specific tasks and methods are targeted to ensure a strict control of collected data that is stored and further processed for sustaining proactive and preventative health care in an age-friendly smart environment.**

Keywords—health data, remote health monitoring system, IoT-based devices, smart environment

FULLY ANALOG CLOCK SIGNAL GENERATOR FOR SPICE BASED SIMULATORS

Ionuț-Constantin Guran, Adriana Florescu, Lucian-Andrei Perișoară,

Alexandru Vasile and Constantin-Daniel Oancea

***Abstract*—Clock signals are vital in synchronous circuits because they synchronize various data signals coming from different parts of an integrated circuit, ensuring the correct functioning of the entire circuit. As simulation has become the main verification concept in circuit design, accurate clock signal generator models are mandatory in order to build high quality circuit models. This paper proposes a fully analog clock signal generator modeling method, which can be used in any SPICE based simulator. All synchronous circuit models currently implemented use a digital primitive based clock signal, which only works in the simulator it was designed for. The main advantage of our proposed method is the compatibility with all SPICE based simulators like PSpice Allegro, SIMetrix, TINA, LTSpice, which greatly widens the user's simulation alternatives.**

Keywords—clock signal generator model, synchronous circuits, SPICE based simulators

IOT SYSTEM USING BLOCKCHAIN IN THE CONSERVATION AND PROMOTION OF CULTURAL HERITAGE

Cristina Sabina Bosoc, Florentina Magda Enescu, Oana Orza, Eduard Hanganu, Cristina Mihaela Balaceanu and George Suciu

***Abstract*—Because every work of art deteriorates over time, cultural heritage protection and conservation is a subject of significant relevance. The type of material, the impact of external climatic conditions, and human variables, all play a role in this degradation. In general, works of art should be conserved in controlled and stable climatic scenarios that need to be recorded and monitored. The goal of this study is to offer a system for data security and monitorization of the elements that influence artefact degradation, while still maintaining a pleasant museum climate for visitors. The study was started in the project MUSEION, where the preservation of historical artefacts was ensured by monitoring pollution levels in museums. Humidity, temperature, vibrations, air pollutants (CO, CO2, NO2, SO2), and volatile organic compounds are the key factors analyzed. The suggested IoT system will be a cloud-based solution that would attempt to provide a wide range of features, including individual material analysis (paintings, metals, textiles, etc.). The prototype will include different components: monitoring stations, data acquisition and administration server, visualization, Cloud database, security aspects using Blockchain technology and alerting platform. Blockchain is a distributed ledger technology and can be used to control the management, ownership and shared display of artefacts and to discourage the sale of heritage objects. The integration of the sensors in the Cloud, which can offer real-time data in case of nominal value exceedances, is a significant characteristic of the technical solution. The results of continuous monitoring over a long period of time reveal the main reasons for art object deterioration in museums. Furthermore, with the support of the entire system, instant decisions for artefact conservation can be established. By minimizing the number of events induced by physical and chemical processes that lead to artefact degradation, the research demonstrated the efficiency, reliability, security and scalability of the pilot system.**

Keywords—Artefacts, IoT, Cloud, real-time data, cultural heritage, Blockchain

DATA MEASUREMENT AND MODELING METHOD OF ELECTRICAL PARAMETERS OF BASIC HOUSEHOLD EQUIPMENT

Andrei Cosmin Gheorghe, Horia Andrei and Emil Diaconu

***Abstract*—Every year the cost of electricity used in a home tends to increase. In order to reduce the energy consumption and implicitly the cost, it is vital to analyze the consumption of the basic household equipment used, both in their normal and standby mode of operation. In this paper, the authors propose a measurement and modeling method of four most important household active power consumer. Data measurement of current and active power was performed over a period of time, in normal and standby operation mode, for each equipment. The data acquisition system equipment consists of an Arduino Nano development board, analog-to-digital converter, voltage sensor and two current sensors. Based on data measurement, MATLAB and Python software environment are used to obtain polynomial model of the current and active power characteristics of household equipment. The accuracy of the obtained model for each equipment is good for both software applications**

Keywords—household equipment, current active, power consumption, data acquisition system, modeling

SOFTWARE SOLUTION FOR MULTI-SENSOR SYSTEMS

Cristian Monea

***Abstract*—This paper proposes a software solution for real-time water quality monitoring using multi-sensors systems. The system requirements are detailed and the proposed solution's architecture is described. The implementation is presented and the advantages of the solution are mentioned. The concept has a level of generality that allows its application to a wide range of multi-sensor systems.**

Keywords—multi-sensor platform, water monitoring, software, embedded Linux, graphical user interface

MACHINE LEARNING METHODS APPLIED FOR WASTEWATER PH NEUTRALIZATION PROCESS MODELING

Madalina Carbureanu, Sanda Florentina Mihalache and Florin Zamfir

***Abstract*—In the present paper are compared six machine learning techniques (decision tree regression, linear regression, KNeighbors regression, support vector regression, gradient boosting regression, and random forest regression) using Python 3.9 software, in order to identify the most appropriate machine learning technique for wastewater pH process modeling. The purpose is to find a data-driven type model for such a process (with strong nonlinearity in dynamic behavior), a model that can be used by the plant human operator as support in the decision-making process regarding the reagent (acid or alkaline) dosing flow.**

Keywords—machine learning, pH neutralization, data-driven model, regression, decision model, reagent dosing

COMMAND AND CONTROL SYSTEM OF A PLANAR PARALLEL ROBOT FOR PCB PROCESSING OPERATIONS

Tudor Catalin Apostolescu, Laurentiu Adrian Cartal, Ioana Udrea,

Georgeta Ionascu and Lucian Bogatu

***Abstract*—In this paper, the original mechanical structure, designed in SolidWorks programming environment, and the associated command and control system of a 2-DOFs (Degrees of Freedom) planar parallel robot for PCBs (Printed Circuit Boards) processing operations like as drilling and marking/drawing, is presented. The robot is controlled by the LabView program, so it is necessary to implement the geometric models. The motors' command programming, performed in LabView using the data acquisition board 7344 National Instruments and the UMI 7764 interface, which connect the 7344 board to the application terminals, is also given. Finally, the experimental model of the robot, and future research are presented**

Keywords—2-DOFs planar parallel robot, PCB, control, LabView

IMAGE ENCRYPTION USING BLOCK CHAIN AND CHAOS FOR SECURE COMMUNICATION

Renjith V. Ravi, S. B. Goyal, Chaman Verma, Maria Simona Raboaca,

Florentina Magda Enescu and Traian Candin Mihaltan

***Abstract*—In the last decade, images have become a valuable source of information. They play an essential role in medical, the defence, engineering, and other fields. As a result, image information security is a pressing concern. Over the past few years, blockchain has received a lot of attention in the context of trust difficulties and the removal of third parties. The article that follows offers a blockchain-based image encryption approach. The image is encrypted and the values are stored on the blockchain using the suggested technique. In transmission, the blockchain assures confidentiality and anonymity. On the basis of NPCR, UACI, and information entropy evaluation, the robustness of the proposed approach has been assessed against differential assault. Entropy analysis is used to illustrate the strength of the system against a brute force assault. The result came close to the optimal value of 8. The suggested method is also demonstrated to be effective in preventing data loss during transmission .**

Keywords—Nahrain map, JSMP Map, block chain based image encryption, chaotic ciphers, confusion-diffusion, Blockchain and image cryptography

ANALYSIS OF MESSAGE FLOW TRANSMISSIONS FOR AN INTER-VEHICLE COMMUNICATION SCENARIO

Andreea-Valentina Militaru, Razvan Gabriel Lazar, Constantin-Florin Caruntu, Ciprian-Romeo Comsa and Ion Bogdan

***Abstract*—Mobility in urban areas evolved massively in recent decades, leading in a continuous manner to traffic difficulties and significantly increasing the number of accidents, especially in crowded intersections. The fifth-generation (5G) technology promises an increase of the capacity for the existent network, a faster connection, an ultra-low latency, and higher reliability. Moreover, device-to-device (D2D) communication is an essential feature when a large amount of devices have to be connected. The main advantage of D2D communication is the direct exchange of information between devices, without having to send the signal through the base station. Hence, this paper uses the Simu5G simulator to explore the D2D communication in a vehicle communication scenario by analysing the quality of the network. For this, the network performance was evaluated by monitoring the Channel Quality Indicator (CQI) and message flow during the movement of the cars were evaluated. The obtained results are in accordance with the real-time operation of 5G technology.**

Keywords—Urban traffic, V2X communication, sidelink, ITS

DETECTION OF PLANT DISEASES BASED ON CONVOLUTIONAL NEURAL NETWORK APPROACH

Nameer Baht and Enrique Domínguez

***Abstract*—Farming productivity is something that the economy counts on heavily. This is one of the, why the disclosure of diseases in plants plays a serious role in agriculture such having a disease in plants, is completely normal. Attention should be paid to this issue and its direct impact on plants and as a result, the quality and quantity of the product or Productivity are affected Plant diseases are an outstanding challenge for farmers, the importance of the topic is reflected in the impact on food security. Modern systems and computer vision have created an opportunity to classify images in Farming. Convolutional Neural Networks (CNN) is one of the latest technologies for image recognition and provides capability to provide quick and specific diagnoses. This paper demonstrates the importance of CNNs in classifying plant diseases and how they work, providing a path toward solutions for artificial disease, and assisting researchers and countries whose economies are based on agriculture.**

Keywords—Plant Diseases, Convolutional Neural Networks, Dataset, Deep learning

AN ONTOLOGY-BASED FRAMEWORK FOR FORMAL VERIFICATION OF SAFETY AND SECURITY PROPERTIES OF CONTROL LOGICS

Hoda Mehrpouyan and Ramesh Neupane

***Abstract*—Any safety issues or cyber-attacks on an Industrial Control Systems (ICS) may have catastrophic consequences on human lives and the environment. Hence, it is imperative to have resilient tools and mechanisms to protect the ICS. In order to verify the safety and security of the control logic, consistent and complete specifications should be defined to guide the testing process. Second, it is vital to ensure that those requirements are met by the program control algorithm.**

In this paper, we proposed an approach to formally define the system specifications, safety, and security requirements to build an ontology that is further used to verify the control logic of the PLC software. The use of ontology enabled us to reason about semantic concepts, check the consistency of concepts, and extract specifications via inference. For the proof of concept, we have studied part of an industrial chemical process to implement the proposed approach.

Experimental results in this work proved that the proposed approach detects the inconsistencies in the formally defined requirements and is able to verify the correctness and completeness of the control logic. The tools and algorithms designed and developed as part of this work will help technician and engineers to create a safer and more secure control logic for ICS processes.

Keywords—Safety and security, Formal Verification, Critical Systems

REAL-TIME PERSON DETECTION FROM UAV IMAGES USING PERFORMANT NEURAL NETWORKS

Alexandru Gabriel Popa, Loretta Ichim and Dan Popescu

***Abstract*—Detection of persons from restricted areas with the help of UAVs is one of the current trends in ensuring the security of regions of interest. For the processing of images acquired by UAVs of special interest are machine learning techniques with an emphasis on neural networks. For this task, two neural networks are proposed and tested in this paper: YOLO v5m and Faster R-CNN. They were learned and tested on two data sets: HERIDAL and a proprietary video stream data set. Both networks gave good results, and the best results were obtained on their own data set (because the images in HERIDAL were taken at a higher height).**

Keywords—person detection, image processing, neural networks, UAV, statistic indicators

SPICE IMPLEMENTATION OF DIGITAL COUNTERS FOR BATTERY MANAGEMENT SYSTEMS USED IN ENERGY STORAGE SYSTEMS

Ionuț-Constantin Guran, Adriana Florescu, Lucian-Andrei Perișoară,

Mihail Ștefan Teodorescu and Irina Bristena Bacîș

***Abstract*—Energy storage systems are complex systems where faults that occur or improper operation can potentially lead to battery destruction. In order to maintain the energy storage system safe and reliable, a battery management system (BMS) must be used. The basic functions of a battery management system are cell voltage, current and temperature measurement, as well as battery protection such as overcharge, deep discharge and overcurrent. Digital counters are essential elements in battery management systems because the functioning of a BMS is also based on event counting and can change the BMS's behavior depending on the type of battery's chemistry or on the energy storage system. Simulation has become the main circuit verification concept used nowadays, but the complex models like battery management systems have not been studied enough until now. Before building a complex BMS model, all its internal blocks must be modeled. For this reason, our paper proposes a new concept in this domain, namely a SPICE implementation of digital counters for battery management systems used in energy storage system. We simulated our model in OrCAD Capture environment and the results prove the correct behavior of the digital counter model.**

Keywords—Energy Storage Systems, Battery Management System, Digital Counter

SLIDING MODE CONTROL IN NATURAL REFERENCE FRAME FOR THREE-PHASE LCL FILTERED ACTIVE FRONT-END CONVERTER

Cagdas Hisar, Ibrahim Sefa and Necmi Altin

***Abstract*—In this study, a sliding mode controller in natural reference frame is proposed for the three-phase active-front-end (AFE) converter. Along with the converter side inductor current, the capacitor voltage feedback is also employed to suppress the resonance of the LCL filter. Besides, PR controllers are employed instead of system equations to obtain the reference signals of the inductor current and capacitor voltage references. Thus, dependency on the filter parameters are eliminated and a robust control structure is obtained. The conventional PI controller is used to control the DC voltage control. The proposed method is validated with the processor-in-the-loop (PIL) simulation results. The obtained results proves that the proposed controller provides fast dynamic response, robust structure, and draws currents with low harmonic content from the gird.**

Keywords—Sliding-mode control, Capacitor voltage feedback, Active front-end converter, Unity power factor, Natural reference frame

A NOVEL APPROACH ON TRANSFORMATION AND ANALYSIS OF DATA LINKED TO DISTRIBUTED DATABASES : A CASE STUDY

Zdzislaw Polkowski, Jyoti Prakash Mishra and Sambit Kumar Mishra

***Abstract*—In general, transformation of data in several forms nowadays is quite possible and feasible due to easy accumulation and storage in large volume databases. In fact, the complexity of tasks associated with the queries in the databases in general can be optimized and resolved prioritizing the activities involved in the applications. Usually the traditional approaches linked with the conventional databases may not be adequate towards satisfying the requirements in the current situations. It is essential to focus on the emerging applications of databases being suitable towards obtaining optimality on large scaled data. In this manuscript, it is intended to prioritize and optimize the data linked to distributed relational database implementing soft computing approach. Also it may keep the information regarding the structure and association of database queries. The optimality in this case can be obtained based on the volume of stored data along with the execution time of database queries.**

Keywords—Distributed Database, Heterogeneity, Dependency preservation, Structured query, Global optima

USING SMART DEVICES FOR FALL DETECTION: ALGORITHMS, SYSTEMS AND APPLICATIONS

Valeriu Manuel Ionescu and Florentina Magda Enescu

***Abstract*—Falling is often an unexpected event that can affect the health and safety of persons and objects. Fall detection algorithms have been designed to take advantage of the multitude of smart devices that incorporate sensors capable of detecting a fall event. This is an overview paper that investigates the main components of a fall detection system implemented in the current literature and presents a test Android application for sensor data collection with the purpose of further implementing and testing fall detection algorithms.**

Keywords—fall detection, Android, smartphone, healthcare, sensors

DETECTING FAULT INJECTION VULNERABILITIES IN BINARIES WITH SYMBOLIC EXECUTION

Julien Lancia

***Abstract*—We propose a framework based on symbolic execution to identify automatically and consistently the effects of fault injection on embedded software at assembly level, or C (compiled to assembly) and Java (compiled to bytecode) binaries, for faults affecting the control flow or the values in memory. We implement our framework on top of the angr symbolic execution engine, with built-in support for various fault models (Stuck-at, Hamming weight, Unconstrained). We assess the performances of our framework on open source programs considering single and double fault injections, showing that it identifies all possible fault injections in a fraction of the time required by manual review.**

Keywords—security, symbolic execution, embedded software, fault injection

DEDUPLICATION DATA TECHNOLOGIES IMPACT ON THE BACKUP SYSTEMS IN INTELLECTUAL PROPERTY ORGANIZATIONS

Radu Costin Moisescu, Constantin Dorin Olteanu, Dorin Vasile Deac Suteu and Aurel Mihail Titu

***Abstract*—The scientific paper presents experimental research on testing deduplication technologies for data saved in centralized backup systems in IP organizations. This research details the impact of implementing data deduplication technology on backup and restore processes in the context of sustained growth in data volumes. The authors consider important to highlight all data backup mechanisms in order to ensure the management of scheduled backup sessions in accordance with the provisions of the ISO27001:2018 standard. The study focuses on comparing the performance of disk backup systems with SAS technology with and without the implementation of deduplication technologies. The basis of the study regarding the impact of the development of data deduplication mechanisms on the performance of centralized backup systems in these organizations is the analysis of the results of dynamic simulations. The authors consider that these particularly important aspects are presented in detail and with an applied research background can be an important contribution in the approached field.**

Keywords—computer systems, deduplication, intellectual property management, backup, disk volume

IMPLEMENTATION OF PD-PI CONTROLLER FOR BOOST CONVERTER USING GWO ALGORITHM

Hossein Shayeghi, Reza Mohajery, Nicu Bizon, Phatiphat Thounthong and Noureddine Takorabet

***Abstract*—In the field of conversion devices, the conventional boost converter has a wide variety of applications because of its broad changeable output voltage. Due to the nonlinearity circuit of this converter, it will express several nonlinear features when the circuit parameters are changed, achieving an unsteady output voltage and making the device sensitive to minor disturbances. This paper utilizes the Grey wolf optimization (GWO) algorithm to configure an optimum PD-PI controller employed in a boost converter. GWO performs better and consumes less processing time compared to PSO and GA. This mechanism controls the output voltage in response to changes in the input voltage and the load current. The proposed controller coefficients intend to achieve the lowest possible value for various time-domain performance indices, with a particular focus on the ISTAE index as the objective function; while utilized controllers' performance is measured using IAE and ITAE as evaluation functions. A comparison of the simulated results under various scenarios explains that the GWO based PD-PI controller works better than the PID controller in settling time and overshoot reduction.**

Keywords—Boost Converter, DC-DC Converter, GWO Algorithm, PD-PI Controller

OPTIMIZATION AND PREDICTION OF HYDROGEN CONSUMPTION FOR A FUEL CELL STACK USED AS BACKUP ENERGY SOURCE IN A DC MICROGRID

Nicu Bizon, Noureddine Takorabet and Phatiphat Thounthong

***Abstract*—In this paper the optimization and prediction of hydrogen consumption for a fuel cell (FC) stack used as backup energy source in a DC microgrid is approached. Power Tracking Control (PTC) is used for the FC stack to generate as much power as needed to compensate for the power flow balance on the DC bus of the DC microgrid (DCmG). Hydrogen consumption optimization will be implemented using an objective function that mixes fuel efficiency and electrical efficiency. The prediction can be made using the linear relationship between fuel consumption and load that was found for each PTC-based optimization strategy. This prediction implemented in DCmG helps the DCmG management system to ensure the hydrogen supply of the FC stack taking into account the fuel remaining in the tank by supplying or by powering the available electrolyzers.**

Keywords—fuel cell stack, electrolyzer, fuel optimization, fuel prediction, DC microgrid, power tracking control

A LOAD SHEDDING APPROACH FOR ISLANDED OPERATION IN INDUSTRIAL ELECTRICAL SYSTEMS

Florin-Constantin Baiceanu, Cosmin-Florin Acsinte, Ovidiu Ivanov,

Ciprian-Mircea Nemes and Bogdan-Constantin Neagu

***Abstract*—Industrial processes rely on continuous and reliable supply from the grid to achieve optimal operation and output. In the case of large sites, local generation is also used to ensure the continuous operation of critical equipment. Heavy disturbances occurring in the grid, such as blackouts and faults, can force the site to switch to islanded operation to maintain the functioning of critical equipment. This paper presents a load shedding approach based on Monte-Carlo simulation applied to a large industrial site in Romania, used to manage the safe islanding of a set of critical consumers in the presence of local generation. A case study shows that, for a load sampling rate of 1 second, stable operating configurations can be found for a time interval of up to 30 minutes.**

Keywords—load shedding, industrial site, islanded operation, Monte-Carlo simulation

STUDY REGARDING THE KNOWLEDGE NETWORKS IN THE EDUCATIONAL SYSTEM

Claudiu Pirnau, Liviu Daniel Ghiculescu, Radu Mircea Carp Ciocardia, Gabriela Parvu and Cornel Enciu

***Abstract*—The aim of this paper was to analyze the implementation and operation of a learning network based on the use of knowledge management in the context of communities, whose knowledge and expertise lead to situations similar to team-building success, when the team achieves more and more efficiently than a a similar group of self-employed people, generating a strong synergy of individual contributions, by coordinating the actions of all team members in order to achieve a common result, with minimal investment and costs. The communities that were the subject of the study consist of pre-university education units (high schools, technical, economic, military and national colleges) and university, respectively. The main objectives of the paper were to identify the needs and barriers encountered in the process of implementing knowledge management (integrated in a number of six categories of knowledge: Know-what, Know-how, Know who, Know why, Know where and Care why), based on which a practical guide will be developed for the implementation of knowledge-based management, at the educational level.**

Keywords—Knowledge Management, Knowledge Audit, Knowledge Flows, Knowledge Network

QUICK ANALYSIS OF THE NIST LIGHTWEIGHT CRYPTOGRAPHY STANDARDIZATION PROCESS FINALISTS

Fernando Georgel Birleanu and Nicu Bizon

***Abstract*—Following the final steps in the process of the National Institute of Standards and Technology (NIST) lightweight cryptography standardization, extremely helpful in constrained systems such as the continuously growing Internet of Things (IoT) with the 5G communications as a major actor, this paper aims to draw and summarize some key features and particularities of the final ten algorithms that remained in the competition of this standardization process. The ten final algorithms are analyzed in terms of parameters used, providing AEAD-only functionality or AEAD and hashing functionality and software and hardware performance. While software performance compares code size for the smallest implementations and timings for the fastest implementations on different microcontrollers versus NIST references (AES-GCM/SHA-256), hardware performance compares resources utilization, maximum frequency achieved and throughput versus NIST references (variants of AES-GCM and SHA family).**

Keywords—lightweight, cryptography, AEAD, hash, LUTs, throughput

IMPROVING WATER QUALITY USING AN INTELLIGENT ELECTRICAL DEVICE

Aurel Ștefan Pica, Isabela Elena Bănescu and Dan Constantin Puchianu

***Abstract*—In this paper we aim to emphasize the importance of water, to analyze the situation of intelligent devices for its purification and to propose effective solutions. Water supports life and livelihoods, and its quality is just as important as the quantity that meets the basic needs of people and the environment. Although it is a very important field, it has received little investment, scientific support and public attention in recent decades. The surface of the Earth is littered with this liquid without which there would be no life, occupying over 70% of the globe, so water quality is vital for all the roles it plays in our lives.**

Keywords—electrical device, purifier, water quality, smart home

AN IMPROVEMENT OF THE TIME METHOD FOR SIGNAL APPROXIMATION. ELECTROCARDIOGRAM CASE STUDY.

Marius Rogobete

***Abstract*—This research proposes an improvement of the graphic representation of a signal in order to interpret it better in automatic systems. For this purpose, in addition to the classical analytical points that graphically define the signal (minimum, maximum and inflection points) it is proposed to use a new class of points that represents the maximum deviation from the chord given by two adjacent signal definition points (e.g., between a minimum and next inflexion point). The Maximum Deviation Method (MDM) is explained in detail and the results are compared with the classical method of representation demonstrating a much better approximation of the real signal. The method was applied on the ECGs to obtain sets of points used as parameters in the learning process of ECG interpretation. As a result, parameters are used in the automated classification model, based on the ID3 tree identification algorithm. Using the MIT-BIH Arrhythmias database, the MDM algorithm was evaluated on ECG data, together with the Machine Learning model. Finally, the conclusions were presented by a comparative analysis with wavelet-based ECG interpretation methods, which demonstrates a good accuracy of this ECG analysis. Moreover, the simplicity of the proposed algorithm, which avoids frequency domain processing, allows its implementation in embedded systems with limited resources.**

Keywords—spatial domain signal analysis, signal recovery, signal parameters, ECG analysis

STATISTICAL ANALYSIS USING MACHINE LEARNING ALGORITHMS IN TRAFFIC CONTROL

Alin Serban and Madalin Frunzete

***Abstract*—Nowadays, urbanization has reached high levels, especially in large cities, leading to the modernization of people's lives, but another aspect is related to high energy consumption, pollution and especially the problem of congested traffic. The number of cars is growing in recent years, and without the right infrastructure, this is a big problem in big cities because it means a lot of time lost on the road by people, more fuel consumption and increasing the level of pollution. The problem of congested traffic is a topical one nowadays. Normal traffic for a road can be affected by any traffic sign, traffic light, snow, rain or road repair. If the factors mentioned above that can affect the traffic are known, and in addition, the situation of normal, daily traffic, is known, it is possible to predict and analyze the traffic in order to optimize it. In this paper we have presented an analysis and solution to this problem with the help of machine learning and GPS coordinates, which can nowadays come from a multitude of electronic devices and equipment. In order to have an adequate solution to the problem of traffic, especially at intersections, the geographical area of interest was divided on the basis of traffic as well as road structure.**

Keywords—Machine learning, GPS(Global Positioning System), Traffic control, Map matching, Open Street Map(OSM)

CONSUMER PROFILINGUSING CLUSTERING METHODSFOR GEOREFERENCED DECISION SUPPORT IN A WATER DISTRIBUTION SYSTEM

Diana-Andreea Arsene, Alexandru Predescu, Ciprian-Octavian Truică,

Elena-Simona Apostol, Mariana Mocanu and Costin-Gabriel Chiru

***Abstract*—Discovering the habits of consumers is essential for effective decision support in smart water networks. While smart water meters can provide detailed consumption data for individual households, additional information can be extracted based on the geographical coordinates, to highlight the distribution of consumer behaviors within a given area. In this paper, multiple processing stages are used to evaluate the available datacollected from a previous study. The OPTICS clustering method is used to cluster the data based on coordinates, while K-Means clustering is used to extract the consumer patterns for each identified zone. The standard deviation of the seasonal component is used to classify the resulting consumer behaviors from the least desirable to the most desirable, towards achieving more sustainable behaviors and operationsfrom the perspective of water resource management andurban water infrastructure.The results are promising towards the development of georeferenced decision supportsystems for water resource management.**

Keywords—Water Distribution System, K-Means Clustering, OPTICS Clustering, Decision Support System

THE RISE OF MOBILE DEVELOPMENT: A COMPARISON BETWEEN IONIC AND FLUTTER

Ovidiu-Constantin Novac, Cornelia-Mihaela Novac, Bogdan Ciora,

Cornelia Emilia Gordan, Gordan Ioan Mircea and Gyöngyi BujdosÓ

***Abstract*—A dive into the world of mobile development frameworks. An overview regarding the mobile technologies, in general but also a close look at two major mobile development frameworks, which are Ionic and Flutter. They are being analyzed at an individual level and furthermore, a comparison between these two technologies is taking place.**

Keywords—Mobile development, Ionic, Flutter

AN IMPROVED ALGORITHM FOR AN EFFICIENT VLSI IMPLEMENTATION OF TYPE IV DST USING SHORT QUASI-BAND CORRELATION STRUCTURES

Doru Florin Chiper and Laura Teodora Cotorobai

***Abstract*—This paper introduces an improved algorithm used for an efficient VLSI implementation of type IV Discrete Sine Transform. The algorithm has a low complexity from a computational perspective and it can be implemented efficiently in parallel by using linear systolic arrays. The improved algorithm that is proposed in this paper is the key for an efficient implementation in VLSI that has a low hardware complexity, offering a high throughput, whose mapping on the linear systolic arrays is done by using a low number of I/O channels with a low bandwidth. The proposed method uses 6 short quasi-band correlations which are computational structures which can be mapped efficiently on systolic arrays that are linear, thus leading to an efficient VLSI implementation characterized by regularity, modularity and of course short interconnections offered by using the aforementioned structures**

Keywords—VLSI algorithms, VLSI architectures, discrete transforms, discrete sine transforms, systolic arrays

OVERVIEW FOR PARALLEL PARTICLE SWARM OPTIMIZATION ALGORITHMS (PPSO)

Wisam Mahdi and Necmi Taspinar

***Abstract*—The increasing computational cost in complex optimization problems that have a large size resulted in the development of optimization algorithms in parallelization. PSO's basic architecture inherits natural parallelism and the acceptance of quick processing machine has made this mission pretty convenient. The emergence of parallel PSO (PPSO) as an algorithm has been well accepted by the researchers. Parallelizing algorithm PSO has been used in a number studies so far. This proposed work provides an overview of the parallelism of the PPSO**

Keywords—Parallel Particle swarm optimization(PPSO), Swarms intelligence based algorithms, Large size complex optimization problems.

WASTEWATER TREATMENT PLANT SECURITY ANALYSIS

Mariam Ibrahim and Abdallah Al-Wadi

***Abstract*—Automation in general means less intervention from humans, which results in reliance and being dependent on automated processes and programmed instruments that continuously stay running and conduct various operations. This results in repetitive behavior which can be exploited as it is predictable. These cyber-physical systems are prone to cyber-attacks which can be challenging to tackle down and figure out their patterns due to the integration of Internet of Things into such automated operations. Wastewater treatment plants (WTPs) can be difficult to manage, the treatment process is crucial as water that is drinkable or reusable by recycling is scarce and hard to attain. Meanwhile, simultaneously making it more prone and susceptible to cyber-attacks caused by exploiting vulnerabilities. Securing such cyber-physical systems requires an understanding of vulnerabilities in the system and how they may be exploited. In this paper, an attack graph analysis and simulation of the treatment process and its vulnerabilities are investigated to prevent such incidents from occurring and minimizing the damage.**

Keywords—wastewater treatment, security analysis, attack graph

GIS-BASED INTEGRATED SYSTEM WITH INTERACTIVE DIGITAL MAP FOR ARCHAEOLOGICAL HERITAGE PROTECTION

Constantin Viorel Marian, Mihaela Iacob and Dan Alexandru Mitrea

***Abstract*—This paper presents the Interactive Digital Map, the main result of an experimental-demonstration research project supported by public funds, won following a national competition.**

The map was planned to support the activity of protecting the archaeological heritage in Romania and to facilitates the access of specialists and the general public to up-to-date information on the archaeological heritage, gathering together in a synthetic form previously unstructured information, different in terms of data quantity and quality, stored in different media and formats (paper, digital, with or without geospatial location) and within several types of institutions without interconnection (ministry of culture / county directorates for culture, museums and research institutes, etc.).

The Interactive Digital Map was designed from start to become a key tool for archaeological heritage integrated management facing the increased pressure from contemporary society, whose economic and real estate development needs are often at odds with the protection and conservation activity of the archaeological heritage.

Keywords—GIS, interactive digital map, archaeological heritage, geospatial representation

REAL-TIME BETTING ALGORITHM FOR TENNIS MATCHES

Cosmina Rosca and Adrian Stancu

***Abstract*—The paper focuses on a new tennis betting framework with high efficiency in return for investment. The algorithm proposes a set of rules to guarantee superior returns than the initial investment. The present work provides a real-time game strategy that analyzes the evolution of the betting odds. The initial context is analyzed using a mathematical model that includes several performance parameters of the two players. Using the initial context, one of the proposed rules will be applied. Next, depending on the real-time score evolution, another rule will be applied. At the end of the game, the investment will be returned or a low financial profit will be earned.**

Keywords—artificial neural networks, algorithm, betting, tennis

THE COMPARISON OF DIFFERENT CONTROL METHODS FOR DUAL-ACTIVE-BRIDGE CONVERTER

Onur Kircioglu, Murat Ünlü and Sabri Çamur

***Abstract*—The dual-active-bridge (DAB) dc-dc converter has been increasingly used in recent years. In this paper, The DAB is investigated for different switching modulation and control strategies. Firstly, a 3.3-kW SiC-based DAB converter is built in MATLAB/Simulink, and the simulation studies were carried out for these recent state-of-the-art modulation and control strategies. Finally, the obtained results are presented for each different Modulation, and efficiencies are compared with each other.**

Keywords—Dual Active Bridge (DAB), SPS, EPS, DPS, TPS, Bidirectional Converters, Chargers

JAVA APPLICATIONS FOR ENGLISH VOCABULARY LEARNING

Alexandru Ene and Cosmin Stirbu

***Abstract*—We present in this paper a suite of four software applications that will help a user to learn the basic vocabulary (about 6000 words) of the English language. The software program asks the user to choose a word from a list of other words. The originality of these applications consists mainly in the modality in which the choices for a tested word are selected. The software applications are graphical applications written in Java programming language.**

Keywords—vocabulary learning, intelligent selection of choices, string similarity, Jaro algorithm

EFFECTS OF SUPPLY CHAIN VOLATILITY ON SMART GREENHOUSES: BALANCING COST & SYSTEM AVAILABILITY

Yasmine Elnadi, Tarek Refaat, Ramez Daoud, Hassanein Amer and Nora Ali

***Abstract*—This paper studies a 200m×40m greenhouse divided into five 40m×40m cells. To reduce cost, it is important to find the minimum number of Access Points (APs) required for correct operation. A 2% maximum Packet Loss Rate (PLR) is used as a criterion for successful communication between sensors, controller, and actuators. Riverbed simulations are conducted, to indicate that the specific greenhouse under study can safely survive three AP failures provided the remaining two APs are in (or relocated to) specific positions, for optimal coverage. Furthermore, with only one AP in the middle of the greenhouse, the system's performance is marginally acceptable. Another important contribution, of this research, is the proposal of a technique to help system designers manage the suitable balance between system cost (from the point of view of APs) and cost of downtime. System steady state availability is used to measure downtime. Finally, a use case is presented, demonstrating the point of diminishing returns, where investing in more APs was not justified from a cost point of view, with an insignificant impact on steady state availability.**

Keywords—precision agriculture, greenhouse, Wi-Fi, networked control system, availability, Markov, supply chain

AN APPROACH TO IDENTIFYING DIFFERENT TYPES OF EEG EPILEPTIC SIGNALS BASED ON HIGHER-ORDER SPECTRA (HOS) FEATURES

Mădălina-Giorgiana Murariu, Daniela Tărniceriu, Oana-Diana Hrișcă-Eva and Anca-Mihaela Lazăr

***Abstract*—The aim of this research consists in finding an efficient feature vector in order to classify the type of seizures of epileptic patients. The handled database consists of focal and non-focal EEG recordings of epileptic patients. A novel method based upon higher-order spectral analysis is performed. Bispectrum and bicoherence are used for an accurate identification of the type of epileptic seizure, so that epileptic patients could undergo surgical resection of epileptic area. This approach consists in a new way of forming feature vectors, from 10% bispectrum and 90% bicoherence. In the classification stage, the k-Nearest neighbors (kNN) classifier was used, because it performs the best, leading to a maximum value of the classification rate of 99.55%, to a sensitivity of 100%, and a specificity of 99.09%.**

Keywords—epilepsy, seizure, electroencephalographic signal, focal EEG, non-focal EEG, bispectrum, bicoherence, classifiers

VIRTUAL REALITY APPLICATION FOR ACUTE PAIN THERAPY - USER EXPERIENCE

Ioan Alexandru Bratosin, Nicolae Goga, Andreea Iuliana Luca, Bujor Pavaloiu and Ioana Podina

***Abstract*—The use of Virtual Reality applications under the form of serious games is gaining traction in the medical domain. The development is pushed by new technological advancements in immersive Virtual Reality technology, improved game-engines and improved hardware capabilities. The user experience is an**

important aspect that needs to be taken into consideration while developing serious games for medical purpose. In this article we show the methods we have applied in our custom-made serious game application for pain therapy, in order to obtain and to analyse relevant user experience data. The two main tools that we have used were the System Usability Scale and the Short User Experience Questionnaire. We have used the mentioned tools to get information regarding the complexity of our system, integrity, usability, ease of use and most importantly the effects on pain. Other information that we took in consideration were game

performance, user friendliness, user motivation, and user enjoyment. The results show that our initial prototype has a consistent and sustainable development as well as a noticeable effect on reducing the pain felt by the users.

Keywords—virtual reality, serious games, pain relief, user experience

MEASURING PSYCHOLOGICAL STRESS RATE USING SOCIAL MEDIA POSTS ENGAGEMENT

Tiromika Y. Lanerolle, Withanage Tharukshi Hansika Perera, Yohan Diluk Shamin Andrado, W.A.P.C. Wickramasinghe, Pradeepa S. Bandara and Jenny Kishara

***Abstract*—In psychology, stress is a feeling of feelings and pressure. Stress is a type of psychological pain. Literature has showcased that mental health stages like anxiety and depression might be identified by the social media post captions, emojis, and the way users communicate with others. Among the main underlying causes and correlates of illnesses and mental health problems is stress. In this study, we explore the conclusions and posts of psychological stress using the data of social media users, who use and share their Facebook accounts. In the first step, a user who are stressed often post about exhaustion, losing control, increasing self-focus, and physical pain using their post captions, emojis, and post images they usually post on Facebook. Collect and read all the posts that are fetched via the social networks and then measure the stress level against different factors. Then the system demonstrates how the user interacts with the intelligent custom virtual AI counselor application thus innovated can be trained and be scaled to measure against the factors. Data can be collected by using Graph API, followed by machine learning techniques and natural language processing (NLP) techniques, and an intelligent custom AI virtual application to measure stress levels by different factors. Also, use AI techniques to build health guidance plans for everyone with the help of the above collections. And reacting to the simple games is another factor to measure a highly accurate result in stress level. Natural Language Processing (NLP) is commonly used to implement smart communication virtual counselor agents. Scaled social media-based stress measurements outperform survey-based stress measurements, held up against involving a combination of social and demographic factors such as gender, age, race, income, and education. A discussion of the implications of using social media as a new tool for monitoring stress levels and developing health-related advice for individuals is presented in the conclusion.**

Keywords—Natural Language Processing, Natural Image Processing, Social media platforms, Data Analysis, Machine learning, Deep learning

LOW-COST X-BAND MICROWAVE OSCILLATOR, MODULATOR AND DETECTOR FOR EDUCATIONAL PURPOSES

Grigore-Adrian Iordachescu and Marian Raducu

***Abstract*—This paper presents step by step guidelines for the construction of low-cost X-band oscillators, modulators and detectors. The devices presented in this paper will all operate on waveguides. These devices are indispensable in microwave training kits, but they are also the most expensive components of these kits and the first to break in intensive use.**

Photos from construction and testing of these low-cost devices are presented, demonstrating the easy fabrication and efficient use of these devices in educational experiments treating microwave telecommunication systems. As the majority of components were taken from commonly used household objects, the total cost of fabrication for all three devices is kept under 25USD.

Keywords—microwave oscillator, Gunn diode, PIN modulator, Schottky detector, waveguides, cavity resonator

COMPLEX ELECTRONIC SYSTEM FOR MONITORING, WARNING AND PREVENTION OF WATER STRESS AND PESTS DETECTION IN AGRICULTURAL CROPS

George Cosmin Stanica, Petre Anghelescu, Alin Gheorghita Mazare,

Laurentiu Mihai Ionescu and Gheorghe Serban

***Abstract*—This paper describes a complex electronic system of equipment and services designed for real-time monitoring of agricultural crops in order to detect risk factors that influence pests occurrence as well as crop water stress. The system will include a multi-sensory platform that will collect environmental parameters such as temperature, humidity, atmospheric pressure, precipitation level, solar radiation, speed, and wind direction, soil parameters such as temperature, humidity, salinity, frost detection and plant parameters such as leaf moisture duration, canopy temperature, as well as intelligent data collection, analysis and processing at a central server, which will also serve as a service provider to report to potential customers: researchers and farmers.**

Keywords—image analysis, pests detection, pheromone trap, real-time monitoring, water stress

SOLAR CELLS - ALTERNATIVE FOR ENERGY DEMAND

Valentin Calinescu, Mihai Oproescu, Vasile-Gabriel Iana and Valentin Alexandru Stan

***Abstract*—This paper represents a study on the commercial solar cells in terms of knowing the structure and techniques of fabrication. At the same time, the paper presents the role of solar cells tin photovoltaic panels as answer to contemporary energy demand. In this context, the production of solar cells become needs adaptation and implicit needs, by benefit from news experimental researches and by expanding the possibilities of technological development. The first part of the study presents the importance of research in the domain of transforming solar energy in electric energy, dynamics of researches, power potential in word versus Romania. The second part highlight characteristics of commercial solar cells available on the market: type, efficiency, film and electrode.**

Keywords—solar cells, photovoltaic, cell type, advantages, energy

STUDY OF THE INFLUENCE OF PROCESS PARAMETERS ON BIOMASS GASIFICATION USING UNISIM DESIGN ENVIRONMENT

Cristina Popa, Elena-Emilia Oprescu and Marian Popescu

***Abstract*—Gasification is the thermal process that converts biomass into useful combustible and advantageous gaseous fuels or into chemical raw material that can be burned or used to produce chemicals with added value. The combustible gas contains carbon monoxide, hydrogen, carbon dioxide, methane, water, nitrogen.**

The aim of the paper is to develop a simulation model of biomass gasification process using UniSim Design environment. A steady-state model was elaborated for hardwood biomass to study the effect of variable process parameters on the products syngas composition. Results show that CO yield decrease with enhancement of water content, leading to a higher CO2 yield, due to the reforming reaction. The mole fraction of CO shows a decrease from 0.13 to 0.02 mole fraction, as the air flow rate increases from 1 to 15 kg/h, meanwhile the hydrogen content rises.

Keywords—biomass, UniSim Design, syngas, simulation, biofuel

FPGA IMPLEMENTATION OF SIMON-128 CRYPTOGRAPHIC ALGORITHM USING ARTIX-7

Ridha Ghayoula, Jaouhar Fattahi, Amor Smida, Issam El Gmati, Emil Pricop and Marwa Ziadia

***Abstract*—FPGA is a hardware architecture based on a matrix of programmable and configurable logic circuits thanks to which a large number of functionalities inside the device can be modified using a hardware description language. These functionalities must often be secured especially when the context is sensitive (military, banking, medical, legal, etc.). In this paper, we put forward an efficient implementation of SIMON's block cipher algorithm using Xilinx Vivado 2018.2. The proposed design is analyzed through simulation on Xilinx Artix-7. A prototype of our design is implemented using the xc7a35tcsg324-1 FPGA chip. Performance and results are discussed.**

Keywords—Artix-7, SIMON-128, FPGA implementations, Cryptography, Security

GRAPHIC MODELING OF THE COMPUTER SYSTEM MANAGEMENT PROCESS WITHIN A PUBLIC ORGANIZATION PROVIDING SERVICES TO CITIZEN

Constantin Dorin Olteanu, Radu Costin Moisescu, Dorin Vasile Deac Suteu and Aurel Mihail Titu

***Abstract*—Quality management in public organizations is an increasingly popular concept around the world. In the field of public administration services, quality requirements are an increasing priority. Digitization of public administration is a solution to increase the quality of services. In this context, the existence and need for an computer system within these public organizations are becoming a necessity. Efficient quality management can significantly increase the quality of services provided to citizens by public organizations. The scientific paper proposes a new perspective, within a public organization in quality management, through the process-based approach. Within this work, the graphic modeling of a process from this organization was made, namely, the computer system management process.**

Keywords—process, graphic modeling, computer system, data protection, network protection

AN APPROACH OF DEMPSTER-SHAFER DECISION FUSION TO DIAGNOSE COVID-19 IN CHEST X-RAY IMAGERY BY USING CONTROLLED ASYMMETRIC TRAINING OF THE TWO CNNS ENSEMBLE

Victor-Emil Neagoe and Gabriela-Loredana Ghenea

***Abstract*—This paper proposes a model of Dempster-Shafer decision fusion based on controlled training of the ensemble of two Convolutional Neural Networks (CNNs) by the asymmetry parameter k, defined as the ratio of the numbers of training data per class assigned to each CNN module. The proposed model is dedicated to COVID-19 diagnose in chest X-ray imagery. We have considered two CNN modules with identical architectures. First CNN module has been trained with 2837 COVID-19 labeled images and (2837/k) NON-COVID images. Second CNN module has been trained with (2837/k) COVID-19 labeled images and 2837 NON-COVID images. We have evaluated the influence of control parameter k on the diagnosis performances. As a result of Dempster-Shafer fusion, for k=2.1, one obtains a maximum Overall Accuracy (OA) of 95.18% The above performance is clearly better than the corresponding OA obtained by a single CNN (92.26%) for the same k, and at the same time it is better than OA obtained by any single CNN module for any considered k. Moreover, one can remark, that by controlled training, for k=20, a CNN module can lead to an incredible low Missing Alarm Rate (MAR) of only 0.63%!**

Keywords—Dempster-Shafer, decision fusion, convolutional neural networks, COVID-19 diagnosis, chest X-ray imagery

MODIFICATION OF SPWM-BASED CONTROLLER FOR VOLTAGE SOURCE INVERTER

Benedict Addo-Yeboa and George Owusu

***Abstract*—Conventional Sinusoidal Pulse Width Modulation (SPWM) topology is one of the essential Pulse Width Modulation (PWM) topologies used in Voltage Source Inverter (VSI) applications such as adjustable speed motor control, Uninterrupted Power Supplies (UPS) and Photovoltaic (PV) Systems. Although conventional SPWM is used in VSI applications, the output voltage waveform of VSI based on this topology contains a high content of harmonic distortion. Hence, this paper presents a modified SPWM topology with an Artificial Neural Network (ANN) technique. The ANN technique was applied to minimize the Total Harmonic Distortion (THD) present in the output voltage waveform of the VSI. The proposed system was designed and evaluated with MATLAB/Simulink software. Based on the comparative evaluation, the paper proves that the proposed system contributes to a 9.1% reduction in the THD value of a three-phase two-level VSI's output voltage waveform.**

Keywords—Harmonics, SPWM, ANN, Inverter, Simulink

MANAGEMENT OF PV HOME CHARGING STATION USING BLOCKCHAIN TECHNOLOGY. CONCEPT, SOLUTIONS

Florentina Magda Enescu, Maria Simona Raboaca, Nicu Bizon and Valeriu Manuel Ionescu

***Abstract*—With the increase in global warming, the problem of reducing carbon emissions arises. A significant part of the harmful emissions is due to the transport sector. As the number of electric vehicles increases, public charging stations will become more and more crowded. Since today we are facing an increase in the price of energy, this paper suggests the use of photovoltaic panels for energy production. The comparison between the costs of a car that uses fuel and an electric one along with the environmental problems and the use of a charging station placed at home will encourage the purchase of electric vehicles. The main goal of the paper consists of a multicriterial analyze between fuel of classical vehicles and the energy for electrical vehicles that are supplied for home charging stations that require green energy from photovoltaic panels. Also using this concept we can share the home charging station with all the user from intelligent applications that is integrated with blockchain technology. In this concept we are propose to use blockchain technology for acquisition data and the management of all the date with trust.**

Keywords—photovoltaic panels, electric vehicle, home charging station, energy, blockchain technology

AN IMPROVED AUTOMATIC PERIODIC NOISE REMOVAL ALGORITHM FOR MICROSCOPIC IMAGES

Marius Ionita and Henri Coanda

***Abstract*—In some cases a periodic noise can be induced in microscopy images which results in quality degradation and the appearance of repetitive patterns on the micrograph. The periodic noise can have multiple frequency components and all of them must be eliminated to reduce the effects on the image. The low frequency noise components are the hardest to be identified and corrected in the frequency domain. The proposed approach analyzes the DFT spectrum, detects the noise components and corrects their magnitudes with different methods considering if the components are of low frequency or not. The low frequency correction method is designed to affect the spectrum as less as possible.**

Keywords—periodic/quasi-periodic noise, frequency domain filtering, Discrete Fourier Transform

ON FEATURE SELECTION FROM TIME-FREQUENCY IMAGES

Dorel Aiordachioaie

***Abstract*—The objective of the paper is to evaluate features of time-frequency images for change detection purposes. The features are obtained by extrapolation from time and frequency domain. From time domain six feature are considered, based on statistical moments. From frequency domain, the spectral flux and the spectral flatness are promoted. The feature selection process is based on the variance of the features, for the analyzed signal. The features with high variance are considered important and have assigned greater weights. Change detection is exemplified with a simple cusum (cumulative sum) criterion. The results obtained by computer-based simulations with real recorded signals reveal reliable discrimination of the change in the structure of the test signal.**

Keywords—Time-frequency Transform, Feature Selection, Image Processing, Signal Processing, Change Detection

CLOUD COMPUTING APPROACH FOR ECG DIAGNOSE MODULE

Mohammed Almalchy, Ahmed Salih Al-Khaleefa, Murtadha A. Alazzawi, Ahmed Alshammari, Hayder M. Albehadili and Haider A. Al-Wzwazy

***Abstract*—This article investigates the cloud computing models and their advantages and disadvantages, discussing the association between them and web-apps of healthcare monitoring systems. Also, we present the major integration mechanism of some already developed medical MATLAB modules such as an innovative ECG diagnosis algorithm within a healthcare monitoring system that has been developed using C# language and Visual studio environment. A comparative performance analysis based on call function durations and security aspects has also been introduced for both implementation approaches (with MS Azure and without it), emphasizing the advantages of cloud SaaS (Software as a Service) technology.**

Keywords—healthcare monitoring system, Cloud service models, ECG diagnosis modules

EFFICIENCY OF NANOSTRUCTURED LAYERS DEPOSITED ON SOLAR CELLS - HARDWARE SYSTEM PROPOSAL

Valentin Calinescu, Mihai Oproescu, Vasile-Gabriel Iana, Ovidiu

Constantin Novac and Mihaela Cornelia Novac

***Abstract*—This article aims to highlight the role of layers deposited on solar cells. By depositing different materials, the energy efficiency of the solar cells can be increased or decreased. In order to quantify how much the efficiency of a solar cell increases or decreases depending on the deposited layers, a hardware system is proposed to acquire specific parameters depending on different operating scenarios: solar radiation level, temperature, value of the load connected to the solar cell output. . The solar cells to be analyzed will be covered with nanostructured layers that have different sizes and concentrations of material.**

Keywords—efficiency, nanostructured layers, solar cells, hardware design

OPTIMIZING PROCESS PARAMETERS USING PREDICTIVE CONTROL

Cosmin Ivan and Mihai C. Arva

***Abstract*—This paper presents the advantages of using multivariable predictive control in optimizing process parameters for a vacuum distillation column. The paper also exemplifies solutions for the integrated implementation of modern control methods and the ability to view and use process parameters in real time in a production management system. Characterized by a wide range of applicability, modern control methods can be found in almost all types of applications, from household equipment to industrial process control. Predictive control is an important element in current industrial process control techniques and, in order to achieve it, a justification of both performance and financial point of view is required. As an experimental part, a case study on optimizing the process parameters for a vacuum distillation column is presented. The results of the benefit study of the proposed control method are also presented.**

Keywords—predictive control, industrial process control, objective function, PID

THE CORRELATION BETWEEN INTERNET USER SEARCHES AND BLOCKCHAIN TECHNOLOGY

Mironela Pirnau, Iustin Priescu, Daniela Joita and Catalina Priescu

***Abstract*—The purpose of this paper is to analyze the impact of blockchain technology on Internet user searches. Given that current IT trends are focused on blockchain technology, artificial intelligence, the Internet of Things, electronic voting, large volumes of data, transportation, and smart cities, we wanted to analyze the importance of the terms "blockchain, blockchain technology, blockchain and artificial intelligence, blockchain and IoT" at the level of Internet searches made by users. Our research was based on the analysis of the distribution of the above-mentioned keywords in the volume of user Google searches and on the identification of the behavior of users regarding the finding of certain categories of information for the term "blockchain". In the present research we tracked the behavior of users' searches on the Internet, by conducting the text analysis accompanied by a latent semantic analysis, and we examined the relevance of long-tail keywords retrieved through Keywords Everywhere tool.**

Keywords—blockchain, data analysis, word frequency, correlation, similarity

DATA COLLECTION AND COMMAND MECHANISM FOR MANAGEMENT OF NETWORK RESOURCES

Raluca Stefania Lungu and Constantin Viorel Marian

***Abstract*—It is a well-known fact that the evolution of data storage has been significant in recent years. Even though the performant devices that are currently on the market have a large data storage capacity, some people, most often companies, use data storage services. Most of information that is needed to be stored has a high level of confidentiality, therefore this is one of the main reasons why a lot of companies choose this, alongside the high volume of data that they can't manage.**

This paper is part of a project that proposes an idea of implementing an Artificial Intelligence algorithm that manages the data which has to be distributed to a number of servers present in a data room.

This paper proposes an improved data collection procedure during the initial phase of user behavior network resource allocation. The information that needs to be stored may or may not overload the destination server; the algorithm would detect when a server/router is close to memory insufficiency and provide extra core to the supervised device. The present paper focuses on how customer information will be obtained, resulting in the shift in resources, this being the initial stage in putting the final application/project into action.

Keywords—Artificial Intelligence, Network, Virtual Machine, Machine Learning, Expert System, Cloud, Data center

APPLICATION OF MULTI-OBJECTIVE ARTIFICIAL BEE COLONY ALGORITHM TO SPECTRAL AND ENERGY EFFICIENCIES TRADE-OFF IN MASSIVE MIMO SYSTEMS

Burak Kürşat Gül and Necmi Taşpınar

***Abstract*—The efficient use of spectrum and energy in cellular communication systems has become extremely important. However, it is not easy to increase spectral efficiency and energy efficiency together, as they are in conflict with each other. In this paper, spectral and energy efficiencies trade-off optimizations have been carried out in the sample of massive multi-input multi-output system, which is known to be successful in spectral efficiency and energy efficiency issues. The multi-objective version of the artificial bee colony algorithm has been applied to the problem, and the results have been compared with the other intelligent optimization techniques, the multi-objective genetic algorithm, multi-objective differential evolution algorithm and multi-objective bat algorithm. The evaluations have shown that the multi-objective artificial bee colony algorithm is more successful than other algorithms compared.**

Keywords—Spectral efficiency, Energy efficiency, Massive MIMO, Intelligent optimization

IMPROVED SPI CONTROLLED, LOW-VOLTAGE, HIGH SPEED, MULTI-CHANNEL SWITCH

Ionelia-Bianca Brezeanu, Cătălin Botezatu, Florin Drăghici and Gheorghe Brezeanu

***Abstract*—An improved architecture of multi-channel analog switch with serial digital interface is proposed. The circuit including 8 individually controlled, single-pole, single-throw (SPST) switches, commanded through SPI interface, is proved to operate at a serial clock frequency up to 2.5 MHz and an input rise/fall time over 4 µs, respectively, for different supply and temperature ranges. Also, the data setup time or minimum reset pulse width parameters are improved. The approach in designing and simulating this circuit is further detailed throughout the paper.**

Keywords—SPI protocol, SPST, analog switches, digital interface

CAT SWARM OPTIMIZATION FOR SOLVING THE N-QUEENS PROBLEM

Clara Barbu and David-Traian Iancu

***Abstract*—Many swarm intelligence algorithms study the behavior of animals and make animal-based systems for solving various tasks. Cat swarm optimization (CSO) is a swarm intelligence algorithm which was originally inspired by the resting and tracking behaviors observed naturally in cats. The N-Queens problem is a classical and complex constraint satisfaction problem which has been used as a benchmark for testing AI techniques for years. This paper aims to adapt the original CSO algorithm to the N-Queens problem by replacing the continuous addition/subtraction operations with swapping operations. The results report very fast convergence at smaller numbers of queens and point towards quicker convergence than similar work at larger numbers of queens, with improvements still needed for perfecting the algorithm.**

Keywords—swarm intelligence, cat swarm optimization, N-queens problem, swapping

SIMULATION OF THE AUTOMATIC CONTROL SYSTEM FOR PRODUCTS QUALITY FROM A DEETHANIZER COLUMN

Abdul Rahman Nawar, Cristian Patrascioiu and Marian Popescu

***Abstract*—Simulation is an efficient and inexpensive tool for testing automatic systems. The paper presents the authors' research in the field of simulation of automatic systems for quality control of the separated products in a distillation column. The used simulation environment is Unisim Design, the features of this environment allowing the implementation of a wide range of computational relationships. The proposed automatic system is designed to feedforward control the quality of the products. The control algorithm is based on the Fenske-Gilliland-Underwood relations, being adapted for multicomponent mixtures. The authors' efforts were oriented towards the substantiation of the programming actions, in the Unisim Design environment, of the computational relations associated with the controller.**

Keywords—simulation, Unisim Design, feedforward controller, quality control

POWER-FOLLOWING STRATEGY FOR MICROGRIDS BASED ON MULTIPLE RENEWABLE/FUEL CELLS SYSTEMS

Nicu Bizon, Noureddine Takorabet, Phatiphat Thounthong, Elena Carcadea, Maria Simona Raboaca and Ioan-Sorin Sorlei

***Abstract*—The field of microgrids based on renewable energy sources (RES) is considered as possible solution for the energy crisis. Different renewable energy alternatives in the solar and wind areas are analyzed in the literature in order to be implemented in buildings (specially on the roofs of the residential houses and buildings of cities), which would create a micro distributed generation on a large scale based on the prediction of data collected, with and without support of a fuel cell system (FC) as back-up energy source. In this paper we analyze three microgrids that exchange energy through the energy market to ensure the operation of the battery in sustained charging mode, with clear advantages in the size of the battery pack and its life. To overcome energy conflicts (such as energy congestion contradiction and energy-related economic and environmental conflicts) and renewable energy uncertainty in order reach an optimal compromise between energy requirements in microgrid, the power-following strategy will be used. The advantages of using hydrogen-based energy storage systems are presented, but the strategy for connecting to the general distribution network is not discussed here**

Keywords—renewable energy source, fuel cell system, energy storage system, microgrid, power-following strategy

BEHAVIORAL INTENTION TO USE SMARTWATCHES: A CASE STUDY

Irina Cristescu, Dragos Daniel Iordache and Cristian Tirlea

***Abstract*—In the context of a fast-aging population smartwatches respond to healthcare and assistance needs, which is an advantage when dealing with the older population. The present study focuses on proposing an UTAUT model for elderly smartwatch adoption. The proposed factors are defined and corresponding hypotheses concerning the relationship between the factors that contribute to the adoption of smartwatches among older adults are formulated. The model investigates the role of design aesthetics (DE), performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC), behavioral intention to use (BI) in elderly's acceptance of smartwatches. The results showed that DE, EE, PE and FC have a direct effect on BI. Among these factors FC has the great effect on the behavioral intention to use smartwatches.**

Keywords—IoT, smartwatch, acceptance, UTAUT, healthcare

CONSIDERATIONS ON THE KINEMATICS ANALYSIS OF AN EOD ROBOT'S MANIPULATOR

Toma Vlad, Gheorghe Olaru, Amado Stefan, Marin Lupoae, Daniel Constantin and Cristian Molder

***Abstract*—This paper presents the kinematics numerical analysis of an EOD robot' manipulator, emphasizing the complex requirements for designing and construction of an EOD robot's manipulator. Hence, in order to determine the manipulator's end effector position in real word coordinate system, an algorithm of direct and invers kinematics is presented. In order to fulfil the EOD mission's requirements, the power of the DC motor necessary to act on kinematical links is computed using a numerical solution.**

Keywords—robot, EOD, manipulator, kinematics, disruption

OVERVIEW ON ELABORATION AND CHARACTERIZATION OF NANOSTRUCTURED OXIDES FOR SOLAR CELLS

Valentin Calinescu, Oproescu Mihai, Iana Vasile Gabriel and Valentin Alexandru Stan

***Abstract*—Nanomaterials are currently a topic of particular interest on the part of researchers, on a part because of the perspectives that their synthesis and characterization have open up in research, but especially because of the applications they have in many areas such as catalysis, water purification, energy storage, fuel cells, sensors, optoelectronic devices or medicine. In this paper there are presented the main nanostructured oxides used in the researchers of deposition thin films on solar cells. ZnO, TiO2, MgO, SiO2, In2O3 and CuO elaboration by sol-gel and spin-coating is conditioned by the interaction between the liquid phase and the substrate especially during the initial steps of the process.**

Keywords—solar cell, substrate efficiency, precursors, oxides, characterization

IDENTIFY SOLUTIONS FOR STIMULATING RAIL FREIGHT TRAFFIC USING THE CONTENT ANALYSIS METHOD

Desdemona Isabela Scarisoreanu and Liviu Daniel Ghiculescu

***Abstract*—The paper focuses on the application of the Content Analysis Method in the case of multimodal freight transport, in order to achieve the goals of the European Green Deal. According to the provisions of this European Union strategy, rail freight traffic will increase by 50% by 2030 compared to 2015. The goal is to ensure the transfer of goods from the road system to the railway network, in order to reduce pollution and to decongest road traffic.**

Keywords—green deal, multimodal freight transport, content analysis method

APPLICATION OF HARRIS HAWKS OPTIMIZATION (HHO) BASED ON FIVE SINGLE OBJECTIVE OPTIMAL POWER FLOW

Murtadha Al-Kaabi, Jaleel Al Hasheme, Virgil Dumbrava and Mircea Eremia

***Abstract*—This article introduces one of the recent meta-heuristic algorithms nature-inspired called Harris Hawks Optimization (HHO) to solve optimal power flow (OPF) problem in power systems. Generation cost (GC), emission (E), active power loss (APL), voltage deviation (VD), and the indicator of voltage stability index (L-index) are the main aims that will be optimized as objective functions in this study. To evaluate the performance of HHO algorithm, IEEE 30 bus power system have been tested with five studied cases. In addition, the numerical results obtained from this method are compared with recent optimization methods have been reported in the literature. These results refer to the ability of HHO algorithm to find better optimal control variables. The results obtained of this paper using HHO algorithm are: 800.1853 $/h, 3.1232 MW, 0.2183 ton/h, 0.1395 p.u., and 0.1123 for generation cost (GC), active power losses (APL), emission (E), voltage deviation (VD), and indicator of voltage stability index (L-index), respectively.**

Keywords—Harris Hawks Optimization, Generation cost (GC), Active Power Losses (APL), Emission (E), Voltage Deviation (VD), indicator of voltage stability index (L-index).

NOVEL CERAMIC PLATE DEFECT DETECTION USING YOLO-R

Andrei-Alexandru Tulbure, Adrian Tulbure, Cosmin Covaciu, Ioan Szabo and Eva Dulf

***Abstract*—The worker shortage that is coming in the future forces factories to develop automated solution for all manual labour that is still performed nowadays. Deep learning based visual inspection solution have provided great results in the last decade warranting further investments in this area. The amount of data available is the sole bottleneck of these systems. Enough data and the model can confidently replace human workers. Not enough data and the project will implode. For stoneware and ceramics manufacturers, visual inspection is a critical task for the quality of the products. Being high volume, a fast inspection system is needed. Accuracy is also a critical threshold. It is mandatory to be at least as accurate as a human quality inspector. In this work we propose a fast, accurate and medium cost defect detection solution based on the YOLOR model. The original object detection model is state of the art when it comes to model evaluation on the open sourced COCO dataset. The version derived from it for the task of defect detection is trained on ceramic plate defects, achieves up to 0.354 validation mAP at an intersection of union(IoU) of 0.5 at 100 epochs. Judging by speed, the model comfortably processes a frame in 33ms on a consumer RTX3070 GPU. Furthermore, the critical aspect of the development process is building a large dataset of more than 100.000 samples and constructing a data engine that is capable of handling all this data. Other important tasks are the: model development process, single or multi-GPU training, deployment via a pilot line, testing and validation.**

Keywords—convolutional neural networks, defect detection, automated inspection, artificial intelligence, industry

COMPUTER KINESIOTHERAPY MOVEMENT SIMULATOR

Ioan Alexandru Bratosin, Ionel-Bujorel Pavaloiu, Nicolae Goga, Bratu Alina Cristina, Ancuceanu Robert and Oana Maria Basescu

***Abstract*—Serious games are an integral part of our modern life. They are mainly used as tools for training individuals in different fields such as industrial, automotive, or in medical domain. In this paper we present an interesting approach on the use of serious games. We propose the use of serious games to showcase multiple series of kinesiotherapy movements meant to prevent medical problems like arthritis, posture disorders, acute or chronic pain, muscle strength conditions or work-related injuries. The application presented in this paper offers the users the possibility to execute specific kinesiotherapy movements from home, after an initial session with the therapist for a in depth explanation of the application and the purpose of the exercises. This application would improve the quality of life of individuals as it would provide an alternative solution to normal sessions of kinesiotherapy and prevent usual problems caused by sedentarism or muscle injuries.**

Keywords—kinesiotherapy, serious games, simulation, quality of life

IMPROVING THE CYBERSECURITY OF MEDICAL SYSTEMS BY APPLYING THE NIST FRAMEWORK

Adriana-Meda Udroiu, Mihail Dumitrache and Ionut Sandu

***Abstract*—The paper tries to present how NIST Cybersecurity Framework (CsF) and HITRUST Model can be adapted and used to assess and improve the security of health care organizations, hard-pressed by the pandemic period. It also describes the application developed for helping health care organizations in the process of implementation of a cybersecurity program. Knowing that in the last two years there have been numerous cyber-attacks targeting both patients' personal data and scientific data on certain treatments, which has exposed medical systems to a wide range of risks regarding the theft, exploitation, unavailability or destruction of this sensitive information, we have chosen the development of a solution that will help improve cybersecurity in one of the critical sectors, namely the health sector.**

Therefore, we chose the NIST framework on cybersecurity (NIST CsF) to carry out an implementation aimed at improving the security of the critically chosen sector, the medical field and public health. For the evaluation (self-evaluation) of the organization, we chose a questionnaire also conducted by NIST, Baldrige Cybersecurity Excellence Builder (BCEB), which is compatible with the cybersecurity framework. Because NIST CsF is a universal and flexible cybersecurity guide for all critical sectors, in order to facilitate the modeling process for the medical field, we have also chosen to use the mapping of HITRUST (The Health Information Trust Alliance) frameworks (RMF – Risk Management and CsF – information security control measures) that are intended exclusively for the medical field.

Keywords—cybersecurity framework, medical systems, conceptual model, risk management, control measures

A PRECISE CONVOLUTIONAL NEURAL NETWORK-BASED CLASSIFICATION AND POSE PREDICTION METHOD FOR PCB COMPONENT QUALITY CONTROL

Ruoshan Lei, Dongpeng Yan, Hongjin Wu and Yibing Peng

***Abstract*—Pre-reflow Automated Optical Inspection(AOI) has been widely applied in the Printed Circuit Board manufacturing industry to perform quality control. Two common problems in AOI-based recognition are how to realize the rapid inspection and how to predict the PCB component's position and rotation quantitatively. However, the complexity of template matching method tends to be exceedingly inefficient. To address the above issue, we propose a new Convolutional Neural Network-based method on the PCB resistor classification and pose prediction. For the problem of requiring a large number of labeled samples to train the network, we achieve the generation of the dataset through extracting Region of Interest and data augmentation. We employ the CNN which directly use the 11 types of resistor image as input and resistor type and pose error as predicted result. The classification accuracy is 99.60%. And the method predicts a one-dimensional vector including horizontal position, vertical position and rotating angle, achieving 99.98% accuracy. The processing time of a PCB resistor image is about 9ms. The experimental results have well demonstrated the effectiveness of our proposed method.**

Keywords—Convolutional Neural Network, Defect Classification, Pose Error, Automatic Optical Inspection, Printed Circuit Board

MECHANICAL CHARACTERIZATION OF MATERIALS FOR PRESSURE VESSEL

Cosmin Paunescu and Gheorghe Vasile

***Abstract*—The problems appeared in the operation of the pressure equipment, determined the appearance of several study methods for the chemical composition and of some mechanical properties. In the Romanian literature we do not find data on the study of these issues. This report presents several studies on the problems that arise in the operation of pressure equipment in the international literature. One of the important properties of materials used in the construction of pressure vessels is their corrosion resistance. It is required that, in the most severe conditions, the corrosion rate does not exceed 0.4 mm / year. Both metallic and non-metallic materials are used in the construction of pressure vessels. This article aims to conduct experimental research on the mechanical properties of some materials used in the manufacture of pressure vessels: P195 GH (OLT 35 K) - EN 10216.2 si 16 Mo 3 - SR EN 10028.**

Keywords—mechanical characterization, materials, pressure vessel

MULTI-AGENT SYSTEM FOR SMART GRIDS WITH PRODUCED ENERGY FROM PHOTOVOLTAIC ENERGY SOURCES

Otilia Elena Dragomir, Florin Dragomir, Valentin Gurgu, Marius Paun,

Octavian Duca and Catalin Dragoi

***Abstract*—The framework of this paper is represented by smart grids with produced energy from photovoltaic sources. The goal of the proposal consists in creating a modular, integrative, adaptable and open software application, based on a multi-agent intelligent techniques, able of estimating the energy produced by photovoltaic panels in a smart grid network, depending on their construction types and different scenarios related to atmospheric conditions. The added value of the paper consists in the implementation of the multi-agent system, based on real functioning scenarios, identified in smart grid functioning.**

Keywords—multi-agent system, smart grid, PV panels, energy, power generared

THE IMPORTANCE OF ELECTRONIC DEVICES IN THE MEDICAL FIELD IN THE PERCEPTION OF FUTURE SPECIALISTS

Aurel Ștefan Pica, Isabela Elena Bănescu, Laura Marcu, Nicoleta Angelescu and Cosmin Panțu

***Abstract*—The article presents the results of a quantitative study, based on a questionnaire, among students, future practitioners in the medical field or electrical engineering field, indicating their perception of the use of electronic devices in the medical field.**

Keywords—electronic devices, medicine, electrical engineering, student perception, quantitative study

RESEARCH AND IMPLEMENTATION OF A TWO-DIMENSIONAL CELLULAR AUTOMATON

George Cosmin Stanica and Petre Anghelescu

***Abstract*—This paper presents a two-dimensional cellular automaton called ”Langton’s ant”. A software application is developed to simulate its evolution and behavior. The program includes options such as automated generation with the ability to customize parameters as well as the opportunity to explore potential designs that may develop during the evolution process. This allows testing of the CA behavior using different conditions, initial states and evolution steps. The C# programming language was used to develop and test the project.**

Keywords—Langton’s ant, cellular automata, evolution, state, neighborhood, pattern

AN EFFICIENT INTEGRATION STRATEGY OF THE PROSUMERS IN THE ACTIVE ELECTRIC DISTRIBUTION NETWORKS

Ecaterina Chelaru, Gheorghe Grigoras, Livia Noroc, Bogdan-Constantin Neagu and Ovidiu Ivanov

***Abstract*—Nowadays, the European citizens, communities, cities, and local authorities increasingly control and produce their energy from renewable sources, speeding up the transition to the active electric distribution networks (AEDNs). The high number of connected prosumers has immediate implications for the operation of the AEDNs due to growing shares of renewable energy generation. Their integration without developing some strategies at the level of each AEDN can lead to operating issues. Thus, an efficient strategy has been developed in the paper to integrate the prosumers in the AEDNs (through identifying the optimal connection phase and the pillar for each prosumer), aiming to minimize energy losses. The obtained results in the case of a real AEDN highlighted the performance of the proposed strategy compared to the classic one in which the old connection phase is maintained for the prosumers. The energy losses in the analyzed time interval (one day) decreased in half (from 8.4% using the classical strategy to 4.1% with the proposed strategy).**

Keywords—prosumers, active electric distribution networks, optimal integration, strategies

AN RLS ALGORITHM FOR THE IDENTIFICATION OF IMPULSE RESPONSES WITH PARTICULAR SYMMETRIC PROPERTIES

Ionut-Dorinel Ficiu, Camelia Elisei-Iliescu, Cristian Lucian Stanciu,

Constantin Paleologu, Jacob Benesty and Cristian Anghel

***Abstract*—In order to effectively solve system identification problems, it is always desirable to make use of particular characteristics of the impulse responses to be identified. In this paper, such an approach is illustrated by focusing on the estimation of systems with particular symmetric/antisymmetric features, which are handled using combinations of bilinear models. In the presented framework, we develop a recursive least-squares (RLS) algorithm customized for such models. When assessed against the conventional RLS counterpart, the proposed algorithm achieves significantly improved results, in terms of the employed performance measure. Simulation results validate the appealing performance of the designed algorithm.**

Keywords—adaptive filters, recursive least-squares (RLS) algorithm, system identification, symmetric/antisymmetric impulse responses, Kronecker product, bilinear forms

DESIGN AND SIMULATION OF THE MILLING OPERATION USING ARTICULATED ROBOTS

Maria Simona Raboaca, Iuliana Maria Murgasanu, Florentina Magda Enescu, Chaman Verma and Luminita Mirela Constantinescu

***Abstract*—Since the twentieth century, the simulation process has been recognized as an essential tool in various fields of research. At first, all the software developed for the simulation was tested in academic research. This paper aims to design and simulate the milling operation using articulated robots and demonstrate the performance characteristics of components on a vast scale in electrical actions in industrial sectors. In the context of the continuous development of the industry, virtual it can simulate the milling operation without the need for human resources. This paper outlines the steps of simulating milling operation using software: Tia Portal, Eplan, AutoCAD, FeaturecAM, Rapsody, and Ecodial Software.**

Keywords—simulation, design, milling operation, articulated robots, HMI

OPTIMIZED SLEW RATE CONTROL TECHNIQUE FOR AUTOMOTIVE LOW-DROPOUT LINEAR VOLTAGE REGULATORS SIMULATION MODELS

Ionuț-Constantin Guran, Adriana Florescu and Lucian-Andrei Perișoară

***Abstract*—Simulation has become the main verification concept used in the automotive domain as its utmost importance lies in validation of the systems design, as well as detecting early faults in the design process. The vast majority of devices used in automotive such as gate drivers, switching regulators, charge pumps, low-dropout linear voltage regulators (LDOs) have a highly complex behavior, hence accurate simulation models are mandatory to ensure the correct functioning of the entire system within the simulation. One critical device for the automotive domain is the LDO, because it powers all the other circuits, hence it is vital to build a simulation model that comprises all its vital characteristics. Since slew-rate is one dominant LDO characteristic that influences the behavior of all the other circuits powered by the regulator, this paper proposes an optimized slew-rate control technique for automotive LDO simulation models, which allows to precisely set the output voltage slew-rate at the desired level. The target simulator is OrCAD Capture CIS, one of the most popular simulation environments currently in use.**

Keywords—Simulation, Automotive, Low-dropout linear voltage regulator, Slew-Rate, OrCAD Capture CIS

A HYBRID SEQUENTIAL CLASSIFIER FOR HYPERSPECTRAL IMAGERY USING DEEP CNN WITH ANT COLONY OPTIMIZATION

Liviu Rujan and Victor-Emil Neagoe

***Abstract*—This paper proposes a novel hybrid approach for hyperspectral image classification using a processing sequence consisting of deep Convolutional Neural Network (CNN) followed by Ant Colony Optimization (ACO). Thus, this hybrid classifier takes into account the joint spectral-spatial information. The first processing step performs hyperspectral pixel classification with CNN by taking into account both the spectral and also the spatial information. The second classification stage based on ACO model uses mainly the spatial pixel correlation and it refines the results obtained in first classification step. The proposed hybrid sequential classifier is evaluated on Indian Pines and Pavia University hyperspectral datasets. The proposed hybrid model has led to a better accuracy by comparison to CNN and SVM classifiers.**

Keywords—- hyperspectral image classification, - Convolutional Neural Networks (CNN), - Ant Colony Optimization (ACO), - spectral and spatial information, - hybrid sequential classifier

WIRELESS ACTUATOR NODE FOR GREENHOUSE MICROCLIMATE CONTROL

Dragos-Ioan Sacaleanu, Stefan-George Rosu, Mihai-Gabriel Matache,

Irina-Petra Manciu and Lucian-Andrei Perișoară

***Abstract*—Agriculture has one of the most important roles in society because it provides food sources for the population. Many agricultural activities can be highly enhanced by using digital technologies. In greenhouse farming, all environmental parameters can be adjusted based on crop types. Automation in the greenhouse is a method where farmers are able to monitor and control the greenhouse environment automatically from anywhere in the world at any time. This paper presents a wireless actuator node to control the greenhouse system through the Internet of Things (IoT). The node provides outputs for different types of actuators that can usually be found in a greenhouse and it can be controlled using numerous specific communication protocols. Compared to other systems, these characteristics make it flexible and scalable to use in multiple scenarios. The prototype was tested under various scenarios in our laboratory and the experimental results demonstrated its functionality. The actuator node functionality was also tested in the greenhouse and demonstrates that it can be used to operate in a real-world environment for optimum control of microclimate conditions.**

Keywords—wireless sensor network, wireless actuator node, agriculture, greenhouse

THEORY OR PRACTICE - NEW TRENDS IN ENGINEERING CAREER

Mihai Oproescu, Adriana-Gabriela Plaiasu, Vasile-Gabriel Iana, Ionut Bulgaru and Corina Savulescu

***Abstract*—This article aims to assess the level of importance of practical activities, in relation to theoretical activities, from the point of view of the student in engineering training programs. As the most important feedback in the evaluation is the final exam specific to each discipline, the proposed case study analyzes the attractiveness of the practical activities, taking into account the results obtained in technical engineering disciplines. Beyond the accumulated level of knowledge, we can have an image of the tendencies of students from technical specialties for theoretical or practical activities.**

Keywords—engineering career, practical activities, theoretical activities, evaluation

LEADING THE DIGITAL TRANSFORMATION OF KNOWLEDGE-BASED ORGANIZATIONS THROUGH CONSUMPTION-BASED IT SERVICE MODELS FOR DATA MANAGEMENT

Dorin Vasile Deac Suteu, Radu Costin Moisescu, Constantin Dorin Olteanu and Aurel Mihail Titu

***Abstract*—Recently changes in people's lives, work, and development knowledge require the use of the full potential of an organization's data, interactions, and decision-making processes. It is no longer an option to use knowledge technology to support everyday activities; rather, it is a requirement for organizations to achieve their efficiency and effectiveness targets. A continuous framework for the management of infrastructure, IT assets, and life cycle management is required, and it is reliant on the legal laws covering security, compatibility, and laws governing data protection. The most difficult challenge proceeds to be the sustained progress of the implementation, which incorporates both the advancement of the infrastructure and the advancement of the software-based systems. This article discusses the challenges of digitizing modern businesses and presents the solution and some examples of how flexible, consumer-driven IT services can address these challenges. To increase agility, security, flexibility, and cost control, the goal is to move from capital costs to more efficient, predictable, relatively scalable operating expenses.**

Keywords—digital transformation, IT management, Cloud

A STATISTICAL COMPARATIVE STUDY FOR DETECTING OUTLIERS IN ELECTRICAL DATA

Sarah Harbi, George-Calin Seritan, Bogdan-Adrian Enache and Sorin-Dan Grigorescu

***Abstract*—The rapid development of artificial intelligence models in electrical engineering drew attention to the outlier detection methods because they represent one of the main causes of model overfitting. In this paper, three popular outlier detection algorithms, boxplots, z-score and standard deviation, are analyzed in the context of electrical data composed of voltages, currents and harmonics. The study aims to establish an algorithm that can accurately detect outliers so the data can be used in others more advanced models.**

Keywords—outlier, Boxplot, z-score, standard deviation

ARTIFICIAL INTELLIGENCE-BASED ALGORITHM FOR RESOURCES ALLOCATION

Constantin Viorel Marian

***Abstract*—In today's world the information should be available at any time and any place. From the user's point of view, these requirements are mandatory even if the traffic is growing and the user's experience is hyper-contextualized, personalized and mostly dynamic. From an application services provider point of view, in software defined networks and cloud intelligent managed data rooms, the networking architecture is required to combine central management and network residency.**

To provide the above mentioned services, the telecommunications networks have to provide maximum flexibility. The same mandatory functionality is required for clustered architectures used in cloud service providers' data rooms. This maximum resilience must involve two aspects: flexibility seen as accepting many different possible configurations and flexibility as the required time for these configurations to be applied to equipment in order to take effect.

A possible solution to these requirements, is to separates the data plane forwarding the traffic from the control plane who's taking the decisions based on different criteria. In the meantime the control plane evolves and becomes a complete centralized management solution.

This paper presents two new ideas and their implementation in a operational test data room. The first one consist of a data processing technique and algorithm that leads to dynamic resource allocation. The second implementation has as a main focus on the artificial intelligence AI-based trend prediction module that takes the decisions for the resources allocation algorithm.

This research is part of a project developed by a joint team composed by cloud services provider in France and computer science specialists in Romania.

Keywords—Algorithm, Artificial Intelligence, Machine Learning, Network, Resources, Virtualization

FINE TUNING IN DEVELOPING OF SWITCHING MODE POWER SUPPLY

Bogdan Armaselu and Mădălin Frunzete

***Abstract*—In this paper, we analyze the operation of a half bridge Switching Mode Power Supply (SMPS), the advantages and disadvantages of using a 2nd order filter circuit and a synchronous rectification bridge, the latter being controlled by an auxiliary output of the transformer. The converter works in a step-down operation mode, reducing the grid voltage to a more used voltage (40V), providing galvanic isolation through a transformer that works at high frequency. The output voltage is regulated using a feedback that allows the controller to adjust the PWM signal applied on the MOSFET. Dead time is also taken into consideration in order for the SMPS to work in the safe zone. The paper contains theory, simulation using LTspice, a practical prototype as well as comparisons between them.**

Keywords—SMPS, Step-down converter, AC to DC converter, synchronous bridge rectifier

DETECTION OF RELEVANT DIGITAL EVIDENCE IN THE FORENSIC TIMELINES

Pavol Sokol, Eva Marková and Kristína Kováčová

***Abstract*—Security incident handling and response are essential parts of every organization's information and cyber security. Security incident handling consists of several phases, among which digital forensic analysis has an irreplaceable place. Due to particular digital evidence being recorded at a specific time, timelines play an essential role in analyzing this digital evidence. One of the vital tasks of the digital forensic investigator is finding relevant records in this timeline. This operation is performed manually in most cases. This paper focuses on the possibilities of automatically identifying digital evidence pertinent to the case and proposes a model that identifies this digital evidence. For this purpose, we focus on Windows operating system and the NTFS file system and use outlier detection (Local Outlier Factor method). Collected digital evidence is preprocessed, transformed to binary values, and aggregated by file system inodes and names. Subsequently, we identify digital records (file inodes, file names) relevant to the case. This paper analyzes the combinations of attributes, aggregation functions, local outlier factor parameters, and their impact on the resulting selection of relevant file inodes and file names.**

Keywords—digital forensic analysis, digital evidence, local outlier factor, forensic timeline

CLINICALLY-VALIDATED TECHNOLOGIES FOR OLDER ADULTS' QUALITY OF LIFE SELF-MANAGEMENT: VINCI ECOSYSTEM

Lidia Bajenaru, Ion Alexandru Marinescu, Ciprian Dobre, Mihaela Tomescu and Anna Marie Herghelegiu

***Abstract*—Today, the challenge in healthcare is to create personalised solutions in which existing care technologies can be better adapted to the cognitive and perceptual decline of older people. In this context, vINCI aims to assist caregivers and provide smart care for the elderly in outpatient and outdoor clinics by integrating proven open data analytics technology with innovative and user-oriented IoT devices in four standardized kits. To clinically validate the results, two multidisciplinary controlled pilots (in Romania and Cyprus) and open call validations (in Romania, Poland, Slovenia, Italy and Ireland) were implemented in controlled settings. This gave older adults across Europe the opportunity to test vINCI technology in real-life use cases, with the results demonstrating the ability of the vINCI ecosystem to provide a maximum level of quality control, automated monitoring and data governance.**

Keywords—Internet of Things, lifestyle, quality of life, healthcare, older adults, personalised assistive care, vINCI technology

REMOTE ACCESS SYSTEM IN THE PRODUCTION PROCESS IN CRISIS SITUATIONS AND MORE

Florentina Magda Enescu, Valeriu Manuel Ionescu, Maria Simona Raboaca and Gheorghe Serban

***Abstract*—In this paper is show a concept of acquisition data using IoT from industrial machines / equipment's with the goal to work remote control with this data in real time, help us to improve the testing method and minimize the cost.**

The aim of the research is to improve and simplify the working environment, where after receiving remote control data from industrial machines, a limited set of instructions is sent to them in a relatively short time, for monitoring and controlling the technological processes. This minimizes the physical interactions between production operators and quality managers (and not only them), in order to comply with the rules of social distancing during a pandemic or other special conditions.

The first stage investigated in this paper was to select the desired implementation system, using SCADA and IoT technology being investigated, then the choice of IoT (or local / cloud server) for real time data acquisition was described, and finally, the orientation towards the use of stored data to create a prediction logic, which is oriented towards the concept developed by IBM, namely: IBM SPSS MODELER.

Keywords—SCADA, IoT, HMI, FPGA, IT, production process monitoring

IMPLEMENTATION OF INTEGRATED INDUSTRIAL SECURITY MANAGEMENT IN CRITICAL ENERGY INFRASTRUCTURES

Pupaza Cristina, Tulpan Marioara, Grigorie Emilia, Fita Nicolae

Daniel, Visan Romulus Nicolae and Herbei Roxana

***Abstract*—As cases of industrial terrorism become more frequent around the world in the current context of industrial dynamism, exacerbated by the global military, energy and health crisis, this paper is of great importance and relevance. In order to ensure European well-being, European states, through its industrial objectives, must provide a range of facilities to its citizens, such as access to electricity, natural gas and fuel, in order to ensure the minimum comfort necessary for a normal and decent life. Knowing full well that access to these facilities is made through certain critical infrastructures (power plants, power substations, overhead/underground power lines, fuel storage depots, oil, natural gas and petrochemicals, refineries, crude oil pumping stations, oil pipelines, compression stations and distribution of natural gas, gas pipelines) , they can be vulnerable by generating a number of risks and threats to them, thus endangering societal life, creating dysfunctions and causing extreme damage to European security and well-being.**

Keywords—industrial security management, critical energy infrastructures, european security

BLOCKCHAIN FOR AI-ENABLED INDUSTRIAL IOT WITH 5G NETWORK

Piyush Pant, Anand Singh Rajawat, S. B. Goyal, Pradeep Bedi, Chaman Verma, Florentina Magda Enescu, Maria Simona Raboaca and Traian Candin Mihaltan

***Abstract*—The world is advancing to a new digitalized world that has one of the most powerful technologies that ever existed in human history. These technologies are making humans create such objects that were only told in the fairy tales in the past. This research proposes a model that integrates the latest and one of the most powerful technologies of the decade. This study integrated the 5G network with the IIoT (Industrial Internet of Things) which is based on artificial intelligence to develop an intelligent machine capable of mimicking humans. Such a system is so powerful yet so vulnerable to problems like hacking, cyber-attacks and so on. This problem is solved with the blockchain. The research adds blockchain to the model to make the model more secure and efficient as it provides a decentralized system to ensure transparency. Previous researches have covered the IoT with blockchain but this research is the advanced version which includes the industrial IoT using Artificial intelligence to make intelligent Internet of Things.**

Keywords—Blockchain, IIoT, Artificial Intelligence, 5G, Industry 5

STUDENT PERFORMANCE ANALYSIS AND COUNSELLING SYSTEM (SPACS) USING SOFT COMPUTING BY FUZZY RULE FORMATION AND DECISION MAKING

Bharati Ainapure, Pratibha Reddy, Sarika Khope, N. Hulle and Bhargav Appasani

***Abstract*—In this modern world, students are vulnerable to many distractions that affect their education and career. Taking this social aspect into consideration, the Students Performance Analysis and Counselling System (SPACS) system will play a crucial role in analyzing the students' overall academic performance. It identifies the factors affecting the performance and helps counsel the student to improve it and provide relevant guidelines to choose a career path by providing an assessment report. The three main broad streams for identifying the correct career path for a candidate are classified into entrepreneurship, research, and employability. The system uses fuzzy logic for rule formation, and decision making as soft computing is tolerant of uncertainty, imprecision, and partial truth. The automated system built eliminates the intervention of a human counselor, which makes the usability of the software by a candidate more efficient, helps with unbiased decisions, and decreases the margin of error. The system widely consists of two basic modules: rule formation based on the user input and decision-making using soft computing technique that will use the input to generate guidelines. The student will use these guidelines to assess his performance and get a clearer view of the line of action for his future endeavors.**

Keywords—Data Mining, Soft Computing, Artificial Intelligence, Students' Performance Analysis and Counselling System (SPACS), Fuzzy Inference System

ON THE DESIGN OF AN INTERACTIVE AUTOMATIC PYTHON PROGRAMMING SKILLS ASSESSMENT SYSTEM.

Florin Stefan Zamfir and Emil Pricop

***Abstract*—This paper aims to achieve an automatic assessment system for programming skills using a dynamically generated Jupyter notebook. The system's main feature is that it allows the testing of knowledge in an interactive manner. This paper presents the components of the system, the role of the components, and their way of interaction. The fundamental principle behind this system is assignment - validation - report. The assignment component envisages the realization of services that allow the dynamic association of tests to users. The validation part involves configuring an interactive testing platform (Jupyter notebook) that allows users to run the tests associated with them and see the result for each question in real-time. The last component, namely reports, collects user responses and sends them to a web application. To validate the programming knowledge, the authors made a Python packet containing modules and functions defined to achieve the proposed objectives. The authors designed some APIs needed to integrate all the web services.**

Keywords—notebooks, Jupyter, API, Python, programming

REAL TIME OPTIMIZATION FOR OPERATION OF WATER DISTRIBUTION SYSTEMS TO WATER LEAKAGE REDUCTION

Pham Dai and Nguyen Hoang Viet

***Abstract*—Water loss in water distribution systems (WDSs) can be reduced by regulating operations of Pressure Reducing Valves (PRVs) installed in WDSs. This engineering task can be formulated as a nonlinear program (NLP). The quality control of WDSs depends on how fast the solution of the NLP is deduced. It is due to the fact that solving such the optimization normally requires a large computation time, the solution of the NLP is thus not suitable for real time operations. In this paper, we applied the sensitivity-based method for deriving the real time pressure settings for PRVs, which is appropriate for real time control of the WDS. One benchmark WDS is taken for optimal pressure control to demonstrate the efficacy of the sensitivity-based method. The results have shown that the real time solution by the sensitivity-based method while requiring a negligible time computation have acceptable accuracy**

Keywords—Water distribution systems, Real time optimization, Water leakage

OPTIMIZING A CONVOLUTIONAL NEURAL NETWORK USING PARTICLE SWARM OPTIMIZATION

Alexandru-Cosmin Mihai and David-Traian Iancu

***Abstract*—This study presents the application of the Particle Swarm Optimization (PSO) algorithm, a swarm algorithm which is based on the particle movement, to optimize the parameters of a Deep Neural Network (DNN), namely an architecture based on Convolutional Neural Networks (CNN). The model is optimized with respect to the image classification task on the MNIST dataset, consisting of images of handwritten digits. The study presents the results of training the model using different PSO hyperparameters and also compares the obtained performances with those obtained when training the model using gradient based optimizers such as Stochastic Gradient Descend (SGD) and Adam.**

Keywords—swarm intelligence, particle swarm optimization, neural network optimization, convolutional neural network

CUSTOMIZED AUTHORIZATION PROCESS FOR CLOUD COMPUTING AND IOT USING ATTRIBUTE-BASED ENCRYPTION

Marius Iulian Mihailescu, Stefania Loredana Nita, Bogdan Laurentiu Asalomia, Marius G Rogobete and Ciprian Racuciu

***Abstract*—Maintaining a complex access control over the encrypted data represents one of the most challenging processes of cloud computing and IoT (Internet-of-Things). In this paper we will present and discuss a policy approach based on cipher-text policy and attribute-based encryption in such way that we are able to guarantee a high level of complexity for controlling the access over encrypted data, and by providing a personalized verifiable authorization process. This process and scheme will be noted as CCIoT-CP-ABE (Cloud Computing Internet-of-Things Cipher Policy-Attribute-Based Encryption). The main advantage of the proposed scheme is to provide data confidentiality for the encrypted data in case if the server has been compromised. The second advantage of the proposed scheme is that guarantees a high level of security against collusion attacks. The evaluation of the performance is presented as well.**

Keywords—attribute-based encryption, ABE, IoT, Cloud Computing, cryptography

DC MICROGRID OPERATION USING AN ENERGY MANAGEMENT STRATEGY BASED ON POWER FOLLOWING

Nicu Bizon, Noureddine Takorabet, Phatiphat Thounthong, Mihai Varlam, Elena Carcadea and Mircea Raceanu

***Abstract*—The DC microgrids based on renewable energy sources (RES) are simple to be implemented in residential houses and should be possible solution for the energy crisis. This paper presents the preliminary results of the implementation of the power-following strategy in a DC microgrid using a fuel cell / electrolyser unit. The fuel regulators of the fuel cell (FC) system will be controlled by the FC current and the boost DC-DC converter interfacing the FC stack with the DC bus will be controlled using the power-following strategy when the regenerable power are less that the load demand. During the period when the renewable power exceeds the load demand, the excess power will supply the electrolyser unit to operate the battery in charge-sustained mode (with the advantage of a smaller size of the battery pack). The advantages of DC microgrid operation using an energy management strategy based on power following for the hydrogen-based energy generation and storage system are presented.**

Keywords—renewable energy sources, fuel cell, electrolyzer, DC microgrid, power-following strategy

ENERGY CONSUMPTION ANALYSIS IN THE FIELD OF RESIDENTIAL CONSTRUCTIONS

Aurel Ștefan Pica, Isabela Elena Bănescu and Dan Constantin Puchianu

***Abstract*—Significant climate change and resource scarcity make it necessary to rethink the field of residential construction. Residential buildings consume a large part of the global primary energy, they also contribute to CO2 emissions. The concept of green buildings is an approach to the entire system of design and construction of buildings that save energy, water and material resources, which are safer and more comfortable. In this study we wanted to analyze the energy consumption of residential buildings and propose effective solutions to reduce them.**

Keywords—energy consumption, smart buildings, electrical devices, residential constructions

GENERATION IV NUCLEAR ENERGY SYSTEMS – ALTERNATIVE SOLUTIONS TO CARBON EMISSION ENERGY SOURCES

Toma Denisa, NiȚu Alexandru-IonuȚ and Bizon Nicu

***Abstract*—The energy sector is in the middle of massive transformations, and global demand grows rapidly. In this context, the main objective of the paper is to realize an overview of the issue of energy development in the nuclear domain, being discussed the most promising pathways of nuclear power plants that meet the needs of energy and nuclear safety. In choosing the candidate systems for Generation IV nuclear power plants, the international forums highlighted 6 main energy systems: Gas-Cooled Fast Reactor System - GFR, Lead-Cooled Fast Reactor System - LFR, Molten Salt Reactor System - MSR, Sodium-Cooled Fast Reactor System - SFR, Supercritical-Water-Cooled Reactor System - SCWR, Very-High-Temperature Reactor System - VHTR.**

Also, the paper presents the main aspects of generation IV energy systems, comparing the six types of nuclear reactors according to the specific criteria: advantages and disadvantages of the advanced generation IV reactors, expected year of implementation, power range as well as research challenges.

Keywords—energy demand, generation IV reactors, LFR

DESIGN AND ANALYSIS OF LOW POWER BIO-AMPLIFIER WITH CURRENT MIRROR TOPOLOGY AT CMOS 45NM TECHNOLOGY NODE

Abhishek Kumar, Suman Lata Tripathi, Chaman Verma, Maria Simona Raboaca, Florentina Magda Enescu and Traian Candin Mihaltan

***Abstract*—The ion sensitive bio-potential amplifier is the critical block in the biomedical instrument. Electrical parameters depend on material properties such as dielectric constants, charge carriers and presence of positive and negative ions. Multiple architectures are available in the literature, have a primary limitation of power consumption, bandwidth, and noise. The different circuit topologies of internal components are capable to provide acceptable value. In this work, 4 topologies of the current mirror have been explored with the primary motivation of reduction in power consumption towards nw. Simulation result of operational transconductance amplifier (OTA) with mod-wilson current mirror combination attains the minimum power of 437 nW and achieves the input-referred noise to 2.55μV/√Hz which is minimum among different topology of the current mirror. Input referred noise found maximum with simple current mirror 2.9655μV/√Hz. The circuit has been optimized with supply voltage ±0.5V for a mid-band gain.**

Keywords—Ion-sensitive, Bioamplifer, OTA, Referred Noise, Low power, Current Mirror, Wearable Electronics

STATISTICAL PROCESSING OF EXPERIMENTAL DATA USING DISPERSION ANALYSIS TO IMPROVE AIRBAG STRENGTH AND QUALITY

Aurel Mihail Titu, Mihai Banica and Alina Bianca Pop

***Abstract*—This scientific paper is based on the presentation of the company in which a case study was conducted to improve the strength and quality of airbags. In this sense, a bibliographic material was analyzed through which some of the essential problems of the object of the study were highlighted. The research method predicts on the design of experiments. Subsequently, statistical processing of the experimental data was performed using dispersion analysis. In this context, the analyzed data were analyzed using 3D graphs. The last part of the paper contains its own points of view and conclusions based on which new research directions are presented.**

Keywords—experimental data, dispersion analysis, airbag, organization, strength, quality

COMPARATIVE ANALYSIS OF ROUTING PROTOCOLS USING GNS3, WIRESHARK AND IPERF3

Cezar-Gabriel Dumitrache, Predusca Gabriel, Gheorghe Gavriloaia, Nicoleta Angelescu, Liana Denisa Circiumarescu and Dan Constantin Puchianu

***Abstract*—A topology is made using the GNS3 software to evaluate the three routing protocols: Enhanced Interior Gateway Routing Protocol, Open Shortest Path First, Routing Information Protocol. The protocols were evaluated with IPerf3 and Wireshark software that will be installed on two virtual machines that will run with VMware Workspace. To get very conclusive results, the Internet Control Message Protocol will also be used. The two virtual machines have been configured to run Windows XP and Ubuntu Linux. Also using Gns3 will be emulating multiple network devices that will be configured by time, with the three routing protocols to evaluate the capabilities of this topology under the same conditions, only the routing protocols being different.**

Keywords—EIGRP, OSPF, RIP, GNS3, IPerf3, Wireshark

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