

Union of Electronics, Electrical Engineering and Telecommunications (CEEC)

Federation of the Scientific-Technical Unions in Bulgaria (FNTS)

Ministry of Transport and Communications

Communications Regulation Commission

Union of Scientists in Bulgaria

Technical University of Sofia

Faculty of Telecommunications - TUS

IEEE Bulgarian Section

**31st NATIONAL CONFERENCE
WITH INTERNATIONAL PARTICIPATION**

TELECOM 2023

THE WAYS TO CONNECT THE FUTURE



P R O G R A M M E

16 - 17 November 2023

*National Science and Technical Centre,
108 Rakovsky St. – Sofia*

&

Virtual room

TELECOM 2023

is technically co-sponsored by IEEE:

**2023 31st National Conference with
International Participation - #59629**

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Huawei Technologies Bulgaria Ltd



Infopulse Bulgaria EOOD

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Telecom 2023 Sessions Timetable

<i>Date</i>	<i>Time</i>	<i>Sessions</i>
Wednesday 15.11.2023	16.00-17.00	Registration of participants & test the system (Virtual Room 1) Meeting ID: 886 1960 4478, Passcode: 290395 Zoom Platform (Phone: +359 2 987 97 67, Mail: ceec@mail.bg)

Thursday 16.11.2023	Exhibition – Infopulse Bulgaria EOOD, Hall 4	
	10.00 – 12.45	Plenary Session 1, Hall 4 & Virtual Room 2 Meeting ID: 813 6764 8808, Passcode: 339781
		Chairmen: Assoc. Prof. Kamen Rangelov, PhD Prof. Seferin Mirtchev, DSc
		Greetings
		Presentations: 1. CRC, 2. ATI, 3. A1, 4. Huawei, 5. Infopulse, 6. Electron progress
	13.15 - 14.00	Plenary Session 2, Hall 4 & Virtual Room 2 Meeting ID: 813 6764 8808, Passcode: 339781
		Chairman: Prof. Seferin Mirtchev, DSc
		Presentations: 7. Ivan Ganchev - invited paper, 8. Kamen Rangelov
	14.15 – 15.30	Section Session 1, Hall 4 & Virtual Room 2 Meeting ID: 813 6764 8808, Passcode: 339781
		TELECOMMUNICATIONS NETWORKS AND SERVICES.
		Chairman: Prof. Elena Shoikova, DSc
		Presentations: Papers 1.1, 1.2, 1.3.,1.4, 1.5
	15.45 – 17.15	Section Session 2, Hall 4 & Virtual Room 2 Meeting ID: 813 6764 8808, Passcode: 339781
		RESEARCH/EDUCATION METHODOLOGIES IN ICT.
		Chairman: Assoc. Prof. Rositsa Goleva, PhD
		Presentations: Papers 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7
	17.30 – 18.30	Discussion, Hall 4 & Virtual Room 2 Meeting ID: 813 6764 8808, Passcode: 339781
EDUCATION ON TELECOMMUNICATION, INFORMATION TECHNOLOGY AND BUSINESS NEEDS.		
Chairmen: Assoc. Prof. Kamen Rangelov, PhD, Prof. Seferin Mirtchev, DSc, Assoc. Prof. Dimitar Arnaudov, PhD		
18.30 – 20.00	Informal meeting forum - Cocktail – Hall 4	

<i>Date</i>	<i>Time</i>	<i>Sessions</i>
Friday 17.11.2023	08.30 – 09.20	<p>Section Session 3, Hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p> <p style="text-align: center;">WIRELESS SYSTEMS – 5G, 6G. MOBILE AND SATELLITE COMMUNICATIONS.</p> <p style="text-align: center;">Chairman: Eng. Stefan Patchedjiev, PhD</p> <p style="text-align: center;">Presentations: Papers 3.1, 3.2, 3.3,.3.4, 3.5</p>
	09.30 – 10.30	<p>Section Session 4, Hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p> <p style="text-align: center;">COMMUNICATION TECHNOLOGY IN INTELLIGENT TRANSPORT SYSTEMS.</p> <p style="text-align: center;">Assoc. Prof. Georgy Petrov, PhD</p> <p style="text-align: center;">Presentations: Papers 4.1, 4.2, 4.3,.4.4, 4.5</p>
	10.40 – 12.30	<p>Section Session 5, Hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p> <p style="text-align: center;">INTERNET OF THINGS (IoT). SMART HOME AND CITIES. EHEALTH. BETTER LIVING WITH ICT.</p> <p style="text-align: center;">Chairman: Assoc. Prof. Dimitar Arnaudov, PhD Prof. Ivan Kurtev, PhD</p> <p style="text-align: center;">Presentations: Papers 5.1, 5.2, 5.3,.5.4, 5.5, 5.6, 5.7, 5.8, 5.9</p>
	13.00 – 15.00	<p>Section Session 6 Hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p> <p style="text-align: center;">E-GOVERNMENT. NETWORK SECURITY. CLOUD COMPUTING.</p> <p style="text-align: center;">Chairman: Assoc. Prof. Ivan Nedyalkov, PhD, Eng. Stefan Patchedjiev, PhD</p> <p style="text-align: center;">Presentations: Papers 6.1, 6.2, 6.3,.6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10</p>
	15.15 – 16.45	<p>Section Session 7, Hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p> <p style="text-align: center;">SIGNALS AND SYSTEMS. IMAGE PROCESSING. EDUCATION METHODOLOGIES IN ICT.</p> <p style="text-align: center;">Chairman: Prof. Seferin Mirtchev, DSc Assoc. Prof. Georgy Petrov, PhD</p> <p style="text-align: center;">Presentations: Papers 7.1, 7.2, 7.3,.7.4, 7.5, 7.6</p>
	16.55	<p style="text-align: center;">Closing of the Conference, hall 4 & Virtual Room 3 Meeting ID: 897 7114 5542, Passcode: 584890</p>
		Prof. Seferin Mirtchev, DSc

CONFERENCE PROGRAMME

Wednesday,
16.00 – 17.00
15.11.2023 г.

Registration of participants & test the system, Zoom Platform
([Virtual Room 1](#)) Meeting ID: 886 1960 4478, Passcode: 290395

Thursday,
16.11.2023 г.

NATIONAL SCIENCE AND TECHNICAL CENTRE
Hall 4 & [Virtual Room 2](#) Meeting ID: 813 6764 8808, Passcode: 339781

EXHIBITION – INFOPULSE BULGARIA EOOD, Hall 4

10.00 – 12.30
16.11.2023 г.

Plenary Session 1, Hall 4 & [Virtual Room 2](#)
Meeting ID: 813 6764 8808, Passcode: 339781
Conference Opening, Greetings
Chairmen: Assoc. Prof. Kamen Rangelov, PhD
Prof. Seferin Mirtchev, DSc

1. „Introduction and development of 5G and 6G networks - radio monitoring and message control.”
Tinka Kapitanova - Chief Director of the Main Directorate "Monitoring and Control of Messages"
Communications Regulation Commission
Valentina Velkova - Head of the "Terrestrial Networks" Department in the "Limited Resource Management" Directorate, *Communications Regulation Commission*
 2. „The role of the Gigabit Infrastructure Act for Europe's connectivity”
Andreana Atanasova - Chairperson of the Managing Board
Alliance of the Technology Industry (ATI)
 3. „AI 5G Network and Innovation”
Alexandar Puntchev
AI Bulgaria EAD
 4. **Ivan Ivanov** - Manager,
Huawei Technologies Bulgaria Ltd
 5. „Digital Transformation in the Telecoms Industry”
Mykola Kozlenko - Delivery manager Infopulse company (Telco Expert)
Infopulse Bulgaria EOOD
 6. "Challenges to the construction of mobile communication-information and command nodes"
Eng. Miroslav Dimitrov -
Electron progress EAD
- 12.30 – 13.00 **Lunch Break**
- 13.00 – 14.00 **Plenary Session 2, Hall 4 & [Virtual Room 2](#)**
Meeting ID: 813 6764 8808, Passcode: 339781
16.11.2023 г. Chairman: Prof. Seferin Mirtchev, DSc
7. „Hot Access network Change (HAC) facilitated by 3P-AAA and 3P-C&B” - invited paper
Ivan Ganchev - University of Plovdiv “Paisii Hilendarski”, Plovdiv; Institute of Mathematics and Informatics – Bulgarian Academy of Sciences, Sofia; Telecommunications Research Centre (TRC), University of Limerick, Limerick,
 8. “Notes on Telecommunications – 2023”
Kamen Rangelov – CEEC

14.15 – 15.30 **Section Session 1, Hall 4 & [Virtual Room 2](#)**
Meeting ID: 813 6764 8808, Passcode: 339781
16.11.2023 г. **TELECOMMUNICATIONS NETWORKS AND SERVICES.**
Chairman: Prof. Elena Shoikova, DSc

1.1 Design and Optimization of Wireless Sensor Network Based on RP2040 and ESP8266
Milen Todorov

1.2 Implementation of an Agile SDLC CI/CD Pipeline for Managing a SDN VXLAN-EVPN fabric
Spas Georgiev, Kamelia Nikolova

1.3 Cloud and Edge Computing Architectures: A Survey
Hasnae Nouhas, Abdessamad Belangour, Mahmoud Nassar

1.4 A Universal Interpersonal Communication Application (UICA) Prototyping
Lazar Pendov

1.5 A Review of Brain-Computer Interfaces and their Applications
Aleksandar Ivanov

15.45 – 17.15 **Section Session 2, Hall 4 & [Virtual Room 2](#)**
Meeting ID: 813 6764 8808, Passcode: 339781
16.11.2023 г. **RESEARCH/EDUCATION METHODOLOGIES IN ICT - I.**
Chairman: Assoc. Prof. Rositsa Goleva, PhD

2.1 Manipulator with Parallel Kinematics for Teaching Robotics
Yassen Gorbounov, Yosif Bekyarov, Hao Chen, Nikolay Lakov

2.2 Robotics in Education: A Comparative Analysis of Robotic Platforms Across Educational Levels
Georgi Georgiev, Georgi Hristov, Plamen Zahariev, Diyana Kinaneva

2.3 A Chat Client-Server Application for E-learning
Serafeim A. Triantafyllou

2.4 Understanding Student Motivation in Digital Education
Nikolay Nikolov

2.5 Image Processing Methods for Microorganisms. Laboratory Assignment
Georgi Todorov, Lilyana Docheva, Ivo Dochev, Stoycho Manev

2.6 Using Python for Development of an Application for Building and Experimenting with GPSS Simulation Models
Aleksandar Hristov

2.7 Vision and Control Capabilities of Autonomous Systems with the Kria Adaptive System-on-Modules
Yassen Gorbounov, Petar Peychinov

Discussion, Hall 4 & [Virtual Room 2](#)

Meeting ID: 813 6764 8808, Passcode: 339781

17.30 – 18.30

EDUCATION ON TELECOMMUNICATION, INFORMATION TECHNOLOGY AND BUSINESS NEEDS.

16.11.2023 г.

Chairmen: Assoc. Prof. Kamen Rangelov, PhD,
Prof. Seferin Mirtchev, DSc,
Assoc. Prof. Dimitar Arnaudov, PhD

**Friday,
17.11.2023 г.**

[NATIONAL SCIENCE AND TECHNICAL CENTRE](#)

[Hall 4 & \[Virtual Room 3\]\(#\)](#) Meeting ID: 897 7114 5542, Passcode: 584890

Section Session 3, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890

08.30 – 09.20

WIRELESS SYSTEMS – 5G, 6G. MOBILE AND SATELLITE COMMUNICATIONS.

17.11.2023 г.

Chairman: Eng. Stefan Patchedjiev, PhD

3.1 Prediction of Radio Wave Attenuation due to Clouds by using Support Vector Machine Model

Hitesh Singh, Vivek Kumar, **Boncho Bonev**, Kumud Saxena, Vinod M Kapse, Ramjee Prasad

3.2 Prediction of Radio Wave Attenuation due to Rain by SVM

Vivek Kumar, Hitesh Singh, Kumud Saxena, **Boncho Bonev**, Vinod M Kapse, Ramjee Prasad

3.3 Neural Network Architecture to Predict Radio Wave Attenuation in a 5G Network

Rosen Pasarelski, **Georgi Petrov**, Teodora Pasarelska, Krasen Angelov

3.4 Life Cycle Evaluation of Photovoltaic Panels

Plamen Stanchev, Gergana Vacheva, **Nikolay Hinov**, Dardan Klimenta

3.5 Modeling of Energy Flows in Microgrids

Plamen Stanchev, Gergana Vacheva, Nikolay Hinov

Section Session 4, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890

09.30 – 10.30

COMMUNICATION TECHNOLOGY IN INTELLIGENT TRANSPORT SYSTEMS.

17.11.2023 г.

Chairman: Assoc. Prof. Georgi Petrov, PhD

4.1 On the Capacity of Vehicular Communication Systems

Paschalis Sofotasios, Seong Ki Yoo, Nidhi Simmons, Simon Cotton, Mikko Valkama

4.2 Road Traffic Analysis for Management of the Intelligent Transport System

Rosen Miletiev, Rumen Yordanov, Georgi Mladenov, Durhan Saliev, Vladimir Hristov

4.3 Dynamic Model and Adaptive Velocity Control of a Robotic Walker for Motion Support

Plamen Petrov, Ivan Kralov

4.4 Development of a Mobile Autonomous Chassis for Studying Grassland Areas by Using Thermal Cameras

Iliyan Damyanov, Durhan Saliev, Rosen Miletiev, **Kalin Dimitrov**

4.5 Prediction of Motion Trajectory of a Moving Object

Ventsislav Nikolov, Ivo Rakitin

Section Session 5, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890

10.40 – 12.30

17.11.2023 г.

**INTERNET OF THINGS (IoT). SMART HOME AND CITIES.
EHEALTH. BETTER LIVING WITH ICT.**

Chairmen: Assoc. Prof. Dimitar Arnaudov, PhD,
Prof. Ivan Kurtev, PhD

- 5.1 Enabling Cybersecurity Mechanisms in a SmartPatch-Based Emergency Response System**
Magdalena Kostoska, **Vladimir Trajkovik**, Bojana Koteska, Nevena Ackovska, Fedor Lehocki,
Ana Madevska Bogdanova
- 5.2 Integrated Process Management Environmet for Educational Institutions**
Georgi Kolev, **Elena Koleva**
- 5.3 Developing and experimenting simulation model of DDoS attacks in IIoT networks using Python**
Aleksandar Hristov, **Galya Pavlova**, Kamelia Raynova
- 5.4 Development and Research of an IoT WSN For Measuring Fine Dust Particles PM10 and PM2.5**
Dimitar Tokmakov, **Stanislav Asenov**, Slavi Lubomirov, Stela Stoyanova, Vesela Yancheva,
Slaveya Petrova, Bogdan Nikolov, Elenka Georgieva, Rumun Popov
- 5.5 Workflow Design for Implementation of In-silico Experiments with Big Biomedical Data Streams**
Stella Vetova
- 5.6 Automated System for Tracking the Condition of a Patient's Feet and Selecting Specialized Insoles**
Ivan Ralev, Despina Georgieva, Irinka Hristova, Greta Koleva
- 5.7 Cyber-Physical System for Smoke Detection and Recognition with Smart Glasses**
Nikolay Gospodinov, Georgi Krastev
- 5.8 Digital Twin Management Systems – Challenges, Application, Development**
Ivan Stankov, Varbinka Stefanova-Stoyanova
- 5.9 Study on the Relationship between Ruminations Number and Udder Surface Temperature in Cows Using Infrared Thermography**
Hristo Hristov, Kalin Dimitrov, **Toncho Penev**

Section Session 6, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890

13.00 – 15.00

17.11.2023 г.

E-GOVERNMENT. NETWORK SECURITY. CLOUD COMPUTING.

Chairmen: Assoc. Prof. Ivan Nedyalkov, PhD,
Eng. Stefan Patchedjiev, PhD

- 6.1 Health Monitoring of Microsoft Defender for IoT Implementation**
Marian Hristov, **Maria Nenova**, Viktoria Dimitrova, Kamelia Nikolova
- 6.2 Studying the Impact of Various DoS Attacks on the Network Performance of a Power Electronic Device**
Ivan Nedyalkov, Georgi Georgiev, Anton Gogushev
- 6.3 Implementation of Blockchain Technology In Electronic Voting Systems**
Angel Georgiev, Vladimir Valkanov

6.4 Secure Text Encryption Based on Clifford Attractors

Tsvetelina Ivanova, **Borislav Stoyanov**, Dobrev Dimitar

6.5 EU Cybersecurity Theory and Practice

Ivan Stankov

6.6 CyberAttacks and Robotics

Grozdan Hristov, Ivan Stankov, Dayana Mladenova

6.7 Web Scraping - State of Art, Techniques and Approaches

Irena Valova, Tsvetelina Mladenova, Gabriel Kanev, Tsvetana Halacheva

6.8 Exploiting Android using Metasploit Framework

Ivan Ivanov, Mariyana Dimitrova, Maya Atanasova

6.9 Antivirus Bypass of Payloads to Launch Advanced Client-Side Attacks

Ivan Ivanov, Mariyana Dimitrova, Maya Atanasova

6.10 A Practical Guide to Deploying Smart Contracts and Orchestrating Digital Ecosystems: Transitioning from Fiat Payment Systems to Digital Economies for Institutional and Academic Institutions

Martin Kaloiev, Georgi Krastev

Section Session 7, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890

15.15 – 16.30

17.11.2023 г.

SIGNALS AND SYSTEMS. IMAGE PROCESSING.

EDUCATION METHODOLOGIES IN ICT.

Chairmen: Prof. Seferin Mirtchev, DSc

Assoc. Prof. Georgi Petrov, PhD

7.1 Signal Processing Techniques Used in Speech Recognition or Synthesis. An Overview

Ivan Ralev, Georgi Krastev

7.2 Creating HDR Image Using Linear Step-by-Step Contrast Changes

Olena Osharovska, Mikola Patlayenko, Valentina Solodka

7.3 Synthesis of Fractal Images in the Problems of Compression of Static and Dynamic UHD Images

Stanislav Galchuk, Irina Tregubova, Mykola Patlaienko

7.4 Web-Based Remote Laboratory For Programming Arduino-Based Experiments

Ventsislav Nachev

7.5 Applying Additive Manufacturing to Engineering Education

Slavi Lyubomirov, Stanislav Asenov, Dimitar Tokmakov, **Hristo Kanevski**, Daniela Shehova, Slaveya Petrova

7.6 Case Study of 3D Scanning and Processing to Create Virtual 3D Plant Objects for Education

Stanislav Asenov, Slavi Lyubomirov, Dimitar Tokmakov, Hristo Kanevski, Daniela Shehova, Slaveya Petrova

16.35

17.11.2023 г.

CLOSING OF THE CONFERENCE, Hall 4 & [Virtual Room 3](#)

Meeting ID: 897 7114 5542, Passcode: 584890.

Prof. Seferin Mirtchev, DSc

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I.6 Hot Access network Change (HAC) facilitated by 3P-AAA and 3P-C&B

Ivan Ganchev

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In this paper, a new vision is presented for Hot Access network Change (HAC) facilitated by Third-Party Authentication, Authorization and Accounting (3P-AAA) and Third-Party Charging and Billing (3P-C&B), utilizing a consumer-based techno-business infrastructure (rather than the subscriber-based one currently in use), which will enable a loose dynamic (even casual) consumer-type association between mobile users and network/service providers. The technological implications of this vision are explained, and the key technological innovations required to support it are outlined.

1.1 Design and Optimization of Wireless Sensor Network Based on RP2040 and ESP8266

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The novelty in this paper is the design and implementation of a wireless network consisting of relatively inexpensive sensor nodes. It highlights the optimizations made, such as sending, storing, and visualizing the data in a cloud platform. In addition, an approach is provided for local storage of the measurement data and its sending in the form of a file to a server in the local network for backup purposes. The nodes run developed software that automatically returns the normal operation of nodes after a power outage or loss of connection.

1.2 Implementation of an Agile SDLC CI/CD Pipeline for Managing a SDN VXLAN-EVPN fabric

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In this paper, a DevOps oriented approach to managing a Software Defined Networking (SDN) based massively scalable data center fabric, using automation and software development principles is proposed and implemented. An Agile based methodology for the software development lifecycle (SDLC) of the coded infrastructure is implemented allowing for a flexible workflow compared to the traditional methods like Waterfall. Finally, it is demonstrated how the SDN based fabric can in the same way be extended into the top-of-rack access layer using the same workflow for non-SDN compliant devices, providing a unified method for automated network management and deployment.

1.3 Cloud and Edge Computing Architectures: A Survey

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Cloud and Edge computing have transformed the digital landscape, each presenting distinct architectural features. As computing paradigms rapidly evolve, it has become crucial to comprehend their specific architectures. This paper conducts a survey focusing on the architectural dimensions and layers in both Cloud and Edge computing. It comprehensively explores key characteristics, main objectives, underlying concepts, advantages, and performance aspects to bridge the gap between these significant computing paradigms. Furthermore, the research affords insights into diverse architectural models within both the Cloud and Edge computing domains, leading to a comparative analysis. In conclusion, this paper highlights the key points and summarizes the study.

1.4 A Universal Interpersonal Communication Application (UICA) Prototyping

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This paper describes a mobile application prototype built on the UICA architecture to test the UICA concept in practice. The prototype considers the security issue of managing multiple credentials and implements two of the five UICA communication categories using MTPROTO (Telegram) and XMPP protocols. It proposes unified interfaces for communication technologies and includes a UICA mechanism for selecting "best" communication service based on context.

1.5 A Review of Brain-Computer Interfaces and their Applications

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Brain-Computer Interfaces (BCIs) have emerged as a transformative technology at the intersection of neuroscience, engineering, and computer science. This paper provides a concise overview of the recent achievements and ongoing challenges in the field of BCIs. With the ability to decode neural activity and translate it into meaningful commands, BCIs hold promise for revolutionizing diverse domains, such as medical rehabilitation, communication, prosthetics, forensics and entertainment. The paper reviews the advancements in BCI technologies, including invasive and non-invasive techniques, elucidating the contributions of machine learning and artificial intelligence algorithms to signal processing.

2.1 Manipulator with Parallel Kinematics for Teaching Robotics

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The article examines the establishment of a physical laboratory prototype of a Delta-type manipulator with parallel kinematics. It covers the mechatronic system's key components and analyzes the working zone limitations. The experimental setup is suitable for training in engineering disciplines related to robotics that require interdisciplinary approach and state-of-the-art technical equipment. The present study aims to demonstrate the feasibility of building an affordable parallel motion mechanism for performing pick-and-place tasks. Its use in the engineering curriculum can lead to a significant increase in the quality of education in a wide range of disciplines related to mechatronics.

2.2 Robotics in Education: A Comparative Analysis of Robotic Platforms Across Educational Levels

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Robotics, with its hands-on and multidisciplinary nature, has emerged as a compelling educational tool, fostering creativity, critical thinking, and problem-solving skills in learners. This paper conducts an in-depth examination of various robotic platforms tailored for different educational

levels: elementary school, high school, and university. The unique learning objectives and challenges inherent to each educational stage are firstly outlined. Then, a comparative analysis of robotic platforms in terms of their design, features, ease-of-use, scalability, and alignment with curriculum standards are provided. For elementary learners, the emphasis is on platforms that introduce basic programming concepts and motor skills. High school platforms transition to more complex algorithms, real-world problem-solving, and interdisciplinary applications. University-level platforms are gauged on their ability to support advanced robotics research, intricate design, and integration with other emerging technologies. The comprehensive review aims to provide educators, researchers, and policymakers with insights into selecting appropriate robotic tools for each educational stage, optimizing the learning experience and better preparing students for a technologically advanced future.

2.3 A Chat Client-Server Application for E-learning

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This paper proposes a chat software application implemented in C programming language to support the learners attending an e-learning program. The Open System Interoperability (OSI) model and the UDP and TCP communication protocols are described to help learners understand and communicate through basic computer technology networks. The purpose of the described application is to support e-learning as a distance learning methodology. Specifically, learners can post their messages and provide important feedback for future improvement of the e-learning program.

2.4 Understanding Student Motivation in Digital Education

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The digital transformation of education introduces both opportunities and challenges, with student motivation surfacing as a crucial factor influencing digital learning outcomes. This study utilized a comprehensive survey to evaluate student motivation within the digital education context. Drawing on responses from 43 participants, an 11-question survey examined various facets of motivation and the potential influence of digital tools and personalized learning strategies. Findings indicate that a substantial percentage of students perceive computer applications as beneficial for motivation, while also emphasizing the influence of other motivational factors such as educator interaction and peer environment. The data also suggests the potential for adaptive and personalized digital learning platforms that cater to individual learning preferences and needs. This research highlights the imperative of a comprehensive understanding of student motivation in digital education, offering valuable insights for those aiming to optimize digital learning experiences.

2.5 Image Processing Methods for Microorganisms. Laboratory Assignment

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This paper presents one way of presenting traditional methods for digital image processing of microorganisms as a laboratory exercise for students. These methods include median and Gaussian filter noise removal, image thresholding, edge detection, and morphological operations. The lab exercise is designed for the students in the Faculty of Telecommunications, they are learning the fundamentals of digital image processing. It will also be useful for students whose major field is microbiology, they can use this paper for further analysis in their research in the part of image analysis of bacteria.

2.6 Using Python for Development of an Application for Building and Experimenting with GPSS Simulation Models

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The present paper aims to propose an open source application with graphical user interface for simulating models, created by General Purpose Simulation System (GPSS). The application is similar to the well-known discrete event simulator GPSS. The application has the following functionalities: Open a GPSS file, Enter or edit the model directly in the GPSS model editor window, experimenting with the entered GPSS model and displaying the results on the screen.

2.7 Vision and Control Capabilities of Autonomous Systems with the Kria Adaptive System-on-Modules

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The role of computer vision in autonomous control systems is increasingly growing. Along with this, there is a steady trend of increasing requirements for sensors performance, the speed of image processing algorithms, and the complexity of their implementation with the means of digital computing. This research explores the prospects for vision and control in a potentially dynamically changing environment using the recent system-on-module (SoM) Kria manufactured by

AMD/Xilinx. Acceleration based on heterogeneous systems incorporating user reconfigurable logic is considered a promising approach to improve performance and energy efficiency due to the high level of parallelism they offer. Therefore, the structure of the Kria SoM platform and the processing pipeline are examined in this paper. Object recognition experiments have been conducted which aim to demonstrate the suitability and accessibility of adaptive computing as a good candidate that can respond to the changing demands of a wide range of robotic applications.

3.1 Prediction of Radio Wave Attenuation due to Clouds by using Support Vector Machine Model

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Due to recent progress in wireless technology across various aspects of the wireless industry, there has been a growing demand for wider radio spectrum bandwidths. This demand is being driven by the expanding market for higher data rates and increased mobility. The rise of the internet has also contributed to the surge in demand for wireless networks, causing the available radio spectrum to become more congested. According to multiple studies, regulatory mechanisms established by authorities to safeguard the rapidly increasing number of spectrum users have resulted in a surge in spectrum demand. Researchers are working diligently to develop a system to address the impending spectrum crisis. Several regulators have shown interest in facilitating access to free radio channels for unlicensed devices. This paper employs a machine learning technique to forecast the attenuation caused by troposphere phenomena such as clouds, dust, hail, gases, and others, especially at frequencies above 10 GHz. The Support Vector Machine (SVM) model was trained utilizing real-time data from the AMSER2 satellite at an Indian site, resulting in improved accuracy. In the results section, a comparative analysis will be conducted.

3.2 Prediction of Radio Wave Attenuation due to Rain by SVM

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Due to the significant annual growth in demand for wireless data transmission capacity, wireless carriers must prepare for a thousand-fold increase in mobile traffic by 2021. To handle high data rates, researchers need to explore new wireless frequencies, and next-generation technologies must tackle various challenges. These challenges include obtaining more spectrum allocation in millimeter wave frequency bands, deploying highly directional beam-forming antennas, extending battery life, achieving high bit rates with lower outage probability, reducing infrastructure costs, and enhancing capacity for multiple users simultaneously. There are two types of telecommunication links: terrestrial and satellite. Terrestrial links, also referred to as radio relay links, involve the propagation of radio waves through the troposphere, which is the region between the Earth's surface and the upper atmosphere. In this region, various obstacles like gases, water vapor, rain, storms, snow, and hail can impede higher frequency radio signals, leading to energy absorption and diffusion that result in signal attenuation. Urban structures such as buildings, trees, lampposts, and grids can also obstruct radio waves on terrestrial paths, causing phenomena such as reflections, diffractions, refractions, scattering, depolarization, and others. To address these challenges and achieve higher accuracy compared to previous studies, this research proposes the utilization of a Support Vector Machine (SVM) model trained with real-time data from the AMSER2 satellite. This approach aims to overcome the obstacles in wireless communication and improve the accuracy of predictions.

3.3 Neural Network Architecture to Predict Radio Wave Attenuation in a 5G Network

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The purpose of this study is to use neural networks to predict radio wave attenuation in 5G networks, addressing the challenges of complex wave propagation and optimizing network performance. The research developed and trained a neural network model that effectively predicts radio wave attenuation in the dynamic and complex context of 5G networks. The model combines spatial data obtained using convolutional neural networks (CNN) with sequential data analyzed using long short-term memory (LSTM) networks. This research contributes to the field of 5G network optimization by introducing an innovative approach for radio wave attenuation prediction. The key contributions of this study can be summarized as follows:

- Improved prediction accuracy - The neural network model demonstrates particular accuracy in predicting the attenuation of radio waves. Its performance metrics, including MAE and RMSE, consistently outperform conventional models, making it a valuable tool for optimizing 5G network design;
- Improved network performance - Accurate radio attenuation predictions allow network operators to optimize coverage and capacity, resulting in improved signal quality and reduced interference. This in turn improves the overall performance and quality of service in 5G networks.
- Incorporation of spatial and sequence data - The combined use of CNN for spatial data and LSTM for sequence data enables a comprehensive analysis of the complex factors affecting radio wave attenuation in 5G networks. This new approach significantly improves the prediction accuracy.

3.4 Life Cycle Evaluation of Photovoltaic Panels

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In the presented paper a life cycle evaluation of photovoltaic panels was presented. A comparative analysis was made of two types of panels with the same power, provided by one manufacturer. The main advantages and disadvantages of photovoltaic panels are presented. Through this examination, a suitable type for building a photovoltaic plant can be easily and efficiently determined. Estimating the lifetime and efficient operation of the individual modules required for construction could significantly reduce construction and maintenance costs.

3.5 Modeling of Energy Flows in Microgrids

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In this article, a microgrid model with the possibility of adding renewable energy sources is considered. The considered network is radial and in it the dues of the lines between the individual nodes have been added and the values of the loads have been set. According to a certain methodology, the necessary cross-sections and type of wires are calculated and designed. Different energy sources and energy storage elements can be easily connected to the implemented scheme. For this reason, it is suitable for study by students and doctoral students for a better presentation of the basic principles in the distribution of energy flows in low voltage grids.

4.1 On the Capacity of Vehicular Communication Systems

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The κ - μ / inverse gamma and η - μ / inverse gamma distributions constitute two of the most distinct composite fading models. The present work offers novel results on the achievable ergodic capacity over these composite multipath/shadowing conditions. The derived expressions are corroborated with respective simulation results and are shown to be useful in practical wireless scenarios in the context of device to device communications, such as cellular, off-body, and vehicle-to-vehicle communications.

4.2 Road Traffic Analysis for Management of the Intelligent Transport System

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This paper represents an investigation of the road traffic based on LPR cameras to improve the efficiency of the intelligent transport systems (ITS). The LPR data are stored in the database to be analyzed for better ITS measurement such as traffic optimization and smart control of the traffic lights. The data processing is based on MySQL database and PHP scripts to obtain the traffic flow parameters. The analysis of traffic indicators allows an optimization of traffic flows in the city road network to increase traffic throughput and safety in the intelligent transport systems.

4.3 Dynamic Model and Adaptive Velocity Control of a Robotic Walker for Motion Support

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This paper proposes a dynamic model and adaptive velocity control for a nonholonomic robotic walker. A control-oriented dynamic model of a nonholonomic robotic walker using the Boltzmann-Hamel method in quasi-coordinates is derived. An adaptive velocity controller is designed to deal with the unknown mass-inertia parameters of the walker due to changes caused by the physical human-robot interaction. The stability property of the closed-loop system in error coordinates is analyzed and asymptotic stability property is established using Lyapunov theory. Computer simulation tests are conducted to verify the validity of the derived walker dynamic model and designed adaptive velocity control scheme with unknown mass-inertia walker parameters. Initial experiments with a robotic walker prototype for motion support are also reported.

4.4 Development of a Mobile Autonomous Chassis for Studying Grassland Areas by Using Thermal Cameras

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This article focuses on the topic of using intelligent approaches and modern hardware and software solutions and systems in the study of pasture areas, by using infrared imaging and developing a mobile, autonomously driven chassis with the ability to robotize the processes of movement, capture the necessary data, processing the information and providing information about the investigated areas.

4.5 Prediction of Motion Trajectory of a Moving Object

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In this paper experimental result of prediction of a moving object in a net of discrete points is presented. The prediction is done by autoregressive model of X-axis and Y-axis independently. Such kind of prediction could be valuable for prediction of moving of autonomous robots, drones and other similar artificial objects which can have implemented some kind of intelligent behavior. Thus the moving object can predict reaching a dangerous area or erupting points in its path. The results are analyzed and conclusions are summarized.

5.1 Enabling Cybersecurity Mechanisms in a SmartPatch-Based Emergency Response System

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This paper elaborates on the cybersecurity challenges of a healthcare system that includes a chest-patch (SmartPatch) sensor, used for the process management of massive victims' events. Integrating biosensors into emergency communication strategies requires mechanisms for achieving trustful communication.

A use case of usage Bluetooth LE communication between SmartPatch and other device is presented in the paper, and presents the security challenges and potential solutions.

5.2 Integrated Process Management Environment for Educational Institutions

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An integrated environment for monitoring and management of educational institutions has been developed on the Home Assistant platform. The system allows surveillance, monitoring and process management of the indoor and outdoor environment, the consumption (and production) of electrical energy, the presence of people etc. The paper presents the capabilities of the system for managing environmental parameters and effective interaction through integration with a voice assistant in native language. Universal control panel and presence sensor have been developed and presented for integration with the process management system.

5.3 Developing and experimenting simulation model of DDoS attacks in IIoT networks using Python

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The DDOS attack vector on a PLC in an automated process control system is investigated and a simulation model for determining the DDOS attack vector on a PLC in an IIoT network was developed using Python. The proposed simulation model can be used for predicting the time for conducting successful DDoS attack, which allows to estimate the maximum response time of defense systems.

5.4 Development and Research of an IoT WSN For Measuring Fine Dust Particles PM10 and PM2.5

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This paper introduces a successfully developed and tested cutting-edge IoT real-time air quality monitoring system tailored for Smart Cities. The system is distinguished by its low energy consumption and relies on the combined use of LoRaWAN and GPRS wireless communication technologies. Its versatility allows for deployment uses both indoors and outdoors. Key components of the system include a single-chip microcontroller, air pollution sensors capable of measuring NO₂, CO, PM₁, PM₁₀, and PM_{2.5} levels, as well as Long-Range (LoRa) and GSM modems. To ensure a sustainable power supply, a photovoltaic and a battery is integrated into the system. Additionally, the system features a graphical interface for presenting the collected information. The utilization of these technologies bestows the fine particulate matter measurement system with several notable advantages. These include cost-effectiveness, long-range communication capabilities, extensive coverage, prolonged device battery life, and straightforward operation. Overall, this system represents a significant advancement in real-time air quality monitoring, aligning perfectly with the objectives of Smart Cities and IoT-driven urban development.

5.5 Workflow Design for Implementation of In-silico Experiments with Big Biomedical Data Streams

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The presented article deals with a workflow for processing and analyzing big biomedical data streams. The proposed workflow is designed using the software for biological and biomedical image processing Cell Profiler. The structure of the workflow consists of twelve stages. It includes the

steps of segmentation and greyscale image masking to produce effective image analysis. The structure of the workflow and the performed experiments are presented graphically.

5.6 Automated System for Tracking the Condition of a Patient's Feet and Selecting Specialized Insoles

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The paper presents a description of a developed system, the purpose of which is to facilitate the work of a medical specialist in monitoring the condition of a person's feet and choosing suitable insoles for him. At the beginning, the problem is considered and an alternative solution is proposed. The developed system is described using UML diagrams, the system interface is also presented.

5.7 Cyber-Physical System for Smoke Detection and Recognition with Smart Glasses

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This paper presents a cyber-physical smoke detection and recognition system based on smart glasses equipped with camera. The system leverages wearable technology to capture real-time smoke. A neural network-based smoke recognition model processes the captured data to identify and classify smoke patterns accurately. The integration of smart glasses enhances situational awareness and enables timely emergency responses.

5.8 Digital Twin Management Systems – Challenges, Application, Development

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Digital twin technology has come into use in recent years and is generally the creation of a virtual copy of a physical system. This virtual copy is created by combining data received from multiple sensors, IoT devices. The resulting information is processed using machine learning algorithms to create an accurate model of the actual physical system. The application of the Digital Twin is increasingly widespread, often being used for product design, manufacturing optimization, productivity enhancement, urban planning and cybersecurity. The potential use of the Digital Blinker in the aerospace and automotive industries is revolutionary, as it is possible to simulate the operation of an engine or other component to improve its efficiency and reliability.

5.9 Study on the Relationship between Ruminations Number and Udder Surface Temperature in Cows Using Infrared Thermography

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In this research, we study the relationship between the number of ruminations and the surface temperature of the udder in dairy cows using infrared thermography. The results show a dependence of the number of ruminations and the surface temperature of the udder on the Temperature-humidity index (THI), which increases with its increase. The correlation coefficient between udder surface temperature and rumination number also increased with increasing THI, which may be a sign of a relationship between them. Udder surface temperature was measured by the method of infrared thermography, THI was reported with a Kestrel device, and ruminations were recorded by counting the number of eructations using a microphone attached to the left side of the cows' neck. The study shows that infrared thermography can be used to accurately and inexpensively monitor rumination and udder surface temperature in dairy cows.

6.1 Health Monitoring of Microsoft Defender for IoT Implementation

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Nowadays, more and more industrial organizations, such as manufacturing plants, electric grids, and oil and gas pipelines, are starting to introduce security mechanisms in their environments. The traditional silos, the standard among Operational Technology (OT) networks up until recently, is no longer a norm, especially after the introduction of Industry 4.0. Usually, air-gapped OT networks used to be much more secure because the adversaries should have physical access in order to compromise an asset or steal intellectual property. However, the digitalization and connectivity transformation, which aim to ease and optimize human work, led to the introduction of security challenges. One of the ways to increase the security posture of an industrial environment is by introducing a network monitoring tool for raising the level of visibility. But what if the actual tool loses visibility due to a malfunction? Hence, this paper aims to propose health/operational monitoring solution for Microsoft Defender for IoT (D4IoT) – one of the leading products on the market for monitoring in Industrial Control System (ICS) environment.

6.2 Studying the Impact of Various DoS Attacks on the Network Performance of a Power Electronic Device

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The objective of this work is to carry out a study to determine which TCP DoS attacks affect the network performance of a power electronic device (PED). For the purpose of the study, an experimental network consisting of two parts, a modeled part (created by using GNS3) and a real part, is set up. The modeled part of the experimental network is used to "attack" the tested PED in the real network. The attacking has been done with different TCP DoS attacks - TCP SYN, TCP ACK, TCP FIN and TCP RST flood attacks. The flooding has been performed using the Kali Linux tools. Additionally, round trip delay was measured and traffic monitoring was done in the real part of the network.

6.3 Implementation of Blockchain Technology In Electronic Voting Systems

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This paper will explore the ability to implement Blockchain technology within electronic voting systems. The goal of this paper is to present an overview and high-level practical solution for this development. To achieve this, aim the Estonian electronic voting system will be used as a base which we will enhance with the functionalities of smart contracts. In the research it will be made a comparison between two of the biggest Blockchain platforms – Ethereum and Cardano, which will help the scientists choose the right system. In conclusion, a small piece of smart contact code will be presented in addition to the summary, placed at the end of the document.

6.4 Secure Text Encryption Based on Clifford Attractors

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Due to the numerous ways that confidential information can be compromised, the security of data exchanged online requires increasingly diverse methods of protection. In this paper, we present a secure text encryption algorithm based on Clifford attractors to improve security of message transfer. The method is subjected to different security tests. The experimental outputs shows that the proposed text encryption algorithm proposes more efficient performance against other similar text encryption algorithms.

6.5 EU Cybersecurity Theory and Practice

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In an increasingly digitized world the need to provide cyber protection is a critical factor for the existence and proper functioning of a number of important information systems and the services they offer. Effectively organized protection of any system, service or information ensures cyber security in the digital space. This paper presents and analyses the measures taken in Bulgaria and the EU to deal with cyber threats.

6.6 CyberAttacks and Robotics

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As artificial intelligence and robotics continue to be integrated into our daily lives, there is a growing concern over potential vulnerabilities and their exploitation. The threats that arise from cyberattacks on robots and AI systems can lead to significant damage to both the system and the user. This article aims to explore the possible connections, threats, and implications for the fields of artificial intelligence, robotics, and cyberattacks. It provides an overview of common forms of cyberattacks, defines robots and artificial examines some of their various applications.

6.7 Web Scraping - State of Art, Techniques and Approaches

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Web scraping has emerged as a crucial technique for extracting valuable information from the vast and ever-growing expanse of the Internet. This paper provides a comprehensive overview of the current state of web scraping. The study surveys prominent applications across diverse domains, highlighting the pivotal role played by web scraping in modern data-driven decision-making processes. The paper meticulously explores various techniques employed in web scraping, including desktop applications, plugins and browser extensions, web-based applications, cloud applications and custom applications. To showcase the versatility of web scraping, the paper elucidates its applications in various domains, including e-commerce, finance, research, and social media analysis.

6.8 Exploiting Android using Metasploit Framework

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In this article we will discuss about exploiting Android devices like tablets/phones/emulators etc. using one of the most popular exploitation frameworks called Metasploit Framework and MSFvenom. Here we'll use MSFvenom to generate a payload and save it as an .apk file, then set up the Metasploit framework listener using the multi handler. Once the user/victim downloads and installs the malicious apk, the attacker can easily open the Metasploit session.

6.9 Antivirus Bypass of Payloads to Launch Advanced Client-Side Attacks

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Penetration tests are the most common form of cybersecurity solution aimed at assessing the security of a system or network. They are a fundamental aspect of building a secure and reliable infrastructure for networks of all sizes. Generating custom payloads to launch advanced client-side attacks will do no good if they are detected and blocked by antivirus programs. In this article, we'll explore different techniques and coders to use to make our payloads as undetectable as possible for penetration testing.

6.10 A Practical Guide to Deploying Smart Contracts and Orchestrating Digital Ecosystems: Transitioning from Fiat Payment Systems to Digital Economies for Institutional and Academic Institutions

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This paper presents a comprehensive guide to deploying smart contracts and orchestrating digital ecosystems tailored to the unique needs of institutional and academic settings. Embracing the potential of Web3 technologies and blockchain foundations, our guide delineates the pivotal role of these digital ecosystems in the transition from traditional fiat payment systems to modernized, efficient, and transparent digital economies. The paper encompasses an introductory exploration of Web3 and blockchain technologies. It then proceeds to outline a systematic plan for the creation of digital ecosystems, emphasizing the necessity for tailored privileges and transparent transactions. A focal point of our guide is the practical implementation of smart contracts, providing a clear example of how they enforce the specified rules, ensuring secure and regulated token flows. With a heightened focus on the academic environment, this guide empowers institutions to seamlessly bridge the gap between traditional and digital economic systems, enhancing financial stability, reducing bureaucracy, and increasing transparency. This resource serves as a reference for academics, institutions, and stakeholders navigating the complexities of modern financial systems.

7.1 Signal Processing Techniques Used in Speech Recognition or Synthesis. An Overview

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The paper presents an overview of the techniques used in audio stream processing in order to obtain a sufficiently complete knowledge base to be used in speech recognition or synthesis. At the beginning, some of the most common methods are presented in tabular form. The mathematical representation of Mel Frequency Cepstral Coefficient (MFCC), Gaussian Mixture Model (GMM), Hidden Markov Model (HMM), and K-Nearest Neighbor Classifier (KNN) is reviewed.

7.2 Creating HDR Image Using Linear Step-by-Step Contrast Changes

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The paper presents results on simulating the creation of an image with an extended dynamic range with a twelve-bit representation of each of the primary colors from a high-definition image, originally represented in the red, green and blue color space by an eight-bit code. The color space of the original image is converted into the space of luminance and color-difference signals, in which a step-by-step uniform increase and decrease in the range of luminance and color-difference signals is performed. The resulting intermediate images are added together to form an extended range. The results showed a subjective increase in image contrast and the emergence of fine details in both light and dark shades. The increase in image detail is objectively shown.

7.3 Synthesis of Fractal Images in the Problems of Compression of Static and Dynamic UHD Images

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In recent years, geometric models have been used to describe natural objects with combinations of simple shapes such as lines, triangles, circles, spheres and polyhedra. However, more complex natural objects such as cellular material, cloud formations and tree canopies are difficult to describe using these familiar sets of shapes. Fortunately, advances in computing tools have made it possible to take mathematics to a higher level, leading to the discovery of unique and different models. In particular, fractals have helped us understand natural phenomena and processes. This paper presents the results of a modified genetic algorithm for fractal coding applied to still images and video sequences. The relationship between compression coefficients and sequence block size is studied and fractal compression is compared with the standard MPEG-4 HEVC compression algorithm. The results show that fractal compression can achieve twice the compression factor with the same signal-to-noise ratio. It is becoming increasingly clear that the boundary between mathematics and information is blurring and the study of such expressions can lead to the discovery of new and unique models.

7.4 Web-Based Remote Laboratory For Programming Arduino-Based Experiments

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The web-based system offers the capability for remote programming of real-world physical experiments based on Arduino microcontroller boards. The system provides accessibility from any location worldwide with an internet connection. It forms the foundation for the development of comprehensive remote laboratories for educational, scientific, and business purposes.

7.5 Applying Additive Manufacturing to Engineering Education

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This paper outlines the incorporation of education and training in digital fabrication and material processing within a master's engineering program, involving a group of 20 students. The program utilized additive manufacturing, specifically 3D printing, to provide students with practical knowledge in part design, manufacturing, and performance assessment. The study focused on fused deposition modeling (FDM) for the fabrication of a robotic arm, where students evaluated the performance of its components. The installation of drive motors and provision of relevant software were also integral parts of the study. A pre- and post-course survey was conducted to monitor the learning experience and gather feedback from the participating students. The results demonstrated that the integration of digital production, self-directed learning, and peer collaboration significantly enhanced engagement and learning outcomes.

7.6 Case Study of 3D Scanning and Processing to Create Virtual 3D Plant Objects for Education

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This article presents the successful application of the EinScan HX 3D scanner in scanning various plant species, leading to the creation of 3D virtual representations of plants. The study involved conducting 3D scans on two plants exhibiting distinct geometric shapes and sizes. These scans were executed using two different methods: Rapid scanning and laser scanning. A comprehensive analysis of the scanning techniques was performed, considering their effectiveness in capturing different plant characteristics. The findings are thoroughly documented and presented in the report.

Furthermore, the acquired results will be instrumental in establishing a digital library featuring 3D virtual representations of protected plant species within their respective ecosystems. In addition, this resourceful approach unlocks opportunities for leveraging the generated 3D objects in diverse fields such as architectural interior design and education.

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