Novice Insights in Electronics and Telecommunications. SSET 2023

Student Symposium *on Electronics and Telecommunications*

Simpozionul Studenţesc de Electronică şi Telecomunicaţii

Cluj-Napoca,

Mai 2023

Novice Insights in Electronics and Telecommunications. SSET 2023

Student Symposium *on Electronics and Telecommunications*

Simpozionul Studenţesc de Electronică şi Telecomunicaţii

EDITORS: Anca APATEAN
Lorant SZOLGA

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Simpozionul Studenţesc de Electronică şi Telecomunicaţii

Facultatea de Electronică, Telecomunicaţii şi Tehnologia Informaţiei
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UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

Facultatea de Electronică, Telecomunicații și Tehnologia Informației

SSET

Simpozionul Studenţesc de Electronică şi Telecomunicaţii

2023

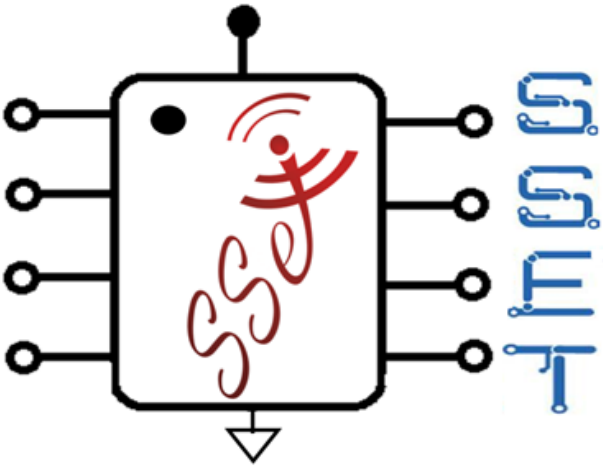

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Table of Contents

EDITORS: Anca APATEAN, Lorant SZOLGA

PUBLISHER: Napoca STAR

Welcome SSET 2023

The Faculty of Electronics, Telecommunications and Information Technology has established a tradition, by organizing the Student Symposium on Electronics and Telecommunications (SSET), whose 18th edition is held on the 26th of May 2023.

The symposium aims to stimulate the creativity and originality of our students, providing them with a formal framework for presenting their most important achievements and results. It is also an excellent opportunity for students to practice and improve their presentation and communication abilities in front of a well-informed audience, as well as to promote their abilities and knowledge acquired during the years of study.

With every edition, this event strengthens the many existing links and generates new connections between the academic and the industrial environment, given the large number of representative companies that have become partners in the symposium.

Bringing together students, faculty, and representatives of the industry in such a high-quality professional environment is a key step in improving the quality of the educational process.

This scientific event is a complementary activity, besides the main didactic and research activities, directly contributing to the successful accomplishment of the mission of our faculty: "To contribute by advanced research to the knowledge development in electronics, telecommunications and information technology, as well as to train specialists able to develop, design, implement, and exploit electronics and telecommunications systems, with applications in the most various industrial, research, and domestic areas".

The high quality of the symposium cannot be achieved without the active involvement of the organizers: the SSET committee, as well as our industry partners, have made this event possible, and my thanks go out to them. I would also like to thank the faculty teaching staff who have encouraged the students to compete in this event and coordinated their scientific endeavours.

Good luck to all the students participating at the symposium!

Professor, Ph.D. ***Ovidiu POP***
DEAN of ETTI, UTCN

Student* Symposium *on Electronics and Telecommunications

Faculty of Electronics, Telecommunications and Information Technology
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Principalele direcții de cercetare în ETTI

În cadrul facultății există o serie de direcții de cercetare, care sunt sintetizate după cum urmează:

- **Analiza şi sinteza circuitelor electronice**
- **Microelectronica - circuite analogice şi digitale VLSI**
- **Tehnici moderne de prelucrare a semnalelor**
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- **Comunicații unificate în Internet**
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- **Recunoașterea automată a vorbirii, sinteza din text a vorbirii**
- **Prelucrarea și securitatea datelor**
- **Software pentru electronică și telecomunicații**
- **Radiocomunicații celulare și prin satelit**
- **Sisteme electronice de putere**
- **Sisteme electronice de monitorizare și control**
- **Energii regenerabile**
- **Senzori și sisteme de achiziție a datelor.**


SSET
2023
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Obiective
– implicarea studentilor in activitatile de cercetare stiintifica
– crearea unui cadru stimulativ de interacţiune, schimb de idei şi experienţe;
– afirmarea studenţilor cu preocupări deosebite pentru rezolvarea de probleme din domeniile electronică, telecomunicaţii şi domenii conexe.
editia XVIII
ETTI

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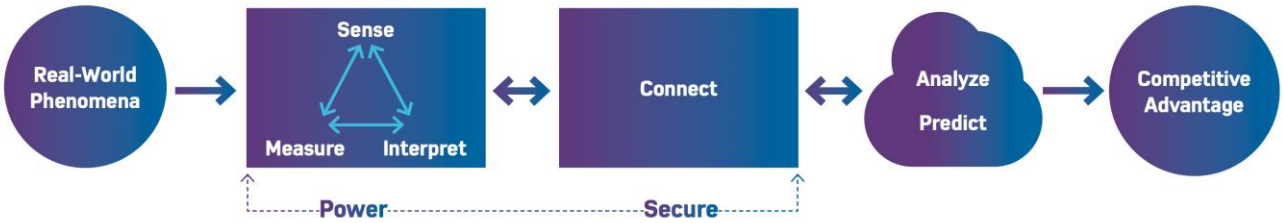

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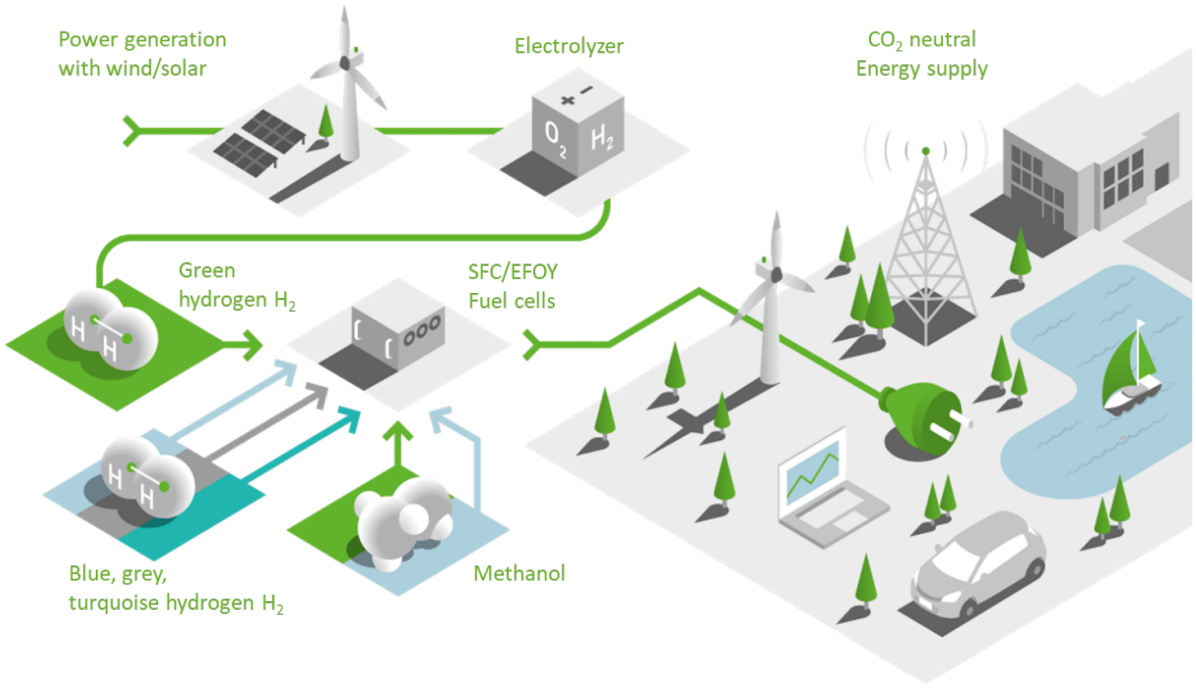

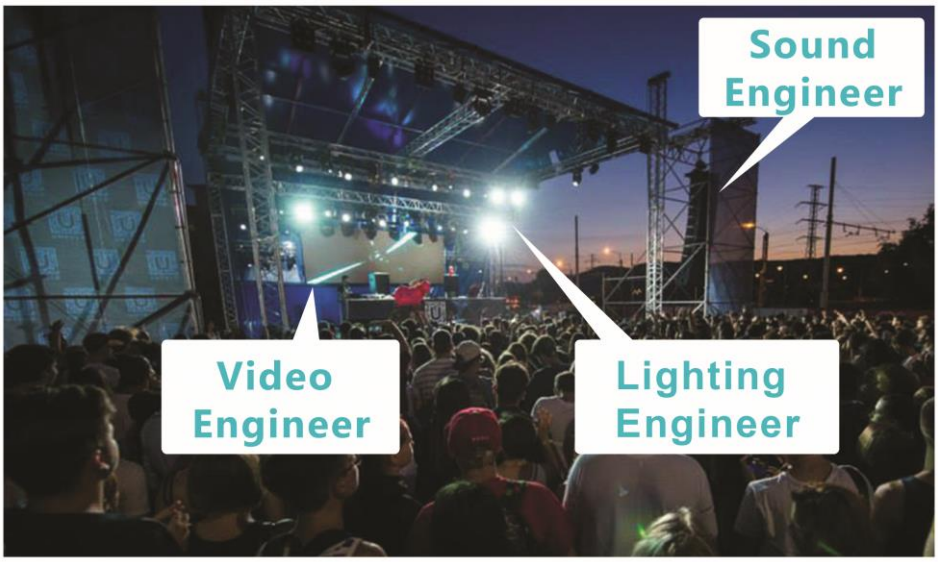

Dani Sound activează de peste 20 de ani în industria spectacolelor, atât prin furnizarea și operarea echipamentelor necesare desfășurării acestora cât și prin consultanță personalizată.

De-a lungul timpului, Dani Sound a contribuit la o gamă variată de evenimente precum: Untold Festival, Lord of the Dance, Sports Festival, Opera Aperta, Peninsula, Techsylvania, TEDxCluj, Festivalul Dilema Veche, Balul Operei, Cerbul de Aur, Baletul pe gheață St. Petersburg, Kings On Ice, All Star Game și multe altele.

Dani Sound a colaborat cu majoritatea artiștilor naționali. Au fost și colaborări cu artiști internaționali dintre care enumerăm: James Blunt, Jean Michel Jarre, Beyonce, Julio Iglesias, Jose Carreras, Andrea Bocelli, Joe Satriani, Al Di Meola, Zucchero, Pink Martini, Lara Fabian, YAMATO, Vaya Con Dios, Nigel Kennedy, Haddaway, Culture Beat, Ingrid, Nadia Ali, Ana Moura, Tarja, Nazareth, Chris Norman, Smokie, Richard Clayderman, Toto Cutugno, Goran Bregovic, Edwin Marton, Tiesto, Parov Stelar, ATB, Paul Kalkbrenner, Guru Josh, Wilkinson, Foreign Beggars, Pendulum și lista continuă.

Mai multe detalii pe:
www.danisound.ro

DANI SOUND

Partners from Previous Edition (SSET 2022)

Previous Edition (SSET 2022) Winners

TST **Bachelor Student (Student în domeniul Inginerie Electronică și Telecomunicații / Inginerie și Management) :**

1st Prize	**Vladut Coman**	***„An Open-Source Implementation of Software-Defined Wide Area Network”,*** Coordinator: **Virgil DOBROTĂ**
2nd Prize	**Andres-Gabriel Pașca**	***„Automated Deployment of a 5G Core Network with Open Source MANO and OpenStack”,*** Coordinators: **Virgil DOBROTĂ, Robert BOTEZ**
3rd Prize	**Tudor Mircică**	***„Simulation of a V2X Scenario Using Eclipse SUMO and MOSAIC”,*** Coordinator: **Iustin IVANCIU**
Honorable mention 1	**Teodora-Bianca Barburiceanu**	***„Load Balancing Architecture using Traffic Manager Routing Methods in Microsoft Azure”,*** Coordinator: **Virgil DOBROTĂ**
Honorable mention 2	**Vlad-Eusebiu Popa**	***„Security in Unified Communications with Cisco Unified Border Element (CUBE)”,*** Coordinator: **Virgil DOBROTĂ**
Honorable mention 3	**Alin-Tudor Sferle**	***„Microservices-Based Web Application for Managing Kubernetes Clusters”,*** Coordinators: **Virgil DOBROTĂ, Robert BOTEZ**

EA **Bachelor Student (Student în domeniul Inginerie Electronică și Telecomunicații / Inginerie și Management) :**

1st Prize	**Emilia Gheorghiță**	***„Comparison of three bandgap topologies implemented in standard CMOS technology with parasitic PNP bipolars”,*** Coordinators: **Iulian CÂMPANU (Infineon), Raul ONEȚ**
2nd Prize	**Cătălin Nandrea**	***„Smart Battery Charger”,*** Coordinator: **Dorin PETREUȘ**
3rd Prize	**Hirceaga Cosmin**	***Sensor network with RS-485 communication”,*** Coordinator: **Septimiu POP**
Honorable mention 1	**Voina Valentin**	***„PCB design in Altium for a data acquisition system”,*** Coordinator: **Septimiu POP**

IET Master/Doctor **(Masterand/Doctorand în domeniul Inginerie Electronică și Telecomunicații) :**

1st Prize	**Grigorița Elena**	***„Novel Thermal Shutdown Circuit for Automotive Power Management Applications”,*** Coordinators: **Tomina SĂLĂJAN (Infineon), Raul ONEȚ**
2nd Prize	**Mîndru Andrei**	***„Body posture analyzing, monitoring and improvement device”,*** Coord: **Călin FĂRCAȘ**
3rd Prize	**Vlad Hanăș**	***„Differences of class D and class AB audio power amplifier”,*** Coordinator: **Ovidiu POP**

Previous Edition (SSET 2022) Scientific Committee

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TST-IM **STUDENT ORAL Presentations Committee**

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Section 2 - ORAL Presentations:

EA-IM **STUDENT ORAL Presentations Committee**

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Present Edition (SSET 2023)

Symposium Program

The event takes place on Friday, 26th of May, according to the below detailed timetable:

Starting Time	Events	(S1) TST-IM	(S2) EA-IM	(S3) Master/Doctor
08:00	Opening Speech	Room 41	Room 41	Room 41
08:15	ORAL Presentations	8:15 – 11:30	8:30 – 11:00	8:30 – 9:45
		Room 41	Room 367	Room 368
11:45	Partners Presentations	Infineon, Bosch, Analog Devices		
12:15	Award Ceremony Closing Word			

SSET 2023 Scientific Committees:

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Professor Emanuel PUȘCHIȚĂ, PhD

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Section 2 - ORAL Presentations: Bachelor Student

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Associate Professor Albert FAZAKAS, PhD

Associate Professor Liviu VIMAN, PhD

Assistant Professor Călin FĂRCAȘ, PhD

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Financial Officer: Eng. Angela RUSU

Simpozionul Studenţesc de Electronică şi Telecomunicaţii

Presentations

Presentations – Section 1 (Student TST-IM)

Presentations – Section 2 (Student EA-IM)

Presentations – Section 3 (Master/ Doctor)

Paper Summary

Section 1 (TST-IM)

S1-1 „Chatbot for Movie Recommendations Using Python”,
Denis Pădurariu, Iustin-Alexandru Ivanciu
Abstract—Chatbot technology can provide efficient and personalized support according to user requests, while also reducing the workload of human operators in a wide variety of domains. Moreover, a chatbot can improve the products and services an organization offers by collecting data about user behavior, preferences and interests. This paper presents a Python-based chatbot which uses The Movie Database dedicated API in order to make movie recommendations based on the following user preferences: genre, actor to appear in the cast, minimum rating score and maximum duration in minutes. Each recommendation comes with the title, release date, rating score, a brief overview and a link to the movie on the TMDB website.
Keywords—API, chatbot, Python, TMDB

S1-2 „Motion Detection System Using Android and Amazon Web Services”, *Paul-Cristian Ionescu, Iustin-Alexandru Ivanciu*
Abstract—This paper presents the development of an Internet of Things system for motion detection using the ESP32-S3-DevKitC-1-N8R8 and the Adafruit AMG8833 thermal camera sensor. The data received from the sensor is sent to an Android application where it can be viewed in real-time. Moreover, if any motion is detected, the user will be notified through a message in the application. Additionally, the data is stored in an Amazon Web Services relational databaseand can be represented using Grafana dashboards.
Keywords—AWS, Android, ESP32, IoT, motion detection

S1-3 „Developing of a multiwire cable continuity tester device”
Tudor Bădean, Șerban Nicolae Meza
Abstract—This document describes the development of a device for testing continuity in multiwire cables.
Keywords—Cable, tester, quality gate, continuity.

S1-4 „mmWave System Precoding Using Hybrid Beamforming and MIMO Transmitter Arrays”
Mircea Diana-Elena, Emanuel Puschiță
Abstract—High demands in both increased speed, throughput, reliability and capacity of a 5G wireless transmission system require new solutions to face the loss problems while preserving the level of power transmission. Compared to a microwave system, communication in higher frequency bands, such as millimeter Waves (mmWave) systems need to anticipate and mitigate propagation challenges by directing the radiated power towards the targeted users. For this, beamforming using large aperture arrays is implemented in transmitters at the base station (BS) to create very directional beams destined to specific users, and also at the receiver of the user equipment that has to permanently be in contact with the BS, through what is called a beam pair. Compared to an optimal (fully digital beamformer), a hybrid beamformer that combines both digital and analog solutions is a cheaper version with similar performance in MIMO systems described by spatially sparse channels, as it is sustained by the measurements on the beam pattern and spectral efficiency evaluated in this study.
Keywords—Hybrid Beamforming, Analog and Digital Precoding, Millimeter Wave, (MIMO)- Multiple Input Multiple Output, Spatially sparse system, scatterer

S1-5 „Network-Aware TCP Congestion Control Algorithm Selection Using Ansible”, *Cosmin Cozma, Robert Botez*
Abstract—The rapid evolution of the internet and technology has led to a demand for high-performance networks with low latency and high bandwidth availability for fast data transmissions. To address this need, network architecture modification and traffic optimization have been explored. In this paper, we present a solution for creating a decision system for Transmission Control Protocol (TCP) algorithms within data centers. The system selects the appropriate type of congestion control TCP algorithm based on the network to improve network performance.
Keywords—Ansible, BBR, Congestion control, CUBIC, Reno, TCP

S1-6 „Evaluation of WebRTC and SIP Performance in a Private Cloud”, *Denisa-Oana Selin, Virgil Dobrota*
Abstract—This paper presents a unified communications solution consisting of a Private Branch Exchange (PBX) instance in an OpenStack-based cloud, four clients running the new WebRTC protocol and the dial plan for videoconferencing applications. This implementation was done using Asterisk PBX under Ubuntu 20.04 LTS, and the network architecture type was Triangle, i.e., Browser A -Web Server -Browser B, using P2P media path. Both security and encryption are ensured by generating certificates and setting them appropriately (at browser or at softphone level).
Keywords—Asterisk, Session Initiation Protocol, Web Real-Time Communication, Voice over IP.

S1-7 „Nano LabCar: AHIL Testing System Using Raspberry Pi Pico and Arduino Every Nano”, *Natalia-Liliana Ciolte, Razvan-Andrei Vidroiu, Raul Malutan, Iustin-Alexandru Ivanciu*
Abstract—While essential in the automotive industry, Hardware-in-the-Loop testing systems can often prove costly and can take up too much space. This paper presents Nano LabCar, a cost effective testing system that can fit on a regular desk. Based on Raspberry Pi Pico and Arduino Nano Every, Nano LabCar can be controlled either via hardware or the dedicated GUI and also allows running automated tests.
Keywords—Arduino, ECU, HIL testing, Nano LabCar, Raspberry Pi

S1-8 „Optimizing Speech Emotion Recognition with Exhaustive Feature Selection and a Deep Convolutional Recurrent Neural Network”, *Valentin-Dimitrie Popescu, Mircea Giurgiu*
Abstract—In this paper we present an approach to improve Speech Emotion Recognition (SER) based on a novel Convolutional Recurrent Neural Network (CRNN) architecture and an algorithm to find the corresponding optimal acoustic feature combination of the emotional speech. Compared to other work, this approach is applied on small speech datasets, such as RAVDESS. For this purpose, it was developed a comprehensive software application that generates all possible feature combinations and rigorously evaluates their performance on the CRNN architecture through cross-validation to obtain the best feature set. The system demonstrates high accuracy when trained and tested with noisy emotional speech, too. It highlights the significance of the proposed approach for an empathetic and effective human-computer interaction by understanding and responding to human emotions.

S1-9 „Integrating an IoT Weather Station and Web Application for Smart Farming”, *Teodor-Mihai Cosma, Laura Ivanciu*
Abstract—As climate changes make weather prediction an increasingly tedious task, the constant monitoring of temperature, humidity, rainfall, UV index, and pressure, becomes a mandatory step of successful farming. This paper presents the implementation of a microcontroller-based IoT weather station, designed for precision agriculture; the weather station gathers sensor data, forwards it to ThingSpeak, and allows user-friendly visualization by means of a responsive web application. Results demonstrate the accuracy of the acquired data. The remote monitoring capabilities provide the user with important information that can help optimize the timeline for using fertilizers and irrigation, leading to energy saving and overall cost reduction.
Keywords — weather station, IoT, precision agriculture, remote monitoring

S1-10 „Fast-Reroutable Networks with P4 Programmable Switches”, *Gabriel-Mihai Oltean, Virgil Dobrotă*

Abstract—This paper presents a use case of building fast-reroutable networks by achieving control of the Data Plane and thus providing in-band packet processing at the switch level. The novelty is related to the use of Programming Protocol-Independent Packet Processors (P4), which is a programming language preferred by the networking community as the next logical evolution of Software Defined Networking (SDN). As we wanted to make a real implementation, a modified Fast-Reroute P4 code and a controller were used alongside a modified P4-utils library. The preliminary results prove that the tandem P4-SDN is a step forward towards a more intelligent programmable network, including new types of devices such as middle boxes, that currently do not have switching/ routing capabilities.

Keywords—Control plane, Data Plane, P4, Reroute, SDN.

S1-11 „Automatic Application Deployment System Using Jenkins and AWS”, *Gabriela-Marina Gherman, Iustin-Alexandru Ivanciu*

Abstract—This paper presents a system for the automatic deployment of a Java application in the Amazon Web Services cloud. The system contains two Jenkins pipelines, one for launching the infrastructure and the other for deploying the application on a Tomcat server. The process is automated using Jenkins, Ansible and a GitHub webhook, and the entire infrastructure is created with Terraform.

Keywords—AWS, Ansible, Jenkins, Terraform, Tomcat, webhook

S1-12 „Network Slicing with Open Source MANO and OpenStack”, *Teodor Sava, Robert Botez*

Abstract—With the emergence of 5G, services require speed, security, flexibility, and low latency. Network slicing in the cloud provides a customizable solution for developing 5G networks while reducing costs. Open Source MANO is used to create virtual network functions which are deployed on OpenStack, the virtual infrastructure manager. This paper describes the deployment of two services using Open Source MANO on OpenStack: URLLC slice and non-URLLC slice. Quality of Service rules are added to every network slice to prioritize URLLC traffic and reduce non-URLLC traffic during high network traffic. Additionally, we demonstrated the benefits of using QoS rules in network slicing by introducing delay in a non-URLLC slice and measuring the round-trip time (RTT) for each slice to prove URLLC traffic prioritization.

Keywords—5G, Network slicing, NFV, Open Stack, Open Source MANO

S1-13 „Introduction to Hamming Group Codes and Demonstration of their Functionality through a Python Application”, *Valcan Darius-Florian, Borda Monica-Elena*

Abstract —This paper presents an introduction to Hamming Group Codes and demonstrates their ability to detect and correct errors in digital communications. A Python application was developed using the libraries Pygame and Tkinter along with graphic design tool Canvain order to illustrate the principle of operation of these codes. The application was designed for use in the Information Transmission Theory laboratory to teach students about Hamming codes. Our results demonstrate that Hamming Group Codes are highly effective in detecting and correcting errors in digital transmissions, which can improve the reliability and accuracy of transmitted data.

Keywords —Hamming Group codes, Digital transmissions, Error detection, Error correction, Python, Py game, Canva

S1-14 „Face Recognition Using Local Binary Pattern Histogram”, *Valentin-Dimitrie Popescu, Raul Măluțan*

Abstract —This paper presents a low-cost, Raspberry Pi 4 Model B-based system for facial recognition and tracking of individuals using a camera, two stepper motors, ULN2003A drivers, and 3D printed components. The system uses OpenCV local binary pattern histograms for face recognition and employs a training mode, allowing people to be easily added and removed from the local dataset. Live tracking mode enables real-time camera movement to follow the main recognized person, providing a live preview of the scene.

Section 2 (EA-IM)

S2-1 „WeatherStation”, *Lăcătuș Mihai, Dorin-Marius Petreuș*

Abstract—The main purpose of this project is to build an indoor weatherstation. This type of project already exists and was first invented by Sir Christopher Wren in 1662. Nowadays, a lot of similar products are available on the market, that are more or less advanced. The most common parameters that can be measured with a weather station are temperature, air humidity, air pressure, UV index, air quality (level of CO2) and altitude. This project is implementing the ones using microcontrollers, basic sensors, and software equipment.

Keywords – Weather Station, microcontrollers, sensors. Software, hardware.

S2-2 „Glasses for Orientation”, *Rareș Bartoș, Dorin Petreuș*

Abstract—The Glasses for Orientation first appeared in 2013 by OrCam as a device whose applications was to respond to voice commands, help with orientation and recognition of faces, objects and colors. All of this using a camera. Glasses for Orientation, for the moment is only about preventing the user about and incoming object based on ultrasound sensors and earphones which emit different sounds depending on de distance between sensors and object and the position of the object.

Keywords—Glasses for Orientation, ultrasound sensor, microcontroller.

S2-3 „Forklift prototype implemented with Mechanum wheels”, *Catalin Oprita, Liviu Viman*

Abstract—The forklift is an industrial vehicle used for transporting different loads indoors (warehouses) and outdoors. It usually has 2 prongs for lifting, and 4 wheels. This prototype aims to solve the lack of maneuvering space typical in crowded warehouses by replacing the regular wheels with omnidirectional Mechanum wheels for different types of movement. It uses 2 dual motor drivers (H-Bridge) for the 12V DC motors and one driver for the lifting mechanism with high torque stepper motor.The power will be supplied from a 11.1V 2700mAh LiPo for the motors and for the other circuits. The robot will be controlled with a mobile phone.

Keywords—Forklift, omnidirectional, H-Bridge, stepper, Mechanum, holonomic

S2-4 „Synchronousbuck converter development board” *Leonard-Gabriel Dumitru, Botond Sandor Kirei*

Abstract—Nowadays, buck converter is used in most electronic devices, and it must be designed to be more and more efficient to have lower power consumption on final electronic product. This paper presents a development prototype that helps us to understand the basic principle behind development of a synchronous buck converter.

Keywords—Buck converter synchronous, nonsynchronous MOSFET, PWM

S2-5 „Comparison of three over current protection circuits for LDOs”, *Elena Marian, Mădălina Farcaș, Raul-Oneț*

Abstract—This paper presents a comparison between three overcurrent protection circuits for low drop-outregulators. One of them is based on current comparison between a sensed current and a reference current and two are using a current-voltage conversion technique to sense the output current. A solution to improve the current limit accuracy is also provided.

Keywords—LDO regulators, overcurrent protection (OCP)

S2-6 „Over/Under Voltage and Thermal Shutdown protections for LDOs used in PMICs: Design techniques”, *Parfenov Sergiu-Andrei, Raul Oneț, Simeon Gabriel*

Abstract—This paper presents the sizing strategies of the main protection mechanisms used in nowadays widely spread power management ICs that incorporate linear regulators. An OverVoltage, UnderVoltage and a Thermal Shutdown protection circuit are presented with details on the design specifications and simulation results obtained that confirm their correct functionalities. The protection circuits were designed in a 180nm CMOS technology, the main parameters being verified over PVT and extreme conditions.

Keywords—Power management IC, protection, CTAT, low noise, CMOS technology

S2-7 „Model Based Design of a PMSG Wind Turbine”,
Valentin Cristea, Laura-Nicoleta Ivanciu,
Abstract—This paper presents a model-based design approach for a permanent magnet synchronous generator (PMSG) wind turbine, which is an important component of the renewable energy sector. With the increasing demand for clean energy due to the current climate situation, wind energy has gained significant importance in recent years. PMSG wind turbines have emerged as a popular solution for wind power generation due to their high efficiency, reliability, and low maintenance requirements. Model-based design (MBD) provides a systematic approach to designing complex systems such as wind turbines, by using mathematical models to simulate and optimize their behavior. This approach offers several benefits over traditional design methods, including reduced development time, improved performance, and cost savings.
Keywords—renewable energy, wind turbine, PMSG, Model-based design

S2-8 „Adaptive Cruise Control”, *Andrei Dascal, Dorin Petreus*
Abstract—The Adaptive Cruise Control first appeared in early 1990s in Japan as a system to notice the driver about the slowtraffic ahead. The next step in the evolution of the ACC was developed by Mercedes “Distronic” radar-system in the 1999’, which controlled the throttle and brake system. The benefit of this feature is first the safety of the driver which controls the vehicle and also improve the fuel efficiency and driving experience, avoiding rear end crashes and congestion in high circulated areas.
Keywords—Adaptive Cruise Control, Vehicle Dynamics, Automotive safety, Transportation System

S2-9 „Digital FIR filter implementation and analysis using Arduino UNO board”, *Raluca Ardelean, Ervin Szopos*
Abstract—This paper presents a method to implement digital FIR filters on the Arduino UNO board. First, a FIR filter is designed using the Matlab toolkit and then the resulted filter structure is implemented using the Arduino UNO R3 board. The input signal for the filter is generated by the Digilent Analog Discovery 2 board. The implemented FIR filters are analyzed both in frequency and time domains and the results will prove the efficiency of the method.
Keywords—FIR filter, Arduino, Analog Discovery 2, buttons, control software, magnitude, signals spectra

S2-10 „Hybrid low-dropout linear regulator”, *Flaviu-Cristian Moldovan, Cristian Răducan*
Abstract—This paper proposes a hybrid implementation of a linear low-dropout (LDO) regulator using an analog LDO for its regulation properties and a digital LDO for its fast transient response and small chip area required. Stability is achieved using pole-zero compensation at the gate of the analog power transistor. The maximum current capability is enhanced by the digital part which turns on only after a certain load threshold. The current consumption is optimized through adaptive biasing of the error amplifier.The LDO regulator is supplied from 1.8V and delivers a maximum output current of 130mA at 1.5V. The circuit was implemented in a 180nm XFAB technology.
Keywords—Hybrid LDO, adaptive biasing, load regulation, fast transient, line regulation

Section 3 (Master/Doctor)

S3-1 „Comparative analysis of symmetrical OTA improvement techniques used for voltage regulators”, *Alessandro Battigelli, Cosmin Sorin Pleșa, Raul Oneț, Marius Neag*
Abstract—This paper presents two techniques to improve overall performance of transconductors. These techniques are easy to implement with little additional power and area consumption, but they offer significant improvements over standard structures. The structures have been implemented in a 120nm CMOS process for automotive applications and used in low dropout (LDO) regulators. Their main benefits, in terms of transient performance, are improved output dynamic current capability due to slew-rate enhancements up to 50 times larger, while also having the gain bandwidth improved by a factor of 8, all with a cost of around 1μA extra current consumption.
Keywords—Operational transconductor amplifiers (OTAs), low dropout regulators, class AB operation, high slew-rate.

S3-2 „Wideband RF Front-end Modeling in MATLAB”
Kovacs Gergő, Oprea Alexandru, Kirei Botond,
Abstract—In this work, a numerical analysis on the behavior of an RF front-end over a wide frequency range is carried out. The objective of present research is to design the front-end to maximize the covered RF spectrum processed by a direct sampling receiver equipped with a giga-sample-per-second analog-to-digital converter. The feasibility of such a front-end for translating signals into the first Nyquist zone -given by the sampling frequency -of the ADC is studied with the help of MATLAB simulations.
Keywords—wide range, front-end, Nyquist, signal mixer, bandpass filter

S3-3 “Implementation and testing of a Class D audio power amplifier”, *Vlad-Claudiu Hanăș, Ovidiu Aurel Pop*
Abstract—This study presents the implementation of a Class D audio power amplifier. The schematics of the project present all the necessary components. Based on the schematics the layout of the amplifier was designed. The final circuit was printed on a two-layer board. The system amplifies the input voltage from a few hundred millivolts to a few volts.
Keywords—amplifier, class D, audio, layout, PCB

S3-4 ”Citric and ascorbic acid classification system”, *Ioana-Adriana Potărniche, Codruța Saroși, Romulus Terebeș, Ramona Gălătuș, Lorant Szolga*
Abstract—This paper presents a classification method for citric acid and ascorbic acid based on their spectrums. The spectrum of each sample was obtained using an ultraviolet-visible spectrophotometer. The substances were analyzed as powder and dissolved in distillate water. The goal was to identify the substances based on their spectrums. It was necessary to calculate spectral parameters to classify the additives using a machine learning technique. These parameters were used as training and testing datasets for the technique.
Keywords—citric acid, ascorbic acid, classification, UV spectrum.

S3-5 „Feedback Loop Improvement of Constant Current Regulators for High Power Laser Applications”, *Mihnea-Antoniu Covaci, Ramona Voichița Gălătuș, Lorant Andras Szolga*
Abstract—This research study analyzes the actual approaches of constant current laser diode drivers. The proposed loop topology results for a step-down DC (direct current) converter in a greater stability, as well as maintaining a similar efficiency compared to existing laser diode drivers, allowing the theoretical use of an unlimited number of parallel laser emitters. Thus, the operation of all devices using laser diodes could be improved.
Keywords—laser diode driver, cascade feedback loop, stability, transfer function