SCIENTIFIC SESSION
OF YOUNG OLYMPIANS

Bucharest, ROMANIA
June 18, 2018

with support of:

Ministry of Research and Innovation

organized by:

National Institute for Research and Development in Electrical Engineering ICPE-CA, Bucharest

in collaboration with:

International Theoretical High School of Informatics, Bucharest

SCIENTIFIC COMMITTEE

Prof. Mustafa OZ

Director of International Theoretical High School of Informatics, Bucharest

Prof. Dr. Wilhelm KAPPEL

Scientific Director of INCDIE ICPE-CA

Prof. Iusein ERVIN

Deputy Director of International Theoretical High School of Informatics, Bucharest

Dr. Eng. Gabriela HRISTEA

Head of Laboratory of Physical-Chemical and Electrochemical Systems and Devices with Applications in the Field of Energy, INCDIE ICPE-CA

Dr. Eng. Mircea IGNAT

Coordinator of "Alexandru Proca" Centre for the Youngsters Initiation in Scientific Research, INCDIE ICPE-CA

ORGANIZING COMMITTEE

Andrei IONESCU
National College “Mihai Viteazul”, Ploiesti

Serghei ULIAN
International Theoretical High School of Informatics, Bucharest

Elena ROBU
National College of Informatics “Tudor Vianu”, Bucharest

Gabriela OBREJA
INCDIE ICPE-CA, Bucharest

PROGRAMME

The fifth edition of
The Scientific Session of Young Olympians

June 18, 2018

Conference Hall of the National Institute for R&D in Electrical Engineering ICPE-CA
313 Splaiul Unirii Street, District 3, Bucharest, building J, 3rd floor

Monday, June 18, 2018	
08^{30} - 09^{00}	**Participants registration**
09^{00} - 09^{20}	**Opening speech** Prof. Mustafa Oz, *Director of International Theoretical High School of Informatics Bucharest* Dr. Eng. Sergiu Nicolaie, *General Director of INCDIE ICPE CA Bucharest* Dr. Eng. Mircea Ignat, *Coordinator of "Alexandru Proca" Centre for the Youngsters Initiation in Scientific Research, INCDIE ICPE-CA Bucharest*
10^{30} – 12^{00}	**Plenary Session I**
	***Simulations of processes characteristic of electric networks, such as commutation, using electrical circuits and simulitude theory* (Simulări ale unor procese de comutație, specifice rețelelor energetice utilizând teoria circuitelor electrice și a simiulitudinii)**, Pricope Andrei - National College of Informatics „Tudor Vianu", Bucharest
	***Theoretical and experimental aspects regarding the study of motility with the help of cilia, with applications in the field of microrobotics* (Aspecte teoretice și experimentale privind studiul motilității cu ajutorul cililor, cu aplicații în domeniul microroboticii),** Constantin Alexandru - National College of Informatics „Tudor Vianu", Bucharest
	***Environmental magnetism on the Black Sea Coast* (Studiul calității mediului prin măsurători de susceptibilitate magnetică),** Săvucă Cristiana, Ghișoiu Oana, Mihai Rada Alina (coordinator: Prof. Șerbu Florin), "Carmen Sylva" Theoretical High School, Eforie Sud
	***The formulation of the nanofluidics and imprinted electric fields problems regarding the energy generation using electrokinetic phenomena and nanopore membranes* (Formularea problemei de nanofluidică și a problemei electrice privind obținerea de energie utilizând efectele electrocinetice și membrane cu nanopori),** Abrudan Alexandru Cornel - National College of Informatics „Tudor Vianu", Bucharest

	***Unconventional microaccelerometers for attitude control systems* (Microaccelerometre neconvenționale pentru sistemele de ghidaj ale nanosateliților)**, Ursu Ștefan - „Nicolae Titulescu" College, Brașov
12^{00} – 12^{30}	**Coffee break**
12^{30} - 13^{00}	***Round table „What are the necessary conditions for Romanian scientific research and education to make the Olympians continue their career in the country ?"***
13^{30} - 14^{30}	**Plenary Session II**
	***Computational elements of the lipid structure* (Elemente de calcul microelectromecanic privind structurile lipidice)**, Ionescu Andrei - „Mihai Viteazul" National College, Ploieşti, Ulian Serghei – International Theoretical High School of Informatics, Bucharest
	***Short history of dialysis* (O istorie a dializei și a sistemelor de dializă (dializoarelor)),** Glăvan Luca Andrei, Voicu David Nicolae - „Spiru Haret" National College, Bucharest
	***Formulation of a research topic on the study of the insect foot with applications in microrobotics and MEMS* (Formularea unei teme de cercetare privind studiul piciorului de insectă cu aplicații în microrobotică și MEMS)**, *Panait Ana Maria, Andrei Tiberiu* - National College of Informatics „Tudor Vianu", Bucharest
	***Electrotherapy aspects* (Aspecte privind electroterapia)**, Denșorean Bianca, Yuan Jiarong, Peța David - International Theoretical High School of Informatics, Bucharest
	***A deep neural network for mapping pixel coordinates to color values* (O rețea neuronală adâncă ce optimizează coordonatele pixelilor dintr-o poză şi valorile lor cromatice)**, Bricman Paul - „George Coşbuc" National College, Bucharest;
	***Robots with obstacle monitoring features* (Roboți cu caracteristici de monitorizare a obstacolelor),** Constantin Alexandru - National College of Informatics „Tudor Vianu", Bucharest
14^{30} – 15^{15}	**Visit to laboratories and departments of INCDIE ICPE-CA Bucharest**
15^{15} – 15^{50}	**Mini-exhibition**
	Poster session
15^{50} – 16^{00}	**Conclusions**
16^{00}	**Closing the seminar** **Closing speech** Mircea Ignat, *Coordinator of "Alexandru Proca" Centre for the Youngsters Initiation in Scientific Research,* INCDIE ICPE-CA Bucharest

Monday, June 18, 2018

Plenary Session I

09:20 – 11:00

***MODERATOR*: Mircea IGNAT**

Simulations of processes characteristic of electric networks, such as commutation, using electrical circuits and simulitude theory
PRICOPE Andrei
„Tudor Vianu” National College of Informatics, Bucharest

Theoretical and experimental aspects regarding the study of motility with the help of cilia, with applications in the field of microrobotics
CONSTANTIN Alexandru
„Tudor Vianu” National College of Informatics, Bucharest

Environmental magnetism on the Black Sea Coast
SĂVUCĂ Cristiana, GHIȘOIU Oana, MIHAI RADA Alina (coordinator: Prof. ȘERBU Florin)
"Carmen Sylva" Theoretical High School, Eforie Sud

The formulation of the nanofluidics and imprinted electric fields problems regarding the energy generation using electrokinetic phenomena and nanopore membranes
ABRUDAN Alexandru Cornel
„Tudor Vianu” National College of Informatics, Bucharest

Unconventional microaccelerometers for attitude control systems
URSU Ștefan
„Nicolae Titulescu” College, Brașov

11:00 – 11:30 Coffee break

11:30 – 12:30 ***Round table „What are the necessary conditions for Romanian scientific research and education to make the Olympians continue their career in the country ?”***

***MODERATOR*: Mircea IGNAT**

Plenary Session II

12:30 – 14:00

***MODERATOR*: Mircea IGNAT**

Computational elements of the lipid structure

IONESCU Andrei
„Mihai Viteazul” National College, Ploieşti
ULIAN Serghei
International Theoretical High School of Informatics, Bucharest

Short history of dialysis

GLĂVAN Luca Andrei, VOICU David Nicolae
„Spiru Haret” National College, Bucharest

Formulation of a research topic on the study of the insect foot with applications in microrobotics and MEMS

PANAIT Ana Maria, ANDREI Tiberiu
„Tudor Vianu” National College of Informatics, Bucharest

Electrotherapy aspects

DENȘOREAN Bianca, YUAN JIARONG, PEȚA David
International Theoretical High School of Informatics, Bucharest

A deep neural network for mapping pixel coordinates to color values

BRICMAN Paul
„George Coşbuc” National College, Bucharest

Robots with obstacle monitoring features

CONSTANTIN Alexandru
„Tudor Vianu” National College of Informatics, Bucharest

14:00 – 15:15	**Visit to laboratories and departments of INCDIE ICPE-CA Bucharest**
15:15 – 15:50	**Mini-exhibition** **Posters session**
15:50 – 16:00	**Conclusions**
16:00	**Closing the seminar**

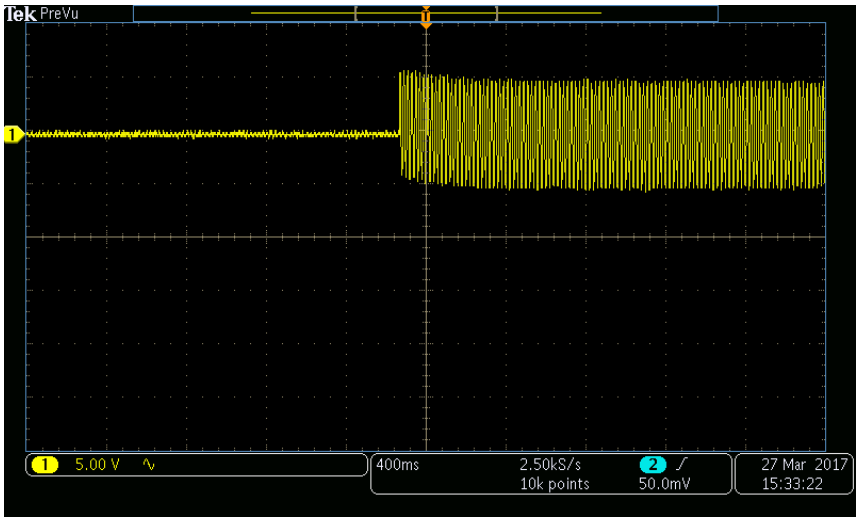
ABSTRACTS

1. *Simulations of processes characteristic of electric networks, such as commutation, using electrical circuits and simulitude theory*

PRICOPE Andrei
„Tudor Vianu" National College of Informatics, Bucharest

Abstract

In this project the components of an electric grid and the means of monitoring them are analyzed, the parameters in which the grid has to operate are presented along with applications for artificial intelligence, neural networks and genetic algorithms in a smart grid. To test the program that would supervise an electric grid, developed using the theory of genetic algorithms to continuously improve its performance, and to identify the phenomena that occur in a RLC network, test were made on models of electric networks. Using the similitude theory, the following phenomena were identified, tested and presented: the commutation, the deforming regime and the stabilizing characteristic.



Simulation of switching phenomenon

2. *Theoretical and experimental aspects regarding the study of motility with the help of cilia, with applications in the field of microrobotics*

CONSTANTIN Alexandru
„Tudor Vianu" National College of Informatics, Bucharest

The paper consists of studying the euglena's motility, which efficiently moves in an aquatic environment with the help of a flagellum-a threadlike cytoplasmic structure, which generates progressive waves. Throughout the study, we performed experiments to reproduce this movement through prototypes using mechanical actuators, with applications in the engineering field.

3. *Environmental magnetism on the Black Sea Coast*

SĂVUCĂ Cristiana, GHIȘOIU Oana, MIHAI RADA Alina (coordinator: Prof. ȘERBU Florin)
"Carmen Sylva" Theoretical High School, Eforie Sud

The objective of our project is to monitor the environmental pollution of the Black Sea seaside using magnetic susceptibility measurements. We monitor: the beaches, areas adjacent to the main highway, which during the summer have extremely high traffic and the trees on the edge of high traffic areas.

Susceptibility measurements were performed in the field, with the Magnetic Susceptibility Meter SM-30. The geographic coordinates of the work points were recorded. Photos of the analyzed areas were taken. The data was processed in Microsoft Excel.

The main conclusion is that magnetic susceptibility measurements can be used in the study the quality of environment. It was simple to determine high levels of pollution on beaches, near highways or on vegetation. We detect pollution with metals (paramagnetic or ferromagnetic). The big advantage of susceptibility studies is the low cost and the possibility of making measurements.

We have found different levels of pollution on the beaches. Older and bigger beaches are the most polluted beaches. The old beaches of Costinesti have low values of susceptibility because they are often washed by waves. On all beaches the higher levels of pollution are in the areas where sun beds and umbrellas are located. Areas with shells (diamagnetic substances) have the lowest values of even negative susceptibility.

At some beaches susceptibility increases to the cliff. In the case of trees, it can be highlighted in all cases that susceptibility is higher on the road. It is obvious that high traffic led to the deposition of paramagnetic or ferromagnetic substances on the roadside. Chemical analyzes may determine precisely what substances are in. In the case of crowded roads, there is an increase in susceptibility to objects around the road.

4. *The formulation of the nanofluidics and imprinted electric fields problems regarding the energy generation using electrokinetic phenomena and nanopore membranes*

ABRUDAN Alexandru Cornel
„Tudor Vianu” National College of Informatics, Bucharest

The main goal of this project is to explain how we can generate energy using imprinted electric fields. To that end, we analyze the model of a semipermeable membrane that contains a matrix of nanopores. The nanofluidic circulation of a liquid through the membrane produces electrochemical phenomena, so that the nanopores create imprinted electric fields. These lead to the formation of a potential difference between the two metallic electrodes placed on both sides of the membrane. Consequently, every nanopore becomes a nanogenerator which develops its own electromotive force.

5. *Unconventional microaccelerometers for attitude control systems*

URSU Ștefan
„Nicolae Titulescu” College, Brașov

Microsattelites are getting more and more popular and attractive in the aerospace industry. So the request of development and improvement of specific microsatellite components is increasing.

One of the most important components is the attitude control system, which is controlling the orientation of the microsatellite (Attitude refers to the orientation and position of the satellite).

A conventional attitude control system consists of three main elements. These are the sensors, the controller and the actuators.

This project aims to develop a precise unconventional micro accelerometer sensor for an attitude control system. A micro accelerometer uses the piezoelectric or electro strictive effect to measure the acceleration produced by the attitude variation. The acceleration produced is induced on a seismic mass which is applying a force on the piezoelectric element. So, measuring the output signal (which is proportional to the acceleration), the controller has the ability to determine the attitude of the microsatellite.

6. *Computational elements of the lipid structures*

IONESCU Andrei
„Mihai Viteazul" National College, Ploieşti
ULIAN Serghei
International Theoretical High School of Informatics, Bucharest

During our work on the project "*Lipid structures in MEMS and their use for drug transportation*" we tried to use some specific electrostatic properties of the lipids to create a new method for DDS. For developing our micro motors and micro actuators we have studied the electrostatic forces which appear inside the lipids. And so, we know what forces need to appear to ensure the functionality of these devices (the electrostatic force used for the linear transportation of the drugs, the rotation force of the lipid etc.)

7. *Short history of dialysis*

GLĂVAN Luca Andrei, VOICU David Nicolae
„Spiru Haret" National College, Bucharest

The kidneys are much more sensible than they seem. Thus, when there happens a change in their structure or functions chronic kidney diseases show up. Consequently, this leads to renal insufficiency. If their functionality drops below an optimum threshold, there are 2 options: dialysis treatment or kidney transplant. Other than this treatment, we talk about the 4 big personalities who had a powerful influence over this domain, and offer a small history of dialysis in Romania.

8. *Formulation of a research topic on the study of the insect foot with applications in microrobotics and MEMS*

PANAIT Ana Maria, ANDREI Tiberiu
„Tudor Vianu" National College of Informatics, Bucharest

9. *Electrotherapy aspects*

DENȘOREAN Bianca, YUAN JIARONG, PEȚA David
International Theoretical High School of Informatics, Bucharest

The subject of the research refers to procedures, methods and devices for medical recovery that use electrotherapy, in conclusion an interdisciplinary research theme, the documentation methodology having certain peculiarities.

A. Methodology of scientific research being the general and specific methodology that refers strictly to the medical field, namely the recovery of the superior member, the way of realization of the theoretical and experimental protocol

B.Anatomy and physiology of the upper limb (hand, fingers and joints), general aspects and elements related to anatomical structures or general tissues. Relationships between these structures and tissues.

C. Electro-kinetic effects, propagation of the electric field in DC and AC, dangerous voltage and electric currents. Active elements and passive elements.

D. Electrotherapeutic devices, instruments and tools required.

10. *A deep neural network for mapping pixel coordinates to color values*

BRICMAN Paul
„George Coşbuc” National College, Bucharest

In this paper, we propose a deep neural network approach for mapping the 2D pixel coordinates in an image to the corresponding Red-Green-Blue (RGB) color values. The neural network is termed CocoNet, i.e. COordinates-to-COlor NETwork.

During the training process, the neural network learns to encode the input image within its layers. More specifically, the network learns a continuous function that approximates the discrete RGB values sampled over the discrete 2D pixel locations.

At test time, given a 2D pixel coordinate, the neural network will output the approximate RGB values of the corresponding pixel. By considering every 2D pixel location, the network can actually reconstruct the entire learned image.

It is important to note that we have to train an individual neural network for each input image, i.e. one network encodes a single image only. To the best of our knowledge, we are the first to propose a neural approach for encoding images individually, by learning a mapping from the 2D pixel coordinate space to the RGB color space.

Our neural image encoding approach has various low-level image processing applications ranging from image encoding, image compression and image denoising to image resampling and image completion.

We conduct experiments that include both quantitative and qualitative results, demonstrating the utility of our approach and its superiority over standard baselines, e.g. bilateral filtering or bicubic interpolation.

11. *Robots with obstacle monitoring features*

CONSTANTIN Alexandru
„Tudor Vianu” National College of Informatics, Bucharest

The autonomous patrol robot is a device that has an arduino development platform and integrates a sensor system to monitor interior parameters such as: temperature, humidity, gas level but also human presence with an obstacle-based drive system on ultrasound.

NOTES

NOTES

NOTES

NOTES