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CERTIFICATE OF ATTENDANCE

This is to certify that **drd.ing. Catalin Lupu** orally presented his paper entitled "**Security Enhancement of Internet Banking Applications by Using Multimodal Biometrics**" during the SAMI 2015 conference in Herľany, Slovak Republic.



member of the international organizing committee

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"Ștefan cel Mare" University of Suceava, Romania

Faculty of Electrical Engineering and Computer Science

**IEEE 13th International Symposium on
Applied Machine Intelligence and Informatics – SAMI 2015
Herl'any, Slovakia, January 22-24, 2015**

Security enhancement of internet banking applications by using multimodal biometrics

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Priority Axis 1 – “Education and training in support for growth and development of knowledge based society”

Key area of intervention 1.5 – “Doctoral and post-doctoral programmes in support of research”

- Internet banking applications have become more and more complex and almost each bank has got its own service. The login and signature security vary from user/static password authentication method (that is one of the weakest way to manage one's accounts) to certificates and tokens (digipasses).
- Biometrics is increasingly used in many parts of our lives, from biometric passport, airport authentication and access control. It is easier and safer to login to internet banking with something you have or are (fingerprint, face, iris etc.) than with something you remember (and that can be stolen by malicious software or people).
- Signing an order will be more secure by using a fingerprint than a code generated by a token. A combination of these two authentication methods will lead to a visible security enhancement, too. The fingerprint can be used for two purposes: to open a token device and/or login to the internet banking application or sign an order.

Introduction

- The idea of using biometrics to increase the certitude that the person that is logging in is really the one he/she claims to be, was implemented many years ago, on different applications. But the usage of biometrics in internet banking wasn't too much studied. There are some banks that already use biometric characteristics to authenticate their clients. For instance, fingerprint authentication is being used by UBB (United Bankers' Bank), IBC (International Bank of Commerce) from the USA and Woori Bank from South Korea. A list of worldwide banks that use biometrics in their activity (not only within internet banking, but also on branch banking, at ATMs or for access control) are presented in the article "*Review banking on biometric in the world's banks and introducing a biometric model for Iran's banking system*"([1]).
- There are many software companies that offer biometric solutions for banks, for example DigitalPersona, Veridicom Intl., Imprivata (with IndentiPHI and Saflink).

Internet Banking - authentication and security concepts

- Internet banking (with its synonyms “e-banking”, “online banking” or “virtual banking”) stands for an online service provided by banks or financial institutions to their clients, in order to manage accounts and operate transactions. The bank will usually provide a secured webpage, where the client can log in using available authentication methods.
- According to John Cronin ([2]), “distance banking services over electronic media” - the precursor of modern internet banking, were introduced in the early 1980s. 1983, when 4 major US banks (Citibank, Chase Manhattan, Chemical and Manufacturers Hanover) and the Bank of Scotland from UK introduced internet banking for the first time, can be considered the birthday of this concept.

Authentication methods and security

- There are many possibilities to login to an internet banking application. The most used methods consist in using a user and a password (static or dynamically generated).
- Major authentication methods:
 - *Username and static password – the weakest possible method;*
 - *Username and static password, using a private web browser certificate – safer than the previous one;*
 - *Username and dynamic password, generated by a digipass device – the device generates a password that is valid for a short period of time (30 sec) based on an algorithm; password generated is called OTP – One Time Password*

BIOMETRICS – A GRAND CHALLENGE

- Biometrics, a term derived from the Greek words “bios” (life) and “metrikos” (measure), stands for a complex of automation methods that should lead to personal identification using some measurable (fingerprint, iris, retina, voice, face geometry, etc.) and/or compartmental (signature, writing dynamics, etc.) characteristics of a person. According to the Webster dictionary ([3]), biometrics is defined as “the measurement and analysis of unique physical or behavioral characteristics (as fingerprint or voice patterns) especially as a means of verifying personal identity”. The word “biometrics” is used for “brevity sake”, because this term “has been historically used in the field of statistics to refer to the analysis of biological (particularly medical) data” ([4], [5]).

Important biometric characteristics, sensors and their applications

- There are many biometric characteristics that can be taken into account: fingerprint, iris, face, hand geometry, gait, retina, vein pattern, keystroke pattern, voice, ear, signature and many others. Some of them can be used for online authentication, but some can be only used for offline or forensic applications (such as DNA). Also, multibiometrics can be used to enhance security.
- However, we have to take into account that some individuals do not possess some of these biometric characteristics (because of a physical impairment). In this case, the system must be adapted to acquire the biometric characteristics the client is able to provide.
- Biometrics are used on several applications, such as computer logon (using fingerprint, face or iris recognition), airport security (Privium System from Amsterdam International Airport, Tel-Aviv “Bel Gurion” International Airport, etc.), hypermarkets (Kroger), US-VISIT (United States Visitor and Immigration Status Indicator Technology) or for fun, at Disneyland Orlando).

Fingerprint identification

- Fingerprints are one of the first studied biometric characteristics. They are used to authenticate persons or for forensic purposes. Besides other biometric characteristics, fingerprints remain at the crime scene, because of the natural grease that exists on fingers. Therefore, ever since 1892, Francis Galton determined the uniqueness of fingerprint characteristics and described some methods and algorithms in a book called “Finger-prints” which can be considered one of the first books in biometrics. Fingerprinting was introduced as an identification method in the UK Police in 1897, by Sir Richard Edward Henry.

The computer logon process using fingerprint (which is also suitable for internet banking authentication) is presented in the following figure.



Windows Logon using author's fingerprint



Mouse with a sweep fingerprint sensor and the detail of the sensor

Iris recognition

- This method is new and was still being developed since 1987, when two ophthalmologists (Leonard Flom and Aron Safir) discovered that the human iris possesses some characteristics that can be used for personal identification or people verification.
- The iris is usually confused with retina, but they are two different components of the human eye, one being acquired relatively easily, using an infrared camera (the iris) and the other needing special equipments to be acquired (the retina).
- The main contributions in iris recognition were John Daugman's studies, starting from 1994, when his patent, called "Biometric personal identification system based on iris analysis", was issued . The main contribution of this patent is the fact that iris recognition can be mathematically described.



Iris recognition login screen, together with the author's right eye



Panasonic BM-ET100US camera

Combining multiple biometrics

- Multiple biometric characteristics can be combined in order to provide a higher level of security. In the following picture, an embedded system will be described, that consists of using a special camera for iris recognition and a fingerprint sensor installed on a mouse. The author uses a laptop with iris and fingerprint recognition software. The system can be used to develop a various number of applications for control access, internet banking or anything else that requires a great level of security.



Multibiometric system, that consists of an iris recognition camera and a fingerprint sensor installed on a mouse

Using biometrics in internet-banking applications for security enhancement

- The degree of login or signing process security can be increased by using biometrics. Biometrics can be used for at least two purposes: to open the token instead of using a PIN and/or to actively interfere in the login or signing process. Biometrics can be used alone, or in combination with another authentication methods, such as a token.
- Also, biometrics must not be imposed to the client, but the front-desk bank officer must explain the customer the advantages of this technology. Some clients are still reticent to this authentication method, but if the advantages are clearly explained, then they will be more receptive to this matter. The solution below must be presented especially to those people that really fear the possibility of their ID theft.

- The first possibility is to integrate the fingerprint sensor on the token in order to replace the PIN of this device. The user will scan his/her fingerprint and the token will continue to function as though the user has inserted the PIN. All the other functions of the token remain unchanged. In the following picture, the idea is graphically described.



Token + fingerprint sensor will lead to a token that operates using this sensor

- When registering the application for the token, a fingerprint or a set of them is/are scanned and stored in the internal memory of the token. Each time the user wants to use the token, he/she has to sweep the finger registered on the token.
- Another solution is to use the integrated fingerprint reader – token device in order to login or sign an order. The user must first open the token (using a PIN or a registered fingerprint, as one could see above) and the authentication page of the internet banking webpage, and, in addition to the username and the code generated by the token, he/she should enter the fingerprint again. This solution requires that the device should be connected to the computer through the USB port or by other communication method (Bluetooth, WiFi, etc.).
- At least, but not at last, the user can use only a username and his/her fingerprint in order to enter the internet banking application. This would be ideal, but the two solutions presented above have, in our opinion, a greater level of security.

- During our researches in this field, we developed a Java application that is able to: (i) acquire the fingerprint from the user; (ii) do the enrollment and store the template in a MySQL database; (iii) do the verification of a user. After the verification, the bank's internet banking application is opened. But, in the future, the main page of the internet banking can be changed in order to introduce only the username and a fingerprint for the logon process, using the application described above.
- We chose Java to implement this application because it is compatible and can be easily integrated with most of the devices (desktop/laptop computers, tablets, smart-phones, etc.).
- This application is still being developed, because we use only one fingerprint sensor (SunPlus USB Fingerprint), placed on an optical mouse. There are a lot of sensors and the communication with them is made by the functions in its software or driver. The aim is to make a universal application that can work with any kind of fingerprint sensor.

Conclusions and future trends

- The topic of this article can be more developed and first of all, one must take into account that some impaired people can't provide a fingerprint, so the system must be adapted in order to satisfy this requirement, too. We chose this combination token/fingerprint sensor because these devices are still cheap enough (less than €30 for all of them). A more secure system shall use iris or other biometric characteristics, but in this case, the price of the device will increase (a cheap camera for iris recognition costs around \$100).
- The two fields presented in this article (internet banking and biometrics) are really wide and the research on combining them can lead to better solutions and higher levels of security.



ACKNOWLEDGMENT

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Thank you for
your attention !!!

Questions ?

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Welcome from the Chairs

Welcome from the Chairs

Welcome from the Chairs

Welcome from the Chairs

Foreword

Computational Intelligence and Intelligent Technologies are very important tools in building intelligent systems with various degree of autonomous behavior. These groups of tools support such features as ability to learn and adaptability of the intelligent systems in various types of environments and situations. The current and future Information Society is expecting to be implemented with the framework of the Ambient Intelligence (AmI) approach into technologies and everyday life. These accomplishments provide the wide range of application potentials for Machine Intelligence tools to support the AmI concept implementation. The number of studies indicates that this approach is inevitable and will play essential and central role in the development of Information Society in close future.

The essential importance of the Machine Intelligence in this historically challenging effort points out the responsibility of MI community including all fields like Brian-like research and applications, fuzzy logic, neural networks, evolutionary computation, multi-agent systems, artificial life, Expert Systems, Symbolic approaches based on logic reasoning, Knowledge discovery, mining, replication and many other related fields supporting the development and creation of the Intelligent System. The importance embedding these systems in various kinds of technologies should bring profit and different role of mankind in production and in everyday life. We expect to have intelligent technologies, solution and even humanoid robots to help the mankind to improve and keep the ideas of humanity and democracy.

The role of Machine Intelligence Quotient will play an important role in the future to be able to evaluate the degree of the autonomous behavior of the designed system. It is belief that it will be domain oriented problem and should also be important to use this information for decisions made by humans e.g. in evaluation of many information system in commercial tender to pick up the system with the highest MIQ. The usefulness of this parameter will be dependent on many influences including technological, domain oriented and also commercial aspects of the CI application in various systems. The commercial need to have “intelligent” solution and products should increase the interest for MI tools.

This year number of contribution showed up from mechanical Engineering domain, control and also pure computer science. We do believe that this multidisciplinary will be very useful to emerge more AI applications in Information Society and will help making products and solutions more “intelligent”.

This proceedings is a small contribution of knowledge dissemination and presentation of important problems and advances in Computational intelligence theory and applications. Hungary and Slovakia as members of EU will do their best to contribute to European Research Area and support the development of Computational Intelligence technology for the benefit of the mankind.

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General Information

General Information

Date and Place

SAMI 2015 will be held in Herľany, Slovakia, from January 22nd till January 24th, 2015.

Social Events

Registered participants are welcome to the reception and the banquet.

Accomodation

All attendees stay in University Resident in Herľany, and in Košice.

General Information

Official Language

The official language of the symposium is English. All presentations, including discussions and submissions, must be made in the official language. No translation will be provided.

General Information

Breakfast and Lunch

Breakfasts and lunches are available during the symposium.

Proceedings

Each accepted paper reaching us in time will be published in the pendrive proceedings that will be distributed at the conference registration desk.

General Information

Opening Hours of the Registration Desk

The registration desk will be open during the symposium.

Presentation

All the presentations can be made by using data projector (Power Point presentation). Authors are kindly asked not to use their own laptop. Please bring your presentation on CD or USB with you.

Herl'any

Herl'any is situated 27 km away from Košice in the direction of Michalovce. There is a cold geyser, which is a rarity in the Europe. There are similar geysers only in Iceland. It was first discovered in 1870 during drilling for sources of mineral water, for baths. The eruption of geyser is from a depth 351 m to a height 20-30 m and interval between eruptions is 32-34 hours. The duration of the spout is around 25-30 minutes.



SAMI 2015 Technical Program

January 22, 2015 Thursday

10:15 – 10:30 **Opening Ceremony**

10:30 – 11:15 **Plenary Session I**

Session Chair: **Levente Kovács**, *Óbuda University, Budapest, Hungary*

Blood Glucose Regulation using an Implantable Artificial Pancreas

Chee-Kong Chui

*Department of Mechanical Engineering
National University of Singapore
Singapore*

11:15 – 11:30 **Coffee break**

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11:30 – 12:15 **Plenary Session II**

Session Chair: **Tamás Haidegger**, *Óbuda University, Budapest, Hungary*

Soft Robotics for Natural and Adaptive Motion Generation

Kyujin Cho

*Biorobotics Laboratory, School of Mechanical and Aerospace
Engineering*

Seoul National Univeristy, Seoul, Korea

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12:15 – 13:50 **Lunch**

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13:50 – 15:30 Session [T1]

Session Chair: **Ladislav Főző**, *Technical University of Košice, Slovakia*

13:50 An Architectural Prototype for Testware as a Service

Tomáš Oberle, Csaba Szabó

Technical University of Košice

14:10 Abusing Mobile Devices for Denial of Service Attacks

Liberios Vokorokos*, Pavol Drienik*, Olympia Fortotira, Ján Hurtuk***

* *Technical University of Košice, Slovak Republic*

** *Gymnasio Limnis Evvoias, Limni, Greece*

14:30 Design Pattern Driven Development of Embedded Applications

Krisztián Holman, Zoltán Szabó

Budapest University of Technology and Economics, Budapest, Hungary

14:50 Experimental Measuring of the Roughness of Test Samples Made Using DMLS Technology from the Titanium Alloy Ti-6Al-4V

Marek Schnitzer, Martin Lisý, Radovan Hudák, Jozef Živčák

Technical University of Košice, Košice, Slovakia

15:10 In-Cylinder Pressure Indication of Internal Combustion Engines for Diagnostic Purposes

István Lakatos, Peter Dely

Széchenyi István University, Győr, Hungary

15:30 – 15:50 Coffee Break

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15:50 – 17:30 Session [T2]

Session Chair: **Rudolf Andoga**, *Technical University of Košice, Slovakia*

15:50 Examination of a Novel Double Diabetes Model
György Eigner**, *Balázs Kurtán**, *Imre J. Rudas**, *Chui Chee Kong and *Levente A. Kovács****

** Óbuda University, Budapest, Hungary*

*** National University of Singapore, Singapore*

16:10 Security Enhancement of Internet Banking Applications by Using Multimodal Biometrics

Cătălin Lupu*, *Vasile-Gheorghiu Găitan*, *Valeriu Lupu

“Ștefan cel Mare” University of Suceava, Romania

16:30 Comparing Genetic Operators for the Timetabling Problem
Attila Hideg

Budapest University of Technology and Economics, Hungary

16:50 Pulse Wave Velocity Measurement; Developing Process of New Measuring Device

Lukas Peter*, *Jan Foltyn*, *Martin Cerny

VSB – Technical University of Ostrava, Czech Republic

17:10 Analysis of Inclusions at Materials Bymetrotomography

Darina Glittová*, *Teodor Tóth*, *Jozef Živčák

Technical University of Košice, Košice, Slovakia

17:30 3D Cultivation of Mesenchymal Stromal Cells from Adipose Tissue in Alginate Beads

Alena Balogová, *Denisa Harvanová**, *Radovan Hudák***, *Ján Rosocha**, *Jozef Živčák****

** Associated Tissue Bank of Faculty of Medicine of P. J. Safárik University and L. Pasteur University Hospital, Kosice, Slovakia*

*** Technical University of Košice, Košice, Slovakia*

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13:50 – 17:30 **Poster Session**

Comparison of Stability Measures for Feature Selection

Peter Drotár, Zdeněk Smékal

Brno University of Technology, Czech Republic

Control Library for AR.Drone 2.0

Jakub Hvizdoš, Peter Sinčák

Technical University of Košice

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QoS-based Optimization of Data Flow in MPLS Networks

Ivana Hucková, Martin Hrubý

Slovak University of Technology in Bratislava, Slovakia

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Path Calculation of 4 DOF Remote Vehicle for Educational Purpose

Lucian Alexandru Şandru, Marius-Florin Crainic, Stefan Preitl, Valer Dolga

Politehnic University of Timisoara, Romania

Detection of Unexpected Data Changes in Monitored System

T. Lojka, M. Bundzel, I. Zolotová

Technical University of Košice, Slovakia

18:00 **Welcome Reception**

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January 23, 2015 (Friday)

SAMI 2015 Technical Program

8:30 – 10:10 Session [F1]

Session Chair: **Michal Puheim**, *Technical University of Košice*

SAMI 2015 Technical Program

8:30 Integration Architectures of Navigation Systems for Unmanned Vehicles
Tomáš Vaispacher, Róbert Bréda, Ladislav Madarász
Technical University in Košice, Košice, Slovakia

8:50 Path Planning and Control of Differential and Car-like Robots in Narrow Environments
Ákos Nagy, Gábor Csorvási and Domokos Kiss
Budapest University of Technology and Economics, Hungary

9:10 Path Tracking of Autonomous Ground Vehicle Based on Fractional Order PID Controller Optimized by PSO
Auday Al-Mayyahi, William Wang and Phil Birch
University of Sussex, Brighton, United Kingdom

9:30 Stabilized Walking for Nao Robot
I. Kapustík, J. Hudec and P. Návrat
Slovak University of Technology, Bratislava, Slovakia

9:50 Event-based Application of Voting System for Mobile Device
Ján Lang and Rastislav Kostrab
Slovak University of Technology in Bratislava, Slovakia

10:10 – 10:30 Coffee Break

SAMI 2015 Technical Program

SAMI 2015 Technical Program

10:30 – 12:30 Session [F2]

Session Chair: **Vladimír Gáspár**, *Technical University of Košice*

10:30 Visualization of Critical Properties of Databases of Information Systems

Kristián Šesták, Zdeněk Havlice

Technical University in Košice, Košice, Slovakia

10:50 Validation of Inverted Pendulum Model for Gait Length Calculation

Martin Cerny*, Norbert Noury, Ludovic Deplorte*****

* *VSB – Technical University of Ostrava, Czech Republic*

** *Institute of Nanotechnologies of Lyon (INL), Villeurbanne, France*

*** *CRNL, Lyon, France*

11:10 Highly Robust Analysis of Keystroke Dynamics Measurements

Jan Kalina*, Anna Schlenker, Patrik Kutílek*****

**Institute of Computer Science AS CR, Prague, Czech Republic*

***Charles University in Prague & Czech Technical University in Prague, Czech Republic*

****Czech Technical University in Prague, Czech Republic*

11:30 Image Compression Techniques Using Local Binary Pattern

Ildiko-Angelica Szoke*, Diana Lungeanu, Stefan Holban***

**Politehnica University Timisoara, Romania*

***University of Medicine and Pharmacy, Timisoara, Romania*

11:50 Extended Heuristic Bubble Algorithm for the Pickup and Delivery Problem with Time Windows

Akin Ilker Savran^{1,2}, Erhan Musaoglu², Cagdas Yildiz², Mehmet Fatih Yuces², Engin Yesil¹

¹ *Istanbul Technical University, Istanbul, Turkey*

² *LA Software Group, Kavacik, Istanbul, Turkey*

12:10 An Asymmetric Multiple Traveling Salesman Problem with Backhauls to solve a Dial-a-Ride Problem

E. Osaba, E. Onieva, F. Diaz, R. Carballedo, P. Lopez, A. Perallos

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8:30 – 12:30

Poster Session

Description of an Intelligent Small Turbocompressor Engine with Variable Exhaust Nozzle

L. Főző, R. Andoga, L. Madarász, J. Kolesár, J. Judičák
Technical University of Košice, Slovakia

Strategies in Higher Education

Franciska Hegyesi, Rita Ósz, Gyula Kártyás, Krisztina Némethy, József Gáti
Óbuda University, Budapest, Hungary

Model Predictive Control of a Ball and Plate Laboratory Model

Matej Oravec, Anna Jadlovská
Technical University in Košice, Slovakia

Cloud Computing System for Small and Medium Corporations

E. Chovancová, L. Vokorokos, M. Chovanec
Technical University in Košice, Slovakia

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A Proposal for Multi-Purpose Fuzzy Cognitive Maps Library for Complex System Modeling

Michal Puheim, Ján Vaščák, Ladislav Madarász
Technical University in Košice, Slovakia

12:30 – 13:40

Lunch

SAMI 2015 Technical Program

SAMI 2015 Technical Program

13:40 – 15:20 Session [F3]

Session Chair: **László Horváth**, *Óbuda University, Hungary*

13:40 Systems Engineering in Product Definition

László Horváth and Imre J. Rudas

Óbuda University, Budapest, Hungary

14:00 Generating Product Variations in Terms of Mass Customization

Vladimír Modrak, Slavomir Bednar, David Marton

Technical university of Kosice, Presov, Slovak Republic

14:20 Application of Business Intelligence Solutions on Manufacturing Data

M. Miškuf, I. Zolotová

Technical University of Košice, Slovak Republic

14:40 Microcontroller-based Application Prototyping using Domain Specific Modeling

Krisztián Holman, Zoltán Szabó

Budapest University of Technology and Economics, Hungary

15:00 Graph Relationship Discovery using Pregel Computing Model

Ján Mojžiš, Michal Laclavík

Institute of Informatics, SAS, Bratislava, Slovakia

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15:20 – 15:40 Coffee Break

SAMI 2015 Technical Program

SAMI 2015 Technical Program

15:40 – 17:20 Session [F4]

Session Chair: **Péter Tóth**, *Óbuda University, Budapest, Hungary*

15:40 Examination of the Learning Characteristics in Vocational Education

Peter Toth

Obuda University, Budapest, Hungary

16:00 Teaching and Learning in Modern Digital Environment

György Molnár

Budapest University of Technology and Economics, Hungary

16:20 Experience and Possibilities of Information Processing in Training of Mentor Teachers

Ildiko Holik

Obuda University, Budapest, Hungary

16:40 Information Processing with Mentor Teachers

Istvan Simonics

Obuda University, Budapest, Hungary

17:00 Classification of Opinions in Conversational Content

Martin Mikula and Kristína Machová

Technical University Košice

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13:40 – 17:20 **Poster Session**

Distributed Firewall in Mobile Ad Hoc Networks

Jozef Filipek, Ladislav Hudec

Slovak University of Technology in Bratislava, Slovakia

Reduction Ratio for GOSCL Constrained by Moore Co-Families on Object Set

P. Butka*, J. Pócsova* and J. Pócs**,***

**Technical University of Košice, Slovakia*

***Palacký University Olomouc, Czech Republic*

****Mathematical Institute, Slovak Academy of Sciences, Košice, Slovakia*

Possible Ways of Detecting Return Oriented Programming Attacks by Network Traffic Analysis

László Erdődi

Óbuda University, Budapest, Hungary

Comparative Presentation of the Application of IT in Teaching in the Republic of Serbia and Hungary

Dijana Karuovic, Dragana Glusac, Ivan Tasic, Robert Pap

University of Novi Sad, Technical faculty "Mihajlo Pupin," Zrenjan, Serbia

Using Edgecam for Creating CNC Programs in Education Process

František Botko*, Michal Hatala*, Miroslav Kormoš*,

Nicolae Ungureanu**, Peter Šoltés***

** Technical University of Košice, Prešov, Slovakia*

*** Universitatea de Nord din Baia Mare, Maramures, Romania*

**** IPM SOLUTIONS, s.r.o. Kamenná Prešov – Šalgovík, Slovakia*

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18:00 **Banquet**

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January 24, 2015 (Saturday)

SAMI 2015 Technical Program

8:30 – 10:10 Session [S1]

Session Chair: **Vladimír Modrák**, *Technical University of Košice*

8:30 Fuzzy Logic Controller for Permanent Magnet Synchronous Machines

Marcela Litcanu, Petru Andea, Frigura-Iliasa Flaviu Mihai
Politehnica University Timisoara, Romania

8:50 The Estimation of the Joint Angles of Upper Limb During Walking Using Fuzzy Logic System and Relation Maps

David Skoda*, Patrik Kutilek*, Vladimír Socha*, Jakub Schlenker*, Alexandr Stefek, Jan Kalina*****

* *Czech Technical University in Prague, Kladno, Czech Republic*

** *University of Defense, Brno, Czech Republic*

*** *Academy of Sciences of the Czech Republic, Prague*

9:10 Image Sharpness Metrics for Digital Microscopy

Gergely Windisch and Miklós Kozlovsky
Óbuda University, Budapest, Hungary

9:30 A Neural Network-based Application for Oil and Gas Pipeline Defect Depth Estimation

Abduljalil Mohamed*, Mohamed Salah Hamdi*, and Sofiene Tahar**

* *Ahmed Bin Mohamed Military College, Doha, Qatar*

** *Concordia University, Montreal, Canada*

9:50 Parallel Image Sharpness Measure for Supercomputing Environment

Gergely Windisch*, Miklós Kozlovsky**

* *Óbuda University, Budapest, Hungary*

** *MTA SZTAKI/Laboratory of Parallel and Distributed Computing, Budapest, Hungary*

SAMI 2015 Technical Program

10:10 – 10:30 Coffee Break

SAMI 2015 Technical Program

SAMI 2015 Technical Program

10:30 – 12:10 Session [S2]

Session Chair: **David Skoda**, *Czech Technical University in Prague*

10:30 Software and Hardware Equipment Power Quality Monitoring Inside a Transelectrica High Voltage Power Station
Nicolae Iacobici-Luca, Petru Andea, Flaviu Mihai Friguraliasa, Doru Vatau
Politehnica University Timisoara, Romania

10:50 Computer-aided Design of a New Combustion Engine Having Only Rotary Parts
L. Dudás
University of Miskolc, Miskolc, Hungary

11:10 Association in Knowledge Management Technologies
Marianna Török, Zsuzsanna Kósa
Budapest University of Technology and Economics, Hungary

11:30 Knowledge Framework for Clinical Processes Architecture and Analysis
Michael A. Košinár, Jan Czopik, Jakub Štolfa, Marek Penhaker
Technical University of Ostrava, Ostrava – Poruba, Czech Republic

11:50 Machine Learning Approach to Point Localization System
Jaroslav Žáček, Michal Janošek
University of Ostrava, Czech Republic

SAMI 2015 Technical Program

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8:30 – 12:10 **Poster Session**

MiniDelta - Educational Robot with Parallel Kinematic Structure

Pavel Dolejší, Václav Krys, Vladimír Mostýn

VŠB – Technical University of Ostrava, Ostrava, Czech Republic

Tensile Tests on Samples Manufactured by the Rapid Prototyping Technology in Comparison with the Commercially Manufactured Material

Jan Lipina, Petr Kopec, Václav Krys

VŠB – Technical University of Ostrava, Ostrava, Czech Republic

SAMI 2015 Technical Program

Learning Parameter Optimization of Multi-Layer Perceptron Using Artificial Bee Colony, Genetic Algorithm and Particle Swarm Optimization

Zehra Gülru Çam, Sibel Çimen*, Tülay Yıldırım*

Yildiz Technical University, Istanbul, Turkey

Solving Multiple Quartic Equations on the GPU using Ferrari's Method

Sándor Szénási, Ákos Tóth

Óbuda University, Budapest, Hungary

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Effect of the Change of Flight, Navigation and Motor Data Visualization on Psychophysiological State of Pilots

Vladimír Socha, **, Jakub Schlenker*, Peter Kaľavský**, Patrik Kutílek*, Luboš Socha**, Stanislav Szabo*** and Pavel Smrčka**

** Czech Technical University in Prague, Kladno, Czech Republic*

*** Technical University of Košice, Košice, Slovak Republic*

**** Czech Technical University in Prague, Prague, Czech Republic*

12:10 **Lunch, Closing and Invitation to SAMI 2016**

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Next Events



IEEE Space Robotics Workshop

February 16-17, 2015

Budapest, Hungary

<http://conf.uni-obuda.hu/SpaceRobotics2015/>

SACI 2015

10th Jubilee IEEE International Symposium on Applied Computational Intelligence and Informatics

May 21-23, 2015

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TOPICS include but not limited to

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- ▣ Genetic, Neural and Fuzzy Algorithms
- ▣ Systems Engineering
- ▣ Expert Systems
- ▣ Artificial Intelligence
- ▣ Advanced Informatics Applications
- ▣ Intelligent Manufacturing Systems
- ▣ Information Technology in Biomedicine

Authors' Schedule

Full paper submission:
February 5, 2015

Notification deadline:
March 10, 2015

Final paper submission:
April 7, 2015



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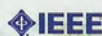
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