

A Review of HDL-Based System for Real-Time Image Processing used in Tumors Screening

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Introduction

- The use of hardware description languages to provide digital image processing results is a recent technique that offers a direct connection to reconfigurable hardware implementation.
- This paper presents a real time system for digital image processing using Verilog hardware description language that can be followed by immediate hardware implementation possibility.
- With our study we intend to contribute to the diagnoses of non-invasive methods in pre-operator stage, using modern VLSI technologies with applications in medical imaging.

Introduction

- The paper focuses on image enhancement methods such as contrast and brightness transformation, inverting and pseudo-coloring images, described and simulated using Verilog hardware description language.
- The scope of our proposed real-time configurable system is for medical applications but can be used in any other area in which the speed of image processing in real time is necessary or vital.
- The real-time configurable system proposed in this paper provides a topical solution, being complementary, alongside the other classical processes for real-time applications.

Introduction

- The FPGA have become a complex platform that involves multiple hardware and software components and offers the ability to develop the most adequate circuit architecture for digital image processing systems.
- The reconfigurable hardware is directly configured using Hardware Description Languages (HDL): Verilog and VHSIC-HDL (VHDL).
- The advantage of reconfigurable hardware (field programmable gate array - FPGA), is that the hardware can be changed based on the computational needs and allows the acceleration to be achieved by a processor.

Introduction

- High flexibility provided by hardware description languages allows the designers to logically describe much easier the system functionality, to simulate and evaluate the processing performances using appropriate development and test environments.
- The modern FPGA is a good choice for embedded real-time imaging systems because they offers sufficient resources in order to allow the systems to be implemented on a single FPGA.
- Using HDL-based platform for image processing is a quite new approach extending the field of digital design to signal processing simulation.

Previous Works

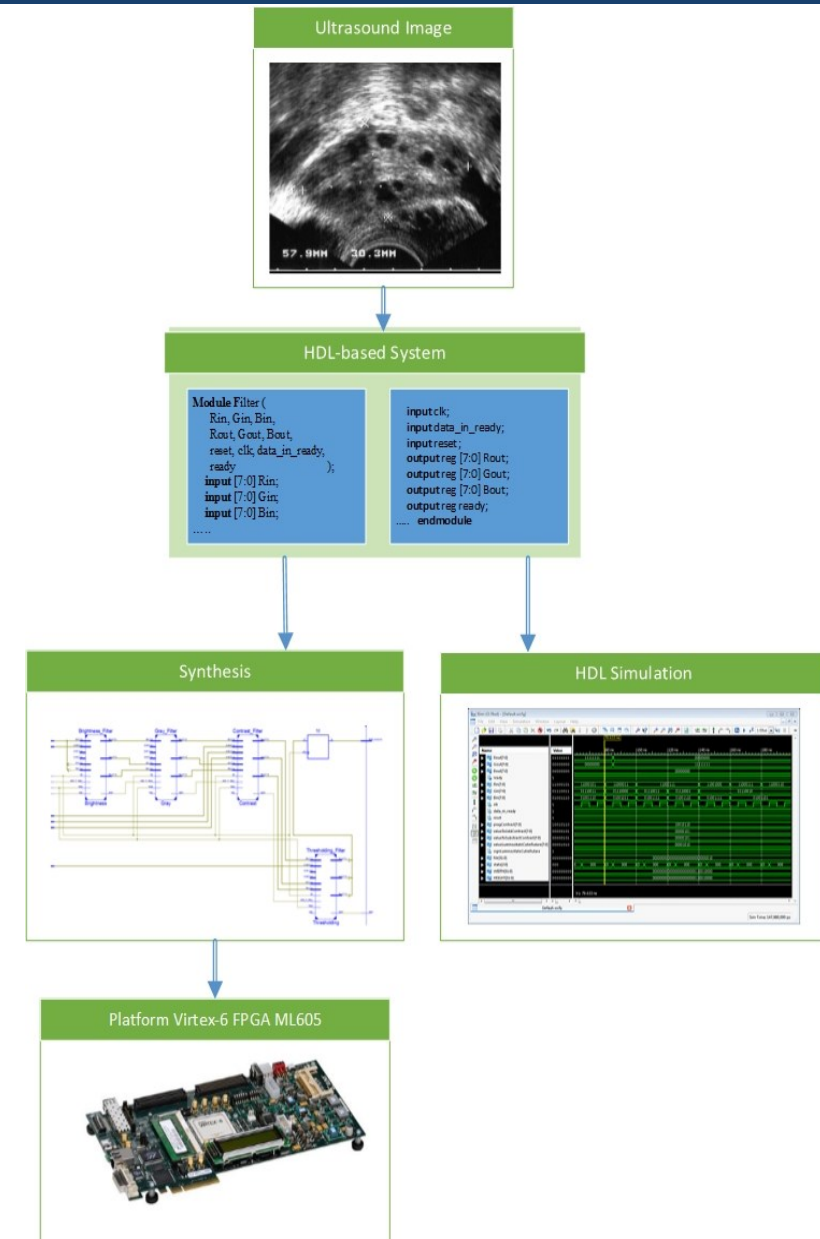
- A class of basic image processing operators that process an image so that the result is more suitable than the original image for a specific application were described in previous works:
 - I. Chiuchisan and M. Cerlinca, „*Implementation of Real-Time System for Medical Image Processing using Verilog Hardware Description Language,*” Proceedings of the 9th International Conference on Cellular and Molecular Biology, Biophysics and Bioengineering (BIO'13), ISSN: 1790-5125, ISBN: 978-960-474-326-1, pp.66-69, Chania, Creta, Greece, 2013.
 - I. Chiuchisan, “*A New FPGA-based Real-Time Configurable System for Medical Image Processing,*” Proceedings of IEEE International Conference on e-Health and Bioengineering – EHB 2013, ISBN 978-1-4799-2373-1, Iași, Romania, 2013.
 - I. Chiuchisan, “*Implementation of Medical Image Processing Algorithm on Reconfigurable Hardware,*” Proceedings of IEEE International Conference on e-Health and Bioengineering – EHB 2013, ISBN 978-1-4799-2373-1, Iași, Romania, 2013.
 - I. Chiuchisan, M. Cerlinca, A.D. Potorac and A. Graur, “*Image Enhancement Methods Approach using Verilog Hardware Description Language,*” Proceedings of the 11th International Conference on Development and Application Systems, ISSN: 1844-5039, pp. 144-148, Suceava, Romania, 2012.

HDL-Based System Description

- The system proposed in this paper is described in Verilog hardware description language at Register Transfer Level (RTL) and the images are digital processed by switching the order of filters and processing them to improve image in order to assist the medical specialists in diagnosis.
- The basic image processing operators, that for our system represent the filters, are described and used as internal components.
- This components are connected in a pipeline structure, with the possibility of amending the order of filters and the parameters of each filter features.

HDL-Based System Description

- The configurable system includes 4 filters in order to improve the ultrasound image by switching and processing them by a series of filters.
- Using a single control input the system achieves to inter-change filters “on-the-fly”, meaning that the design is dynamically reconfigured.



HDL-Based System Description

Verilog code for filters order in the system

```
input [7:0] Filter_order;
assign PseudoColor_order = Filter_order [1:0];
assign Contrast_order = Filter_order [3:2];
assign Invert_order = Filter_order [5:4];
assign Brightness_order = Filter_order [7:6];
```

Verilog code for output vector described using continuous assignment

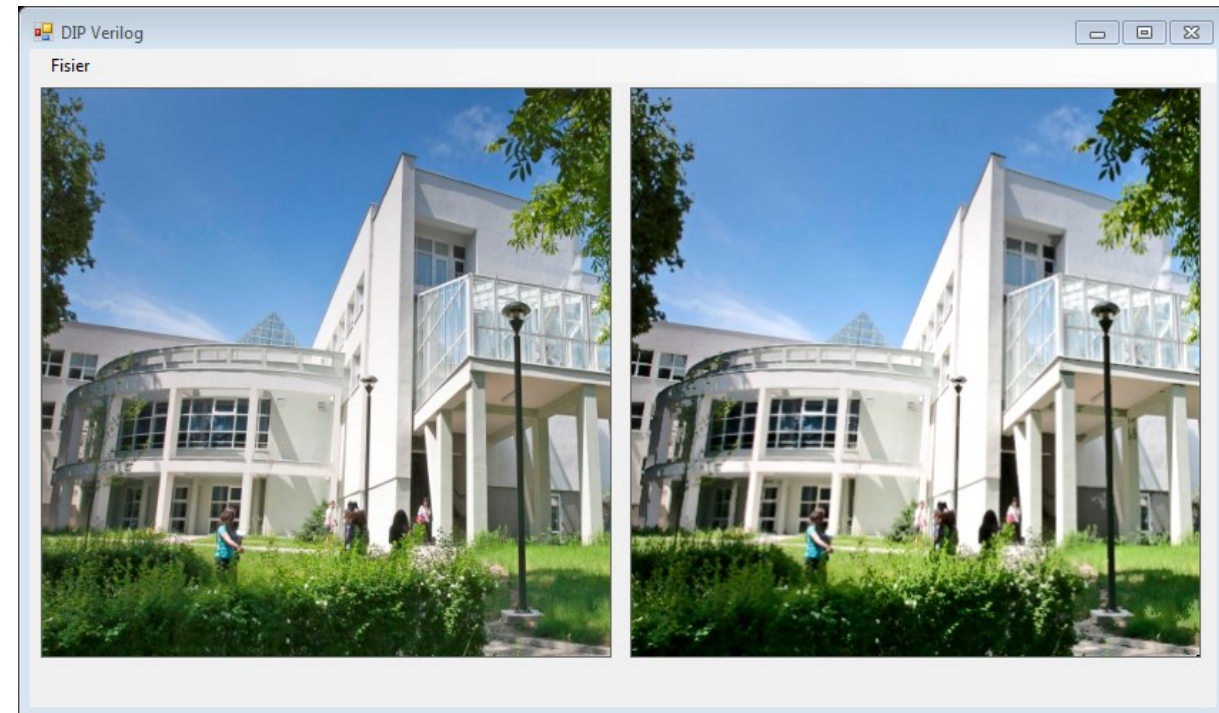
```
assign RGB_Out2[0] = PseudoColor_filter_order == 2?
RoutPseudoColor: Contrast_filter_order == 2?
RoutContrast: Invert_filter_order == 2? RoutInvert:
RoutBrightness;

assign RGB_Out2[1] = PseudoColor_filter_order == 2?
GoutPseudoColor: Contrast_filter_order == 2?
GoutContrast: Invert_filter_order == 2? GoutInvert:
GoutBrightness;

assign RGB_Out2[2] = PseudoColor_filter_order == 2?
BoutPseudoColorare: Contrast_filter_order == 2?
BoutContrast: Invert_filter_order == 2? BoutInvert:
BoutBrightness;
```

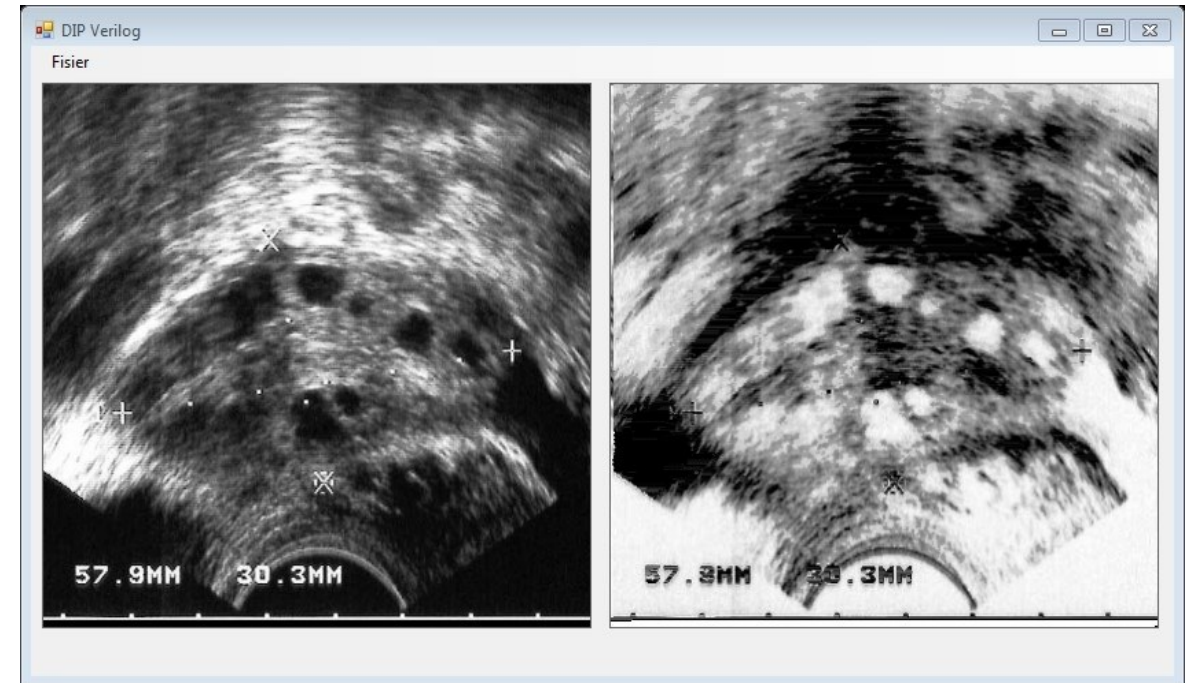
HDL-Based System Description

- In order to transform the initial image into a binary image that can be handled by the Verilog language we developed an application that converts images from Bitmap-format into a binary-format and stores them into an external file.
- The binary-file was applied as vector to the Verilog models.
- The output file was similarly converted and viewed using the same application, to show the original image and the results of the enhancement methods.



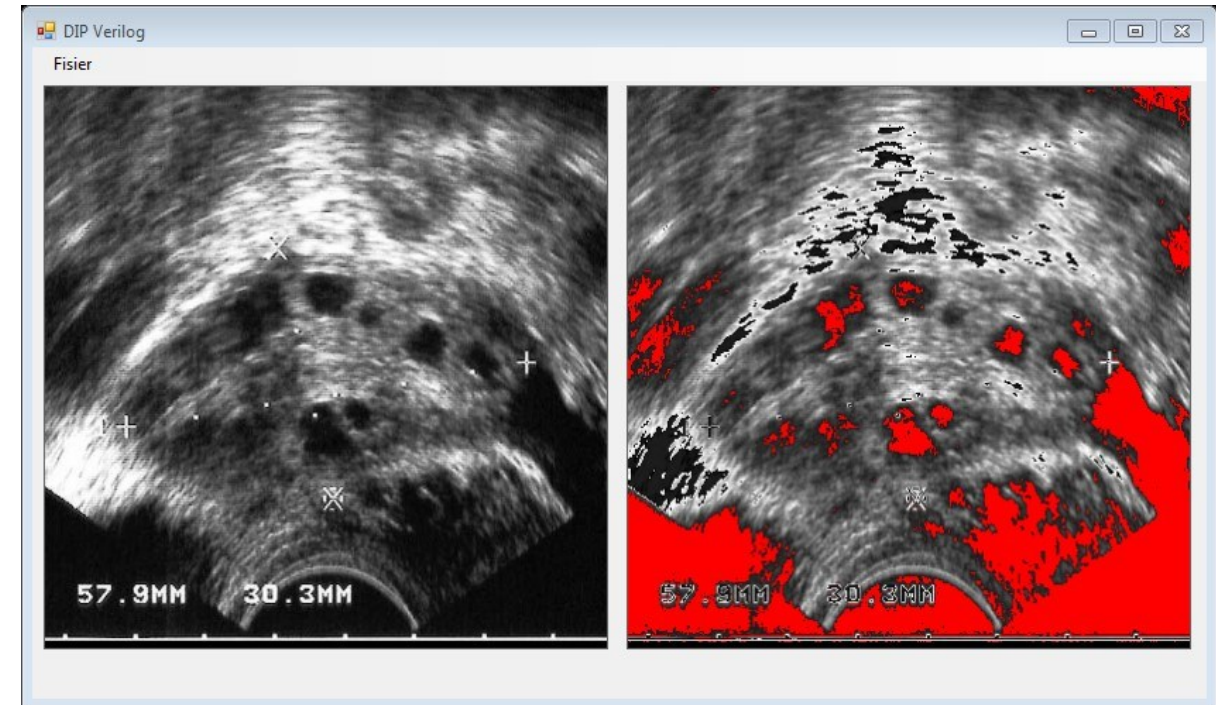
HDL-Based System Description

- Some of these filters have been encapsulated within the design tools and then applied to an ultrasound image in order to achieving efficient FPGA implementation in terms of area, speed and throughput rates and the parameters applied to filters are constant and were set by the user.



HDL-Based System Description

- The class of digital processing algorithms described in our work is limited to basic algorithms, but further research on complex image processing algorithms will be performed.



Conclusions

- The solution proposed in this paper offer a partial shift from imaging systems based on Digital Signal Processors (DSP) to image processing systems based on Reconfigurable Hardware (FPGA).
- The greater future potential of our proposed system lies in fact that it is not necessary to use an additional processor dedicated to image processing, which could slow down the flow:
- image acquisition → preprocessing the image → image use in order to establish a decision which can be human-type (in the case of a diagnosis based on medical images) or non-human (in the case of an industrial process).

Conclusions

- The most important advantage of the proposed system is due to the fact that processing is always related with a hardware structure with immediate implementation availability and is not generated based on a mathematical only model.
- More, the use of digital design tools in signal processing simulations is offering a shorter way to the final implementation of processing circuit.

Conclusions

- The technique described in this paper is part of a larger research oriented on the use of hardware description languages in signal processing simulations area.
- Other hardware processing simulations are to be studied as future work in order to evaluate and prove the advantage of this kind of approach.
- Extend the complex digital CAD tools into the signal processing field are offering not only a different developing solution but also a new larger implementation method which has to be considered together with the future digital technologies.

Acknowledgment

- This paper was supported by the project "*Sustainable performance in doctoral and post-doctoral research PERFORM*" - Contract no. POSDRU/159/1.5/S/ 138963, project co-funded from European Social Fund through Sectorial Operational Program Human Resources 2007-2013.

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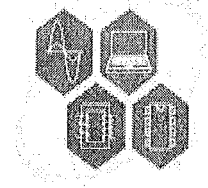
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FrPOC Plenary Session, Miorita

Opening Ceremony

Chair: [Voicu, Mihail](#)

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Co-Chair: [Rasvan, Vladimir](#)

Univ. of Craiova

FrPP1 Plenary Session, Miorita

Perspectives on Software Integration for Intelligent Robotic Systems

[Cervera, Enric](#)

Jaume-I Univ. of Castello de la Plana

Chair: [Rasvan, Vladimir](#)

Univ. of Craiova

FrPP2 Plenary Session, Miorita

Visual Data Understanding and UI Control with Humans in the Loop

[Charvillat, Vincent](#)

Univ. of Toulouse

Chair: [Lazar, Corneliu](#)

Gheorghe Asachi Tech. Univ. of Iasi

FrPP3 Plenary Session, Miorita

How to Cluster Data: Algorithms and Validation

[Fränti, Pasi](#)

Univ. of Eastern Finland

Chair: [Minzu, Viorel](#)

Dunarea de Jos Univ. of Galati

FrA1 Regular Session, Miorita

Linear Systems

Chair: [Oara, Cristian](#)

Pol. Univ. of Bucharest

Co-Chair: [Pastravanu, Octavian-Cezar](#)

Gheorghe Asachi Tech. Univ. of Iasi

11:10-11:30, [Paper FrA1.1](#)

On a Conjecture in Stability Analysis of Polytopic Systems – Mimicking Spectral Radius Properties from Real to Complex Matrices

[Pastravanu, Octavian-Cezar](#)

Gheorghe Asachi Tech. Univ. of Iasi

[Matcovschi, Mihaela-Hanako](#)

Gheorghe Asachi Tech. Univ. of Iasi

11:30-11:50, Paper FrA1.2

Study of the Interaction between a One Degree of Freedom Force Augmenting Device and a Human Operator

Gadi, Suresh Kumar

Pol. Univ. of Aguascalientes

Osorio-Cordero, Antonio

Cinvestav

Lozano, Rogelio

Univ. of Tech. of Compiègne

11:50-12:10, Paper FrA1.3

Minimal Factorization of Transfer Matrices for Generalized Systems

Flutur, Cristian

Pol. Univ. of Bucharest

Oara, Cristian

Pol. Univ. of Bucharest

12:10-12:30, Paper FrA1.4

Sufficient Conditions for Stabilisability of Decentralised LTI Systems: Weighted Directed Graph Approach

Abdolmaleki, Mohammad

Univ. of Melbourne

Aldeen, Mohammad

Univ. of Melbourne

12:30-12:50, Paper FrA1.5

Outer Bound Estimations for the Spectral Radii of Interval Matrices

Matcovschi, Mihaela-Hanako

Gheorghe Asachi Tech. Univ. of Iasi

Pastravanu, Octavian-Cezar

Gheorghe Asachi Tech. Univ. of Iasi

Voicu, Mihail

Gheorghe Asachi Tech. Univ. of Iasi

FrA2 Regular Session, Ara

Hardware Design

Chair: Ungureanu, Florina

Gheorghe Asachi Tech. Univ. of Iasi

Co-Chair: Florea, Adrian

Lucian Blaga Univ. of Sibiu

11:10-11:30, Paper FrA2.1

Enhancing the Sniper Simulator with Thermal Measurement

Florea, Adrian

Lucian Blaga Univ. of Sibiu

Buduleci, Claudiu-Raul

Lucian Blaga Univ. of Sibiu

Chiş, Radu

Technical Univ. of Cluj-Napoca

Gellert, Arpad

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Vintan, Lucian

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11:30-11:50, Paper FrA2.2

Offline Error-Detection Strategies for the IDEA NXT Crypto-Algorithm

Opritoiu, Flavius

Pol. Univ. of Timisoara

Bozesan, Andreea

Pol. Univ. of Timisoara

Vladutiu, Mircea

Pol. Univ. of Timisoara

11:50-12:10, Paper FrA2.3

Dual Priority Scheduling Algorithm Used in the Nmpira Microcontrollers

Andries, Lucian

Stefan Cel Mare Univ. of Suceava

Gaitan, Vasile Gheorghita

Stefan Cel Mare Univ. of Suceava

12:10-12:30, Paper FrA2.4

Sensorial System for HYPER-REDUNDANT ARM

Vladu, Ionel Cristian

Univ. of Craiova

Vladu, Ileana

Univ. of Craiova

Ivanescu, Mircea

Univ. of Craiova

Strimbeanu, Daniel

Univ. of Craiova

12:30-12:50, Paper FrA2.5

Hardware Event Handling in the Hardware Real-Time Operating Systems

Moisuc (Ciobanu), Elena-Eugenia

Stefan Cel Mare Univ. of Suceava

Larionescu, Alexandru-Bogdan

Stefan Cel Mare Univ. of Suceava

Ungurean, Ioan

Stefan Cel Mare Univ. of Suceava

FrA3 Invited Session, Carpati

Fractional Order Modeling and Control

Chair: Copot, Cosmin

Ghent Univ.

Co-Chair: Muresan, Cristina Ioana

Tech. Univ. of Cluj Napoca

Organizer: Copot, Cosmin

Ghent Univ.

Organizer: Muresan, Cristina Ioana

Tech. Univ. of Cluj-Napoca

11:10-11:30, Paper FrA3.1

Stabilizing Control Strategies: A Comparison between the Fractional Order Controller and the IMC (I)

Folea, Silviu

Tech. Univ. of Cluj-Napoca

Marton, Botond

Tech. Univ. of Cluj-Napoca

Muresan, Cristina Ioana

Tech. Univ. of Cluj-Napoca

11:30-11:50, Paper FrA3.2

Optimization of Fractional PID Controller by Maximization of the Criterion That Combines the Integral Gain and Closed-Loop System Bandwidth (I)

Jakovljevic, Boris

Univ. of Novi Sad

Rapaić, Milan

Univ. of Novi Sad

Šekara, Tomislav

Univ. of Belgrade

Jelcic, Zoran

Univ. of Novi Sad

11:50-12:10, Paper FrA3.3

Visual Servo Control of a Steward Platform Using Fractional-Order PID Controller (I)

Copot, Cosmin

Ghent Univ.

Ionescu, Clara

Ghent Univ.

De Keyser, Robin M.C.

Ghent Univ.

12:10-12:30, Paper FrA3.4

Fractional Order Control on a Wind Turbine Benchmark (I)

Viveiros, Carla

Inst. Superior De Engenharia De Lisboa

Melicio, Rui
Igreja, José Manuel Cardoso
Mendes, Victor

Univ. De Evora
Inst. Superior De Engenharia De Lisboa
Inst. Superior De Engenharia De Lisboa

12:30-12:50, Paper FrA3.5

Benign and Malignant Breast Tumors: Diagnosis Using Fractal Measures (I)

Dobrescu, Radu Pol. Univ. of Bucharest
Ichim, Loretta Pol. Univ. of Bucharest
Mocanu, Stefan Pol. Univ. of Bucharest
Popescu, Dan Pol. Univ. of Bucharest

FrA4 Regular Session, Laca

Optimisation

Chair: Shcherbakov, Pavel Moscow Inst. for Control Sciences, RAS
Co-Chair: Caruntu, Constantin - Florin Gheorghe Asachi Tech. Univ. of Iasi

11:10-11:30, Paper FrA4.1

Precedence Constraints Treatment in Ant Colony Optimization

Serbencu, Adrian Emanoil Dunarea De Jos Univ. of Galati
Minzu, Viorel Dunarea De Jos Univ. of Galati
Serbencu, Adriana Dunarea De Jos Univ. of Galati

11:30-11:50, Paper FrA4.2

On the Computation of Lyapunov Functions for Discrete-Time Nonlinear Systems

Bobiti, Ruxandra Valentina Eindhoven Univ. of Tech
Lazar, Mircea Eindhoven Univ. of Tech

11:50-12:10, Paper FrA4.3

Optimal Control with Fixed-End Point for Linear Perturbed Systems

Ostafi, Florin Gheorghe Asachi Tech. Univ. of Iasi
Botan, Corneliu Gheorghe Asachi Tech. Univ. of Iasi

12:10-12:30, Paper FrA4.4

Quadratic Image of a Ball: Towards Efficient Description of the Boundary

Polyak, Boris T. Moscow Inst. for Control Sciences
Shcherbakov, Pavel Moscow Inst. for Control Sciences
Khlebnikov, Mikhail Moscow Inst. for Control Sciences

12:30-12:50, Paper FrA4.5

Trajectory Planner for Mobile Robots Using Particle Swarm Optimization

Solea, Razvan Dunarea De Jos Univ. of Galati
Cernega, Daniela Cristina Dunarea De Jos Univ. of Galati

FrA5 Regular Session, Bucegi 1

Software Engineering

Chair: Iliescu, Dragos
Co-Chair: Costeniuc, George

Univ. Pol. of Bucharest
Continental Automotive Romania SRL Iasi

11:10-11:30, Paper FrA5.1

Is FBDK Suitable for Developing and Implementing Process Control Optimization Problems?

Rohat, Oana
Popescu, Dan

Pol. Univ. of Bucharest
Pol. Univ. of Bucharest

11:30-11:50, Paper FrA5.2

Double Precision Stencil Computations on Kepler GPUs

Vizitiu, Anamaria
Itu, Lucian
Lazar, Laszlo
Suciu, Constantin

Transilvania Univ. of Brasov
Lucian Blaga Univ. of Sibiu
SC Siemens SRL
SC Siemens SRL

11:50-12:10, Paper FrA5.3

Assisted Management of Product Data - a PDM Application Proposal

Iliescu, Dragos
Ciocan, Ion
Mateias, Ion

Pol. Univ. of Bucharest
Pol. Univ. of Bucharest
Doosan IMGB Bucharest

12:10-12:30, Paper FrA5.4

Semantic Report Search Engine - Questor

Vasilateanu, Andrei
Goga, Nicolae
Moldoveanu, Alin

Pol. Univ. of Bucharest
Pol. Univ. of Bucharest
Pol. Univ. of Bucharest

12:30-12:50, Paper FrA5.5

SaaS Solutions for Small-Medium Businesses Developer's Perspective on Creating New SaaS Products

Resceanu, Ionut Cristian
Resceanu, Cristina Floriana
Simionescu, Sabin Mihai

Univ. of Craiova
Univ. of Craiova
SC White Pyramid SRL

FrB1 Invited Session, Miorita

New Trends in Robotic Systems

Chair: Cervera, Enric
Co-Chair: Panescu, Doru-Adrian
Organizer: Cervera, Enric
Organizer: Borangiu, Theodor
Organizer: Panescu, Doru-Adrian
Organizer: Burlacu, Adrian

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Gheorghe Asachi Tech. Univ. of Iasi
Jaume-I Univ. of Castello de la Plana
Pol. Univ. of Bucharest
Gheorghe Asachi Tech. Univ. of Iasi
Gheorghe Asachi Tech. Univ. of Iasi

16:10-16:30, Paper FrB1.1

Integration of Mobile Agents in Distributed Manufacturing Control (I)

Raileanu, Silviu

Pol. Univ. of Bucharest

Borangiu, Theodor

Pol. Univ. of Bucharest

Ivanescu, Nick Andrei

Pol. Univ. of Bucharest

Morariu, Octavian

Pol. Univ. of Bucharest

16:30-16:50, Paper FrB1.2

Trading Optimality for Computational Feasibility in a Sample Gathering Problem (I)

Kloetzer, Marius

Gheorghe Asachi Tech. Univ. of Iasi

Ostafi, Florin

Gheorghe Asachi Tech. Univ. of Iasi

Burlacu, Adrian

Gheorghe Asachi Tech. Univ. of Iasi

16:50-17:10, Paper FrB1.3

A Constraint Satisfaction Approach for Planning of Multi-Robot Systems (I)

Panescu, Doru-Adrian

Gheorghe Asachi Tech. Univ. of Iasi

Pascal, Carlos

Gheorghe Asachi Tech. Univ. of Iasi

17:10-17:30, Paper FrB1.4

Spiking Neural Network for Controlling the Artificial Muscles of a Humanoid Robotic Arm (I)

Hulea, Mircea

Gheorghe Asachi Tech. Univ. of Iasi

Caruntu, Constantin - Florin

Gheorghe Asachi Tech. Univ. of Iasi

17:30-17:50, Paper FrB1.5

3D Complex Surface Generation through Procedural Robot Motion (I)

Borangiu, Theodor

Pol. Univ. of Bucharest

Ciocan, Mihai

Pol. Univ. of Bucharest

Raileanu, Silviu

Pol. Univ. of Bucharest

Morariu, Octavian

Pol. Univ. of Bucharest

Stocklosa, Octavian

Pol. Univ. of Bucharest

17:50-18:10, Paper FrB1.6

Kinematic Evaluation of Articulated Rigid Objects (I)

Burlacu, Adrian

Gheorghe Asachi Tech. Univ. of Iasi

Condurache, Daniel

Gheorghe Asachi Tech. Univ. of Iasi

Clim, Eduard

Gheorghe Asachi Tech. Univ. of Iasi

FrB2 Invited Session, Ara

Real Time Systems Applications

Chair: Popescu, Dumitru

Pol. Univ. of Bucharest

Co-Chair: Lupu, Ciprian

Pol. Univ. of Bucharest

Organizer: Popescu, Dumitru

Pol. Univ. of Bucharest

Organizer: Lupu, Ciprian

Pol. Univ. of Bucharest

16:10-16:30, Paper FrB2.1

Emergent Intelligence in Agents: A Scalable Architecture for Smart Cities (I)

Patrascu, Monica

Pol. Univ. of Bucharest

Dragoicea, Monica

Pol. Univ. of Bucharest

Ion, Andreea

Pol. Univ. of Bucharest

16:30-16:50, Paper FrB2.2

Real Time Agent Based Simulation for Smart City Emergency Protocols (I)

Dragoicea, Monica

Pol. Univ. of Bucharest

Patrascu, Monica

Pol. Univ. of Bucharest

Serea, George Alexandru

Pol. Univ. of Bucharest

16:50-17:10, Paper FrB2.3

An Approach for Load Balancing in Virtual Power Plant Structures (I)

Lupu, Ciprian

Pol. Univ. of Bucharest

Oancea, Dumitru

Pol. Univ. of Bucharest

Oara, Cristian

Pol. Univ. of Bucharest

Lupu, Mircea

Transilvania Univ. of Brasov

Apetrei, Dan

ELSACO Energy

17:10-17:30, Paper FrB2.4

Real-Time Acquisition of Quality Verified Nonstandardized Color Images for Skin Lesions Risk Assessment – a Preliminary Study (I)

Udrea, Andreea

Pol. Univ. of Bucharest

Lupu, Ciprian

Pol. Univ. of Bucharest

17:30-17:50, Paper FrB2.5

Designing Control Systems with Distributed Parameters (I)

Miron, Cristian

Pol. Univ. of Bucharest

Popescu, Dumitru

Pol. Univ. of Bucharest

Petrescu, Catalin

Pol. Univ. of Bucharest

17:50-18:10, Paper FrB2.6

Fuzzy Modeling and Control for a Road Section (I)

Dimon, Catalin

Pol. Univ. of Bucharest

Popescu, Dumitru

Pol. Univ. of Bucharest

Stefanoiu, Dan

Pol. Univ. of Bucharest

FrB3 Regular Session, Carpati

Applied Informatics

Chair: Postolache, Mihai

Gheorghe Asachi Tech. Univ. of Iasi

Co-Chair: Ciobanu, Adrian

Inst. of Computer Science, Romanian Acad. Iasi Branch

16:10-16:30, Paper FrB3.1

A Review of HDL-Based System for Real-Time Image Processing Used in Tumors Screening

Chiuchisan, Iuliana

Stefan Cel Mare Univ. of Suceava

Geman, Oana

Stefan Cel Mare Univ. of Suceava

Keywords: Biomedical Engineering, Signal Processing, Real Time Applications

Abstract: Potentially malignant ovarian tumors are rare entities with an excellent prognosis, which depends by the tumor stage of diagnoses. There are currently limited data about tumor type identified intra-

operator and based on current optimal treatment applied to the potentially malignant ovarian tumors. However, improvements in identification of women at high risk for ovarian cancer, as well as improved imaging techniques, increase the probability of early detection. In this paper we study a several criteria for identification and differentiation-pre-operative (using real-time imaging filters) and intra-operative detection of ovarian tumors with malignant potential or invasive carcinomas and ovarian benign tumors. With our study we intend to contribute to the diagnoses of invasive and non-invasive lesions in pre-operator stage, using modern VLSI technologies with applications in medical imaging.

16:30-16:50, Paper FrB3.2

A Study on Automatic Recognition of Positive and Negative Emotions in Speech

<u>Pavaloi, Ioan</u>	Inst. of Computer Science, Romanian Acad. Iasi Branch
<u>Ciobanu, Adrian</u>	Inst. of Computer Science, Romanian Acad. Iasi Branch
<u>Luca, Mihaela</u>	Inst. of Computer Science, Romanian Acad. Iasi Branch
<u>Musca, Elena</u>	Inst. of Computer Science, Romanian Acad. Iasi Branch
<u>Barbu, Tudor</u>	Inst. of Computer Science, Romanian Acad. Iasi Branch
<u>Ignat, Anca</u>	Alexandru Ioan Cuza Univ. of Iasi

16:50-17:10, Paper FrB3.3

Security Solution for Healthcare Hybrid Cloud Platform

<u>Marcu, Roxana Elena</u>	Pol. Univ. of Bucharest
----------------------------	-------------------------

17:10-17:30, Paper FrB3.4

Uniformity and Correlation Test Parameters for Random Numbers Generators

<u>Petrila, Iulian</u>	Gheorghe Asachi Tech. Univ. of Iasi
<u>Manta, Vasile</u>	Gheorghe Asachi Tech. Univ. of Iasi
<u>Ungureanu, Florina</u>	Gheorghe Asachi Tech. Univ. of Iasi

17:30-17:50, Paper FrB3.5

Artificial Intelligence Application Built for ATS Detection with a New Portable Hollow Fiber IRAS Spectrometer

<u>Praisler, Mirela</u>	Dunarea De Jos Univ. of Galati
<u>Ciochina, Stefanut</u>	Dunarea De Jos Univ. of Galati
<u>Stoica, Atanasia</u>	Dunarea De Jos Univ. of Galati

17:50-18:10, Paper FrB3.6

CFD Simulation of the Airflow Pattern within a Three-Bed Hospital Room with or without a Portable Air Conditioner in Use

<u>Vladut, Gabriel</u>	S.C. IPA CIFATT Craiova
<u>Sbirna, Liana Simona</u>	Univ. of Craiova
<u>Sbirna, Sebastian</u>	St. Stephen Ec. School of Craiova
<u>Codresi, Cristian</u>	Sodinal Romania
<u>Martin, Liviu</u>	Turceni City Hospital

FrB4 Regular Session, Laca

Control Applications

Chair: <u>Valean, Honoriu</u>	Tech. Univ. of Cluj-Napoca
Co-Chair: <u>Nitulescu, Mircea</u>	Univ. of Craiova

16:10-16:30, Paper FrB4.1

Dynamics Properties and Control for Oilwell Drillstrings

<u>Bobasu, Eugen</u>	Univ. of Craiova
<u>Ivanov, Sergiu</u>	Univ. of Craiova
<u>Popescu, Dan</u>	Univ. of Craiova
<u>Rasvan, Vladimir</u>	Univ. of Craiova

16:30-16:50, Paper FrB4.2

The Determination of the Maximum Energetic Zones for a Wind System, Operating at Variable Wind Speeds

<u>Erdodi, Gheza-Mihai</u>	Pol. Univ. of Timisoara
<u>Petrescu, Doru-Ionut</u>	Pol. Univ. of Timisoara
<u>Sorandaru, Ciprian</u>	Pol. Univ. of Timisoara
<u>Musuroi, Sorin</u>	Pol. Univ. of Timisoara

16:50-17:10, Paper FrB4.3

Modelling of Bio-Products Conversion Processes for Pollutant Compounds Formation Dynamics Assessment

<u>Roman, Monica</u>	Univ. of Craiova
<u>Selisteanu, Dan</u>	Univ. of Craiova

17:10-17:30, Paper FrB4.4

Parameter Estimation Techniques for a Rehabilitation Hand Exoskeleton

<u>Ivanescu, Mircea</u>	Univ. of Craiova
<u>Popescu, Dorin</u>	Univ. of Craiova
<u>Nitulescu, Mircea</u>	Univ. of Craiova
<u>Popescu, Nirvana</u>	Pol. Univ. of Bucharest

17:30-17:50, Paper FrB4.5

Temperature Control of the Asphaltic Emulsion in an Industrial Tank

<u>Muresan, Vlad</u>	Tech. Univ. of Cluj-Napoca
<u>Abrudean, Mihail</u>	Tech. Univ. of Cluj-Napoca
<u>Valean, Honoriu</u>	Tech. Univ. of Cluj-Napoca
<u>Colosi, Tiberiu</u>	Tech. Univ. of Cluj-Napoca

17:50-18:10, Paper FrB4.6

Variable DC Power Sources for ¹³C Isotope Separation Column Boiler Supply

<u>Dulf, Eva Henrietta</u>	Tech. Univ. of Cluj Napoca
<u>Both, Roxana</u>	Tech. Univ. of Cluj-Napoca
<u>Munteanu, Radu A.</u>	Tech. Univ. of Cluj-Napoca
<u>Festila, Clement</u>	Tech. Univ. of Cluj Napoca
<u>Secara, Mihai</u>	Tech. Univ. of Cluj-Napoca

FrB5 Regular Session, Bucegi 1

Nonlinear Systems

Chair: Sima, Vasile

National Inst. for Res. and Development in Informatics, Bucharest

Co-Chair: Halas, Miroslav

Slovak Univ. of Tech.

16:10-16:30, Paper FrB5.1

Modelling and Performance Analysis of an Urban Wastewater Treatment Plant

Luca, Laurentiu

Dunarea De Jos Univ. of Galati

Barbu, Marian

Dunarea De Jos Univ. of Galati

Caraman, Sergiu

Dunarea De Jos Univ. of Galati

16:30-16:50, Paper FrB5.2

Eigenvalues for a Nonlinear Time-Delay System

Halas, Miroslav

Slovak Univ. of Tech. in Bratislava

16:50-17:10, Paper FrB5.3

Control-Oriented Modeling and Flight Dynamics Analysis of a Flexible Generic Hypersonic Vehicle

Zhu, Jiao

Beihang Univ

Chen, Wanchun

Beihang Univ

Ma, Hongzhong

Beijing Electro-Mechanical Engineering Inst

Yang, Zhihong

Beijing Aerospace Tech. Inst

17:10-17:30, Paper FrB5.4

Imperialist Competitive Algorithm with Variable Parameters for the Optimization of a Fuzzy Controller

Ciurea, Stelian

Lucian Blaga Univ. of Sibiu

Trifa, Viorel

Tech. Univ. of Cluj-Napoca

17:30-17:50, Paper FrB5.5

Nonlinear Fuzzy Control of Human Heart Rate During Aerobic Endurance Training with Respect to Significant Model Variations

Patrascu, Adrian

Babes-Bolyai Univ. of Cluj-Napoca

Patrascu, Monica

Pol. Univ. of Bucharest

Hantiu, Jacob

Babes-Bolyai Univ. of Cluj-Napoca

17:50-18:10, Paper FrB5.6

Sampled-Data Robust Feedback Linearization Using Neural Network-Aided Unscented Kalman Filter

Zaheer, Asim

National Univ. of Sciences and Tech. of Islamabad

Hasan, Momena

National Univ. of Sciences and Tech. of Islamabad

Ali, Usman

National Univ. of Sciences and Tech. of Islamabad

Salman, Muhammad

National Univ. of Sciences and Tech. of Islamabad