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## COMMITTEES

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### Chairmen of the Conference

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### Vice-Chairmen of the Conference

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**Sergey Ablameyko** Belarus

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## ORGANIZATIONS

### Organized by

**BELARUSIAN STATE UNIVERSITY OF INFORMATICS AND RADIOELECTRONICS,**  
*Faculty of Computer Systems and Networks*

### In cooperation with

- Belarusian State University
- United Institute of Informatics Problems of the National Academy of Sciences of Belarus
- Belarusian Association for Image Analysis and Recognition
- The International Association for Pattern Recognition
- Netcracker Technology
- ISsoft Solutions



<b>TIME SCHEDULE PRIP'2019</b>
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**Tuesday, May 21, 2019**

<b>9:00-13:00</b>	Registration (room 229)	
<b>10:00-10:15</b>	Opening of the conference (room 229)	
<b>10:15-11:10</b>	Plenary session <b>P1</b> (room 229)	
<b>11:10-11:30</b>	Coffee Break (room 232)	
<b>11:30-13:00</b>	Plenary session <b>P2</b> (room 229)	
<b>13:00-14:00</b>	Lunch	
<b>14:00-16.00</b>	A1 (room 229)	W (room 232)
<b>16.00-16.15</b>	Coffee Break (room 232)	
<b>16.15-18.00</b>	B1 (room 229)	W (room 232)
<b>Conference banquet</b>		

**Wednesday, May 22, 2019**

<b>9:00-9:45</b>	Plenary session <b>P3</b> (Conference Hall, Rectorat Building**)	
<b>9:45-10.45</b>	A2 (room 229)	B2 (room 232)
<b>10:45-11:00</b>	Coffee Break (room 232)	
<b>11.00-12.30</b>	A3 (room 229)	B3 (room 232)
<b>12:30-13:45</b>	Lunch	
<b>13:45-15.45</b>	A4 (room 229)	B4 (room 232)
<b>15.45-16.00</b>	Coffee Break (room 232)	
<b>16.00-17.00</b>	A5 (room 229)	B5 (room 232)
<b>Visit to the theatre of opera and ballet</b>		

**Thursday, May 23, 2019**

<b>9:00-10.45</b>	A6 (room 229)	B6 (room 232)
<b>10:45-11:00</b>	Coffee Break (room 232)	
<b>11.00-12.30</b>	A7 (room 229)	B7 (room 232)
<b>12.30-13.00</b>	Closing ceremony (room 229)	
<b>Sightseeing tour of Minsk</b>		

<b>Scientific program</b>
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**Opening of the conference**

1. Welcome words of the conference honorary chairman *Vadim Bogush*
2. Welcome words of the co-chairman *Victor Krasnoproshin*
3. Welcome words of the co-chairman *Aleksander Tuzikov*

**Tuesday, May 21**

**Session P1: KEYNOTE LECTIONS** (room 229)

**Chairman:** Prof. Krasnoproshin V.

10:15-11:00    **P1.1**    **Gerhard Rigoll (Germany)** Recent Progress in Computer-Vision-based Human Activity Recognition and Related Areas

**Tuesday, May 21**

**Session P2: KEYNOTE LECTIONS** (room 229)

**Chairman:** Prof. Tuzikov A.

11:30-11:15    **P2.1**    **Kurosh Madani (France)** Humanizing Robots' Vision through Machine-Learning Based Artificial Visual Attention

12:15-13:00    **P2.2**    **Henning Müller (Switzerland)** Image-based medical decision support in the age of deep learning

**Tuesday, May 21**

**Session A1: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION** (room 229)

**Chairman:** Prof. Starovoitov V.

14:00-14:15    **A1.1**    **Boris Kulik, Alexander Fridman** Clustering Methods for Logical Models

14:15-14:30    **A1.2**    **Bobkov A., Krasnoproshin V., Vissia H.** Predictive Analytics Based on Semantic Patterns

14:30-14:45    **A1.3**    **Samer El-Khatib, Yuri Skobtcov, Sergey Rodzin** Theoretical and experimental evaluation of Exponential PSO algorithm for MRI images segmentation using Drift Theorem

14:45-15:00    **A1.4**    **Dmitry Cheremisinov, Liudmila Cheremisinova, Vazgen Melikyan, Arthur Sahakyan** Reachability Graph Reduction for Model Based Testing of Concurrent Systems

15:00-15:15    **A1.5**    **M.M. Lange** An Information Criterion of Classification Efficiency for Fusion Schemes in an Ensemble of Data Sources

15:15-15:30    **A1.6**    **Karaki Youmna, Ivanov Nick** Hyperparameters of Multilayer Perceptron with Normal Distributed Weights

15:30-15:45    **A1.7**    **Sladjana Spasić, Srdjan Subotić, Željka Višnjić-Jeftić, Mirjana Lenhardt** Determination of the Developmental Stage of Erythrocytes In the Common Nose (Chodrostoma nasus) Using Different Classification Methods

15:45-16:00    **A1.8**    **Reznik A.L., Tuzikov A.V., Soloviev A.A., Torgov A.V., Kovalev V.A.** High-speed algorithms aimed to search for random pulsed-point sources

**Session B1: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 229)**

**Chairman:** Prof. Doudkin A.

<b>Tuesday, May 21</b>	16:15-16:30	<b>B1.1</b>	<b>M. Kharinov, A. Buslavsky</b> Object Detection in Color Image
	16:30-16:45	<b>B1.2</b>	<b>Ivan Radkevich, Alexander Nedzved, Igor B. Gurevich, Vera Yashina</b> Optimisation of Monocular Camera 3D Object Detection by Optical Flow
	16:45-17:00	<b>B1.3</b>	<b>Roni Shahino, Michael Werman</b> Connecting Stationary and Egocentric Videos
	17:00-17:15	<b>B1.4</b>	<b>A. Kurylovich, R. Bohush, S. Ablameyko</b> Video-based Content Detection and Recognition of Bank Cards in iOS Mobile Devices
	17:15-17:30	<b>B1.5</b>	<b>Anton Sysoev, Semen Blyumin, Roman Scheglevatyh</b> Approach to Sensitivity Analysis of Neural Network Models Based on Analysis of Finite Fluctuations
	17:30-17:45	<b>B1.6</b>	<b>Alexander A. Ivaniuk, Siarhei S. Zalivaka</b> FPGA Based Arbiter Physical Unclonable Function Implementation with Double Reduced Hardware Overhead
	17:45-18:00	<b>B1.7</b>	<b>Dmitry Pertsau, Alexander Doudkin</b> Compression of Earth Remote Sensing Hyperspectral Data Using Context Modeling

**Workshop ARTIFICIAL INTELLIGENCE, DEEP LEARNING AND ROBOTICS (room 232)**

**Chairman:** Prof. Kovalev V.

<b>Tuesday, May 21</b>	14:00-14:15	<b>W1.1</b>	<b>Henning Müller (Switzerland)</b> Histopathology image retrieval
	14:15-14:30	<b>W1.2</b>	<b>Yashin Dicente (Switzerland, Great Britain)</b> Lung graph models
	14:30-14:45	<b>W1.3</b>	<b>Dmitry Voynov, Vassili Kovalev</b> Dependence of the Success Rate of Adversarial Attacks to the Deep Neural Networks on Biomedical Image Type and Attack Parameters
	14:45-15:00	<b>W1.4</b>	<b>Vitali Liauchuk, Vassili Kovalev</b> Detection of Lung Pathologies Using Deep Convolutional Networks Trained on Large X-ray Chest Screening Database
	15:00-15:15	<b>W1.5</b>	<b>Sergei Kozlovski, Vassili Kovalev</b> Generation of Artificial Biomedical Image Datasets for Training Deep Learning Models
	15:15-15:30	<b>W1.6</b>	<b>Malyshev Valery, Vassili Kovalev, Vitali Liauchuk, Alexander Kalinovsky</b> A Comparison of Segmentation Methods Based on Image Registration and Convolutional Neural Networks
	15:30-15:45	<b>W1.7</b>	<b>Alexander M. Krot, Uladzislau Sychou</b> The nonlinear analysis of chaotic signals based on matrix decomposition of a Chua's circuit with smooth nonlinearity
	15:45-16:00	<b>W1.8</b>	<b>M. Karol, I. Novik, M. Tatur, A. Tratsiakou</b> Technical service of complex intelligent systems

**Workshop ARTIFICIAL INTELLIGENCE, DEEP LEARNING AND ROBOTICS (room 232)**

**Chairman:** Prof. Golovko V.

<b>Tuesday, May 21</b>	16:15-16:30	<b>W1.9</b>	<b>A.Zhuk, S.Ablameyko</b> Automatic detection of discrete objects in satellite images using U-NET neural network
	16:30-16:45	<b>W1.10</b>	<b>Vladimir Golovko, Egor Mikhno, Alexander Kroschenko, Sergei Bezobrazov</b> Deep learning for brands object detection and recognition in images
	16:45-17:00	<b>W1.11</b>	<b>Rykhard Bohush, Iryna Zakharava, Siarhei Ivankovich</b> CNN-based Real-time Person Tracking for Indoor Video Surveillance using CUDA Technology
	17:00-17:15	<b>W1.12</b>	<b>Natalia Iskra, Vitali Iskra</b> Temporal Convolutional and Recurrent Networks for Image Captioning
	17:15-17:30	<b>W1.13</b>	<b>A. Kachurka, S. Ablameyko</b> Roads recognition on the Earth surface images using artificial neural networks

Wednesday, May 22

**Session P3: KEYNOTE LECTIONS** (room 229)

**Chairman:** Prof. Kurosh Madani

09:00-9:45    **P3.1**    **Elena Zaitseva (Slovakia)** Reliability Analysis of Multi-State System

**Session A2: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION** (room 229)

**Chairman:** Prof. Kurosh Madani

Wednesday, May 22

09:45-10:00    **A2.1**    **Abdurrahman Özbeyaz, Ramazan Coban, Ramazan Aslan** EEG Signals Classification Using Artificial Neural Network and Support Vector Machine in a Neuromarketing Study

10:00-10:15    **A2.2**    **Vissia Herman, Krasnoproshin Viktor, Valvachev Alexander** Decision Making Based on Semantic Analysis of Global Text

10:15-10:30    **A2.3**    **Yauheni Marushko, Alexander Doudkin, Jan W. Owsinski** Based on Ensemble of Convolutional Neural Networks Identification technique of Remote Sensing Data

10:30-10:45    **A2.4**    **Leonid I. Gretchikhin, Yury A. Rakhzhynski, Ivan P. Shumsky** Methods and Equipment for Automatic Analysis of Digital Images

**Session B2: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS** (room 232)

**Chairman:** Prof. Gerhard Rigoll

Wednesday, May 22

09:45-10:00    **B2.1**    **Boris Assanovich, Yury Veretilo, Natallya Bich, Anastasiya Pushkina, Valentina Khilmanovich** Recognition of Genuine Smile as a Factor of Happiness and its Application to Measure the Quality of Customer Retail Services

10:00-10:15    **B2.2**    **Vladimir Lutkovski, Dzmityr Zheludkovich, Andrei Popleteev** Multimodal Biometric System for Human Emotions Monitoring

10:15-10:30    **B2.3**    **Nguyen Anh Tuan, V.Yu.Tsviatkou** The Search of Extremes on the Gray-scale Images Using the Space-Oriented Masks for Region Growing

10:30-10:45    **B2.4**    **Artyom Gvozdovich, Maxim Vashkevich, Yuliya Rushkevich, Alexander Petrovsky** Detection Bulbar Dysfunction in ALS Patients Using Acoustic Analysis of Vowels Extracted from Continuous Speech



**Session A3: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION (room 229)**

**Chairman:** Prof. Elena Zaitseva

<b>Wednesday, May 22</b>	11:00-11:15	<b>A3.1</b>	<b>A. Nemirko</b> Lite Nearest Convex Hull Classifier
	11:15-11:30	<b>A3.2</b>	<b>Sergey Dvoenko</b> On Clustering by Metric Medians
	11:30-11:45	<b>A3.3</b>	<b>Dmitry Cheremisinov, Liudmila Cheremisinova</b> Subcircuit Pattern Recognition in Integrated Circuit Design
	11:45-12:00	<b>A3.4</b>	<b>Y. Kharin, M. Kislach</b> Statistical analysis of Poisson conditionally nonlinear autoregressive time series by frequencies-based estimators
	12:00-12:15	<b>A3.5</b>	<b>Novoselova N.A., Tom I.E.</b> A comparison of spatial clustering methods for disease outbreak detection
	12:15-12:30	<b>A3.6</b>	<b>Krasnoproshin Victor V., Matskevich Vadim V.</b> Annealing method in training restricted Boltzmann machine

**Session B3: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 232)**

**Chairman:** Prof. Azarov I.

<b>Wednesday, May 22</b>	11:00-11:15	<b>B3.1</b>	<b>Mezhennaya M.M., Dzik S.K., Kalilec T.V., Runkevich K.N., Kishkevich I.V., Laschetko R.A.</b> Laser Speckle Image Processing for Visualizing Tissue Perfusion
	11:15-11:30	<b>B3.2</b>	<b>D. Mazouka, V. Krasnoproshin</b> Integration of graphics engines into graphics pipeline technology
	11:30-11:45	<b>B3.3</b>	<b>Raman Zuk, Boris Zalesky, Phillip Trotski</b> Return Home of Autonomously flying Small Drone with Use of Onboard Camera
	11:45-12:00	<b>B3.4</b>	<b>Vladislav V. Avramov, Eugene V. Rybenkov, Nick A. Petrovsky</b> Image Enhancement by 2-D non-Separable Quaternionic Filter Bank-based Thresholding Neural Network
	12:00-12:15	<b>B3.5</b>	<b>V. Ganchenko, A. Doudkin, Thai Quang Vinh</b> Convolutional Neural Networks for Pattern Recognition on Agriculture Aerial Images
	12:15-12:30	<b>B3.6</b>	<b>Uladzimir Kavalenka, Dmitriy Kostiuk, Stanislav Derechennik-jr.</b> Overlaying signs of drug use on images of users faces in real time

**Session A4: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION (room 229)**

**Chairman:** Prof. Krasnoproshin V.

<b>Wednesday, May 22</b>	13:45-14:00	<b>A4.1</b>	<b>Daniil Shunkevich, Natalia Iskra</b> Ontological Approach to Image Captioning Evaluation
	14:00-14:15	<b>A4.2</b>	<b>Dmitriy A. Kostiuk, Oleg O. Latiy, Anastasia A. Markina, Vadim P. Shamonin</b> Using biometric measurements to compare graphical user interfaces
	14:15-14:30	<b>A4.3</b>	<b>Ivashenko Valerian</b> Semantic logging of knowledge processing based on binary generated events
	14:30-14:45	<b>A4.4</b>	<b>Hubchyk Ihar, Ivanov Nick</b> Kernel polling for task migration between graphics processing units
	14:45-15:00	<b>A4.5</b>	<b>Hanna Tsykunova, Lazar Kopanja, Victoria Kulinkovich</b> Analysis of modern classifiers for multidimensional data
	15:00-15:15	<b>A4.6</b>	<b>Katsiaryna Halavataya</b> Local feature descriptor indexing for image matching and object detection in real-time applications
	15:15-15:30	<b>A4.7</b>	<b>Aliaksandr Belko, Nikolai Babarika, Iosif Zeylikovich, Aliaksandr Nikitin</b> Diagnostics of the structure of fractal copper clusters in a matrix of polytetrafluoroethylene
	15:30-15:45	<b>A4.8</b>	<b>Oleg Baranovski, Alexander Valvachev</b> The Standardized Architecture of Intelligent Systems Based on the Brain Topology

**Session B4: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 232)**

**Chairman:** Prof. Nedzved A.

<b>Wednesday, May 22</b>	13:45-14:00	<b>B4.1</b>	<b>Mikalai Rahachou, Sergey Ablameyko</b> Segmentation-based algorithm for change detection in remote sensing images
	14:00-14:15	<b>B4.2</b>	<b>Nedzved A. M., Dosin A. N., Belotserkovsky A. M.</b> The horizon surface generation from lines on seismic profile
	14:15-14:30	<b>B4.3</b>	<b>Denys Zolotukhin, Anatoliy Sachenko, Artur Hermanowich, Myroslav Komar, Pavlo Bykovyy</b> Developing the 3D Model Characters Based on Textures Maps Module
	14:30-14:45	<b>B4.4</b>	<b>Leonid Ivanovsky, Anna Ostrovskaya, Vladimir Khryashchev, Anatoly Sedov</b> High-resolution Aerial Image Segmentation for Automated Building Detection
	14:45-15:00	<b>B4.5</b>	<b>Olga Nedzved, Luhong Jin, Wannu Lin, Sergey Ablameyko, Yingke Xu</b> Particle tracking in super resolution cell video
	15:00-15:15	<b>B4.6</b>	<b>Henadzi Stantchik, Alexander Nedzved, Alexei Belotserkovsky</b> Shadow description for machine learning algorithms
	15:15-15:30	<b>B4.7</b>	<b>Alexander Eroma, Andrei Dukhounik, Oleg Aksenov, Yauheni Marushko</b> Telemetry Signal Pattern Detection based on Fuzzy Clustering
	15:30-15:45	<b>B4.8</b>	<b>V.V.Ryazanov</b> About data analysis using logical regularities of classes

**Session A5: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION (room 232)**

**Chairman:** Prof. Tatur M.

**Wednesday, May 22**

- |             |             |                                                                                                                  |
|-------------|-------------|------------------------------------------------------------------------------------------------------------------|
| 16:00-16:15 | <b>A5.1</b> | <b>V.G. Rodchenko</b> Knowledge Discovery Based on Cluster Structures                                            |
| 16:15-16:30 | <b>A5.2</b> | <b>Hanna Karkanitsa</b> Adaptive Decision Support Systems                                                        |
| 16:30-16:45 | <b>A5.3</b> | <b>Obraztsov Vladimir, Sun Moqi</b> Some Methodological Remarks on Pattern Recognition                           |
| 16:45-17:00 | <b>A5.4</b> | <b>V.I. Malugin, A.S. Makarevich</b> Regime-Switching Models: Classification Algorithms and Economic Application |

**Session B5: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 232)**

**Chairman:** Dr. Volarava N.

**Wednesday, May 22**

- |                     |             |                                                                                                                                             |
|---------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 16:00-16:15         | <b>B5.1</b> | <b>I.B.Gurevich, V.V.Yashina</b> On the Interpretability of Operations of Descriptive Image Algebras                                        |
| 16:15-16:30         | <b>B5.2</b> | <b>Y. Aslamov, A. Aslamov, I. Davydov, A. Tsurko</b> Sparse Wavelet Decomposition with Redundant Dictionary for Vibration Waveform Analysis |
| 16:30-16:45         | <b>B5.3</b> | <b>A.A. Voranau, Y.V. Harakhavik</b> Executable Files Features Extraction for Malware Detection Using Machine Learning                      |
| 16:45-17:00         | <b>B5.4</b> | <b>Yaraslau Bury, Dmitry Samal, Ihar Kukharchuk</b> Extrapolating training method for artificial neural networks                            |
| Poster presentation | <b>B5.5</b> | <b>Ekaterina Kurbatova, Veronika Lyalina</b> Shadow detection based on edge segmentation                                                    |

**Session A6: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION (room 229)**

**Chairman:** Prof. Nemirko A.

<b>Thursday, May 23</b>	09:00-09:15	<b>A6.1</b>	<b>Stanislav Sholtanyuk</b> Comparative analysis of neural networking and regression models for time series forecasting
	09:15-09:30	<b>A6.2</b>	<b>Volha Siniauskaya, Nikita Viarbitsky, Boris Zhalezka</b> Using of the Concepts of Algorithmic Marketing and Machine Learning in the Marketing Data Processing
	09:45-10:00	<b>A6.3</b>	<b>Pilipchuk Ludmila, Laguto Anna, Pilipchuk Andrei</b> Decomposing approach to multi-commodity network flow programming problems
	10:00-10:15	<b>A6.4</b>	<b>A. Kharin</b> Performance of sequential statistical tests for monitoring of random data
	10.15-10.30	<b>A6.5</b>	<b>V. Babenya, S. Ablameyko</b> Classification of benign and malignant tumors in histopathological images of breast cancer by using convolutional neural networks
	Poster presentation	<b>A6.6</b>	<b>Iu.V. Krak, V.S. Kasianiuk, H. I. Kudin, O.V. Barmak, E.O. Manziuk</b> Multivariate scaling of the characteristic features based on pseudo-inverse operations for recognition problems solving

**Session B6: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 232)**

**Chairman:** Prof. Sladjana Spasić

<b>Thursday, May 23</b>	09:00-09:15	<b>B6.1</b>	<b>Alexander Inyutin</b> Morphological Filters for Processing Printed Circuit Board Images
	09:15-09:30	<b>B6.2</b>	<b>Punko U. V., Volarava N. A., Prychodzko U. S.</b> Recognition of Reed – Sternberg cells in case of Hodgkin's lymphoma
	09:30-09:45	<b>B6.3</b>	<b>V. B. Surya Prasath, Dang N. H. Thanh, Le Thi Thanh, Nguyen Quang San, Dvoenko Sergey</b> Wireless Capsule Endoscopy Image Enhancement with a Human Visual System Consistent Model
	09:45-10:00	<b>B6.4</b>	<b>Dang N. H. Thanh, Le Thi Thanh, Dvoenko Sergey, V. B. Surya Prasath, Nguyen Quang San</b> Adaptive Thresholding Segmentation Method for Skin Lesion with Normalized Color Channels of NTSC and YCbCr
	10.00-10.15	<b>B6.5</b>	<b>Dzmitry Kamarosuki</b> Salt Deposits Image Segmentation using Fully Convolutional Neural Network

**Session A7: PATTERN RECOGNITION AND CLASSIFICATION, KNOWLEDGE-BASED EXPERT AND DECISION SUPPORT SYSTEMS, APPLICATION OF PATTERN RECOGNITION (room 229)**

**Chairman:** Dr. Lukashevich M.

<b>Thursday, May 23</b>	11:00-11:15	<b>A7.1</b>	<b>Andrey E. Gorodetskiy, Vugar G. Kurbanov, Irina L. Tarasova</b> Formation of Images Based on Sensory Data of Robots
	11:15-11:30	<b>A7.2</b>	<b>R.G. Mammadov, T.Ch. Aliyev</b> Analysis of changes in the moments of inertia of the plane figure during its rotation around three coordinates for recognition
	11:30-11:45	<b>A7.3</b>	<b>Shibzukhov Z.M., Dimitrichenko D.P., Kazakov M.A.</b> Neural Network Learning via Resistant Empirical Risk Minimization
	11:45-12:00	<b>A7.4</b>	<b>Masuma Mammadova, Zarifa Jabrayilova</b> Intelligent Demographic Forecasting System
	12:00-12:15	<b>A7.5</b>	<b>Merab Phkovelishvili, Nato Jorjiashvili, Natela Archvadze</b> Usage of heterogeneous data and other parallel data for prediction problems
	12:15-12:30	<b>A7.6</b>	<b>Y.Yu Kulkov, S.S. Sadykov, A.L. Zhiznyakov, D.G. Privezentsev</b> Recognition of Flat Objects Based on Probabilistic Features of Their Contours and Convex Hulls

**Session B7: IMAGE ANALYSIS, SIGNAL AND INFORMATION PROCESSING, 3D IMAGE PROCESSING AND MODELING, APPLICATION OF IMAGE ANALYSIS (room 232)**

**Chairman:** Dr. Prytkov V.

<b>Thursday, May 23</b>	11:00-11:15	<b>B7.1</b>	<b>Mustafayev Valeh Azad oglu, Salmanova Malahat Nasiman gizi</b> Modeling the dynamic interaction processes using fuzzy Petri nets of type Vf
	11:15-11:30	<b>B7.2</b>	<b>Dmitry Dol, Alexander Dol, Leonid Bessonov, Dmitry Ivanov, Vladislav Zolotov, Pavel Dmitriev, Alexander Beskrovny, Alexander Falkovich</b> A method of constructing an outline simple closed contour of the two-dimensional region
	11:30-11:45	<b>B7.3</b>	<b>R.Yu.Zakurdaev, I.E.Chernetskaya</b> Symmetrification of Electric Network with Random Parameters by Switching Replaces
	11:45-12:00	<b>B7.4</b>	<b>Seungho Choi, Jonghun Yoon</b> Crack inspection algorithm utilizing real-time image processing
	12:00-12:15	<b>B7.5</b>	<b>C K Roopa and B S Harish</b> A New way of classifying Cardiac Conduction using CNN and Neuromorphic Model

### Session and presentation codes

Session and presentation codes consist of three digits and identify all sessions uniquely: **Td.n**

**T** – stands for the conference section:

**P** – *Keynote Lections*

**A** – *Pattern Recognition and Classification&Knowledge - Based Expert and Decision Support System&Application of Pattern Recognition*

**B** – *Image Analysis&Signal and Information Processing&3D Image Processing and Modeling&Application of Image Analysis*

**W** – *Artificial Intelligence, Deep Learning and Robotics*

**d** - is the part of section: *1, 2 and so on.*

**n** - indicates the numeric order of a presentation within a session.

### Instruction to authors for oral presentation

Speakers are requested to meet their session chairman **10** minutes before the session starts. The session rooms will be indicated in the booklet, which is included in your conference documents. Oral presentations are limited to **15** minutes for regular papers and include a few minutes for discussion. Speakers are urged to adhere to this limit and follow instructions from their session chairmen.

**The lecturing halls will be equipped by a computer with projector.**

*Also, participants are invited to briefly present recent results not appearing in the official program.*

## General Information

### 1. PRIP History

The first International Conference «Pattern Recognition and Information Processing - PRIP». Started in 1991, PRIP Conference was held in Minsk. The main goal of the PRIP was to establish cooperation between Belarusian researches and International Community in the mention field.

Belarusian research in the area of pattern recognition and image processing was very strong in the former Soviet Union. It led that when in 1991 USSR Association of Pattern Recognition decided to organize First All-Union Conference «Pattern Recognition and Image Analysis» (ROAI in Russian), the proposal to host this conference was made to Belarusian scientists. Initiative group of Belarusian scientists was a core who organized the Conference. The host organization was Institute of Engineering Cybernetics, Belarusian Academy of Sciences. The Conference was held in October 1991. More than 200 researchers participated in the Conference. Four volumes of the Proceedings have been published.

Then, in December 1991, USSR stopped its existence. Such as all information about foreign events was passed in Moscow first, Belarusian scientists practically stopped receiving any information. It was one of the main motivation for our decision. Moreover, we have to say that most of the international activity in Pattern Recognition area has been organized by International Association for Pattern Recognition (IAPR). In 1988, USSR Association of pattern Recognition joined the IAPR. Then, in 1992, USSR Association became the Russian one, and Belarusian scientists had to think about their own steps. After the consultations with IAPR in autumn of 1992 it was decided to create Belarusian association. The meeting of Belarusian researchers working in image analysis and pattern recognition was held on December 14, 1992. At that meeting, Belarusian Association for Image Analysis and Recognition (BAIAR) was created. All necessary documents were prepared and BAIAR was officially registered as non-profit public organization in Belarus. In March 1993, IAPR considered all submitted documents and officially accepted BAIAR as a national representative of Belarus in IAPR.

In 1992--1993, economic situation in the former Soviet Union republics was very difficult. The financial difficulties led to reduction of a number of scientific events held annually in the USSR. Only the most known and well established conferences continue to be held but their attendance were very reduced. The attendance of international conferences in other countries was practically impossible due to financial difficulties. In spite of all these problems, BAIAR decided that the second PRIP must take place. BAIAR formulated the goal of the PRIP Conference as follows: to establish cooperation between Belarusian researchers and International Community in the field of Pattern Recognition and Image Analysis.

It was done all preparation, and in October 1993 the Conference was held. The host organization was Institute of Engineering Cybernetics. The attendance was not big due to deep crisis, so mainly scientists from Belarus attended the Conference. One volume of the Proceedings has been published. The official Conference language was Russian.

The strong attempt to increase level of the third PRIP Conference was made in 1995. There were made several important decisions by BAIAR, namely:

- (a) two conference languages: Russian and English.
- (b) to change the title of the Conference. It started to call «Pattern Recognition and Information Processing» in English. Changing the name was made to be separated from Russian ROAI Conference.
- (c) To start intensive cooperation with International Institutions.

Three volumes of Proceedings have been published: one volume was published in English in Poland, and two volumes were published in Russian in Minsk. The main organization was the Institute of Engineering Cybernetics.

It was decided at that Conference that three Belarusian organizations (Institute of Engineering Cybernetics of the Academy of Sciences, Belarusian State University and Belarusian State University of Informatics and Radioelectronics) would organize the Conference on a rotation base.

The fourth PRIP Conference. In 1997, the fourth PRIP Conference was held in Belarusian State University. In 1997 PRIP, for the first time, has obtained the IAPR Sponsorship that immediately attracted more scientists to

the Conference. There were about 100 participants, and 130 papers submitted to the PRIP'97. The Conference Proceedings (720 pages) have been published in two volumes (one volume in Poland, and the second one in Belarus).

The fifth PRIP Conference. In 1999, the Conference was held in Belarusian State University of Informatics and Radioelectronics. Papers from 22 countries have been presented at the Conference. It attracted more than 100 participants and 113 papers. The Proceedings (636 pages) have been published in two volumes (one volume in Poland, and the second one in Belarus).

The sixth PRIP Conference. For 2001, BAIAR decided that English would be the only Conference language. In 2001, the Institute of Engineering Cybernetics hosts the Conference. 74 papers from 22 countries have been accepted for the Conference. The Proceedings (about 600 pages) are published in two volumes (one volume in Poland, and the second one in Belarus).

The seventh — ninth PRIP Conferences (2003, 2005, 2007) were fully international conferences were English was the only language. Information about their participants can be found at the table below.

***PRIP 1991-2016: papers, countries, language and chairs***

<b>Table 1 PRIP 1991-2007: papers, countries, language and chairs</b>				
<b>PRIP</b>	<b># of papers</b>	<b># of countries</b>	<b>Working language</b>	<b>Chair</b>
1991	171	1	Russian	<b>Yu. Zhuravlev</b> ( <i>Computer Centre of the Soviet Academy of Sciences, Moscow, USSR</i> )
1993	85	4	Russian	<b>S. Ablameyko</b> ( <i>Institute of Engineering Cybernetics, National Academy of Sciences, Minsk, Belarus</i> )
1995	107	7	Russian, English	<b>S. Ablameyko</b> ( <i>Institute of Engineering Cybernetics, National Academy of Sciences, Minsk, Belarus</i> )
1997	130	16	English, Russian	<b>V. Krasnoproshin</b> ( <i>Belarusian State University, Minsk, Belarus</i> )
1999	113	22	English, Russian	<b>R. Sadykhov</b> ( <i>State University of Informatics and Radioelectronics, Minsk, Belarus</i> )
2001	74	22	English	<b>S. Ablameyko</b> ( <i>Institute of Engineering Cybernetics, National Academy of Sciences, Minsk, Belarus</i> )
2003	95	24	English	<b>V. Krasnoproshin</b> ( <i>Belarusian State University, Minsk, Belarus</i> )
2005	125	28	English	<b>R. Sadykhov</b> ( <i>State University of Informatics and Radioelectronics, Minsk, Belarus</i> )
2007	93	18	English	<b>A. Tuzikov</b> ( <i>United Institute of Informatics Problems, National Academy of Sciences, Minsk, Belarus</i> )
2009	126	30	English	<b>V. Krasnoproshin</b> ( <i>Belarusian State University, Minsk, Belarus</i> )
2011	115	26	English	<b>R. Sadykhov</b> ( <i>State University of Informatics and Radioelectronics, Minsk, Belarus</i> )
2014	106	10	English	<b>A. Tuzikov</b> ( <i>United Institute of Informatics Problems, National Academy of Sciences, Minsk, Belarus</i> )
2016	82	14	English	<b>V. Krasnoproshin</b> ( <i>Belarusian State University, Minsk, Belarus</i> )



## 2. PRIP Topics

The main topics of the PRIP Conference:

- Pattern Recognition
- Image Analysis
- Signal Processing
- Biometric Technologies
- Systems and Parallel Architectures for Signal and Image Processing
- Knowledge-Based Expert and Decision Support System
- Application of Pattern Recognition and Image Analysis
- 3D Image Processing and Modelling

In addition to these traditional topics, new emerged topics are being discussed at the PRIP. Some examples of new topics are: moving object recognition, watermarking, human identification approaches, fuzzy classifiers, and others.

## 3. PRIP Organizers

PRIP is a biannual event that is organised by:

- United Institute of Informatics Problems (former Institute of Engineering Cybernetics of BNAS);
- The Belarusian State University;
- The Belarusian State University of Informatics and Radioelectronics

PRIP is sponsored by the following bodies:

√ International Association for Pattern Recognition	<i>from 1997</i>
√ Belarusian Association for Image Analysis and Recognition (IAPR national member)	<i>from 1993</i>
√ IEE Belarus Centre	<i>from 1993</i>
√ IEEE Computer Society Belarus Sub-Committee	<i>from 1999</i>
√ INTAS	<i>2001, 2003</i>
√ Ministry of Education	<i>1997, 1999, 2003, 2005</i>
√ Belarusian Fond of Fundamental Research	<i>1999, 2001, 2003</i>
√ Belarusian Fond of Informatisation	<i>1995</i>

## 4. Belarusian Association for Image Analysis and Recognition

The Belarusian Association for Image Analysis and Recognition (BAIAR) was founded in December 1992. The main goals of the BAIAR:

- development of pattern recognition theory and applications in Belarus;
- exchange of information and experience between different scientific groups working in the field;
- organization of conferences, seminars, exhibitions;
- assistance to establish relations with foreign researchers;
- publication of Belarusian scientists results in the field of pattern recognition.

The number of researchers who work in pattern recognition field in Belarus is about 200.

### ***BAIAR Governing Board***

Prof. S.Ablameyko	President, United Institute of Informatics Problems, National Academy of Sciences, Minsk, Belarus
Prof. V.Krasnoproshin	Vice-President, The Belarusian State University, Minsk, Belarus
Prof. <b>R. Sadykhov</b>	Vice-President, State University of Informatics and Radioelectronics, Minsk, Belarus
Prof. A.Tuzikov	Belarus representative in IAPR Governing Board

Prof. V. Starovoitov	Secretary, United Institute of Informatics Problems, National Academy of Sciences, Minsk, Belarus
Ms. V. Konakh	Treasurer, The Belarusian State University, Belarus

## 5. Main Results and Future Prospects

Nowadays, the PRIP Conference became a well-known and established Conference. Information about PRIP is included in all major home pages on Computer vision and Pattern Recognition. The Conference proceedings are cited in INSPEC, the main world database of publications.

One of the principal outcome of the PRIP is the increasing of the presentation level of results by Belarusian scientists. It is one of our aims to give Belarusian researchers (especially young ones) a chance to present their results for international community. Thanks to PRIP, many researches got fellowships and contracts in Western Institutions. Among them many young and promising researches PRIP can be considered as a top form of our International collaboration because many published papers are results of joint projects, visiting programs with more ten countries.

BAIAR formulates the main goals for the future as follows:

- (a) to increase the level of papers presented at PRIP and make PRIP a top-level International Conference on Pattern Recognition and Image Analysis,
- (b) to continue our tradition to held PRIP in Minsk, the capital of Republic of Belarus, one of the beautiful European cities. BAIAR argues this decision that organizers have the opportunity to introduce unique Belarusian traditions, history and culture for International Community.

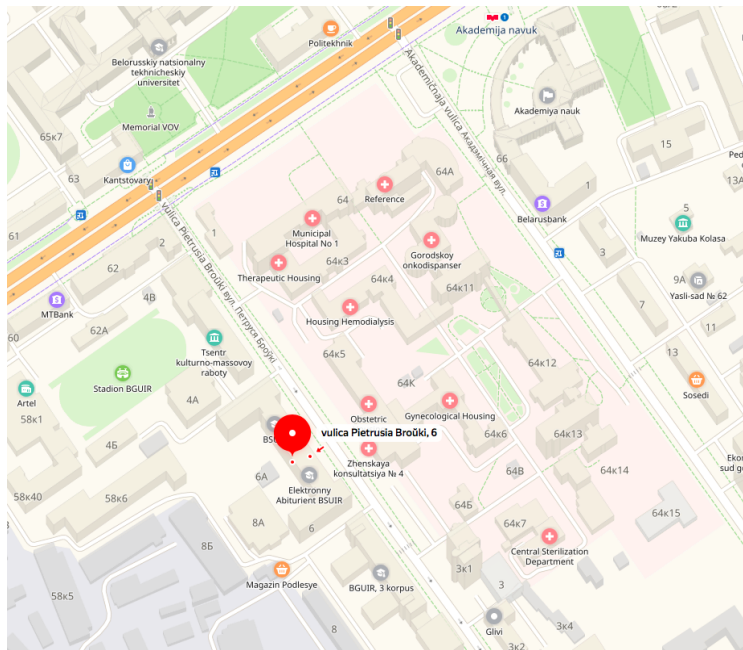
### CONFERENCE PLACE AND ADDRESSES:

Belarussian State University of Informatics and Radioelectronics, 6, P. Brovki str., Minsk, 220013, Belarus, Faculty of Computer Systems and Networks

E-mail: [prp2019@bsuir.by](mailto:prp2019@bsuir.by)

Phone: +375-17-2938663

PRIP'2019 web-site: <http://prp.bsuir.by>



### OFFICIAL LANGUAGES

The official languages of the conference are **English**. No translations will be available.

## **REGISTRATION**

The registration desk will be open in the Belarusian State University of Informatics and Radioelectronics, Monday, 21 May from 9:00 to 13:00 (room 229, Brovki str. 6).

## **HOTEL ACCOMMODATION**

An accommodation will be available in several hotels of Minsk close to Conference site. Room rates are from \$20 to \$70 for CIS participants and from \$20 to \$100 per night for others. The accommodation fee should be paid directly to a hotel.

## **PUBLIC TRANSPORT IN MINSK**

Public transport means in MINSK are buses, trams, trolley bus and underground. Tickets should be bought in advance at the underground stations or in kiosks.

## **SOCIAL EVENTS**

The following facultative social events are in the program of our Conference:

- Conference banquet,
- Visit to the theatre of opera and ballet,
- Sightseeing tour of Minsk.