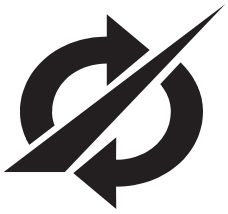
Ministry of Science and Higher Education of
the Russian Federation

ST. PETERSBURG INSTITUTE FOR INFORMATICS
AND AUTOMATION
OF THE RUSSIAN ACADEMY OF SCIENCES

Annual Report
2018

St. Petersburg, 2018



Ministry of Science and Higher Education of the Russian Federation

ST. PETERSBURG INSTITUTE FOR INFORMATICS AND AUTOMATION OF THE RUSSIAN ACADEMY OF SCIENCES

Annual Report 2018

St. Petersburg, 2018

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GENERAL INFORMATION

St. Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences was founded in 1978 according to the Decree of the Council of Ministers of the USSR dated 12/19/1977 and to the Decision of the Presidium of the USSR Academy of Sciences dated 01/19/1978 on the basis of the Computer Science Department of Ioffe Physical and Technical Institute of the USSR Academy of Sciences, and was assigned the name of Leningrad Research Computer Center (LRCC) of the USSR Academy of Sciences. Currently the Institute is the only one scientific institution in the North-West region of Russia that does basic research in informatics, information technologies, automation and robotics.

The Institute Director is Professor of the Russian Academy of Sciences Andrey L. Ronzhin appointed by order of the Ministry of Science and Higher Education of the Russian Federation No. 20-3/114 п-о of 07/18/ 2018 on the basis of the minutes of the SPIIRAS staff meeting of 03/23/2018. The Institute scientific leader is Honored Scientist of RF, Corresponding Member of the Russian Academy of Sciences Rafael M. Yusupov.

Based on LRCC one of the first global computer and information networks in the country the Academic Network "North-West" was created. In 1985 LRCC was transformed into Leningrad Institute for Informatics and Automation of the USSR Academy of Sciences.

By 1991 the Institute grew into a large scientific research organization, and its several departments gave rise to a new institution of the Russian Academy of Sciences: Center of Ecologic Security of the St. Petersburg Scientific Research Center of RAS. In 1992 when historic name of St. Petersburg was returned to the city the Institute in turn was renamed in St. Petersburg Institute for Informatics and Automation of RAS (SPIIRAS). According to the Decree of the Russian Federation Government dated 12/30/2013 No.2591-p the Institute was handed over to the Federal Agency for Scientific Organizations (FASO Russia).

By the Decree of the Council of Ministers of the Russian Federation dated 06/27/2018 No.1293-p the Institute was transferred to the management of the Ministry of Science and Higher Education of the Russian Federation (Minobrnauki of Russia).

The scientific and methodological guidance of the Institute research activity is provided by the Department of Nanotechnologies and Information Technologies of the Russian Academy of Sciences (Division of Information Technologies and Automation).

The Institute purpose and object of activities are to do basic, prediscovery and applied scientific, including those of interdisciplinary nature, research in informatics, automation and robotics, information and telecommunication technologies intended for solving actual scientific and engineering as well as social and economic problems in the following areas as specified by the Institute Charter:

- Fundamental basics of the informatics, informatization of the society and regions, origination and development of the national state and world intelligent information resources, social networks.
- Fundamental basics of the information security, cyber-security of the computer and telecommunication systems; counteractions against cyber-terrorism.
- Theoretic basics of constructing the technologies of Big Data analysis and processing intended for solving problems of regularities' detection, machine learning, estimation models' building (construction), prognostication, and decision-making over a finite set of alternatives.
- Fundamental basics of integration and self-organization in the existing and promising public as well as commercial information-management and telecommunication systems and networks at various stages of their life-cycles.
- Fundamental and technologic basics of building and implementation of intelligent integrated systems for decision-making support and multimodal users' interfaces in man-machine and robot complexes.
- Fundamental basics of complex modeling and automation at proactive monitoring and information processes control in complex (info-, bio-, eco-, cogni-, socio-, geo-, aerospace and transportation) systems.

Within the Government order approved in 2018 by the Ministry of Science and Higher Education of the Russian Federation the Institute worked on eight budget tasks:

- State and prospects of the information society development in Russia.
- Development of theoretic and technological basics of context managed recommending servers and intelligent personified assistive decisions for socio and cyber-physical systems.
- Methodology and technology of integrating the existing and prospective state and commercial information-management and telecommunication systems and networks at different stages of their life-cycle.
- Theoretic basics and algorithmic models of control and interaction of mobile heterogeneous robotic complexes and autonomic selforganizing systems.
- Fundamental basics of information security.

- Theoretic and technological basics of building collaborative robotic systems.
- Development of scalable stable algorithms of building big data semantic models and their application to solving applied tasks of clustering and machine learning.
- Theory and distributed algorithms for self-organization of agents' group behavior in an autonomous mission.

Research done on 65 projects included 5 projects on grants of the President of the Russian Federation, 7 – on the grants of the Russian Science Foundation, 44 – on the grants of the Russian Foundation for Basic Research; 1 – on the projects of Federal target programs and programs of the Russian ministries and services, 2 – on the project of MIK, 5 – on the projects of industrial enterprises, 9 – on the contracts with international partners.

The following organizations acted as customers: FSUE "Khrunichev State Research and Production Space Center"; LLC "Innovative Technologies"; Interparliamentary Assembly of Member Nations of the Commonwealth of Independent States (IPA CIS); FSUE "Arsenal Design Bureau"; LLC "Ravelin, LTd"; FSBEI HPE "Volga State University of Technology"; Ford Motor Company; Huawei Technologies Co; FESTO AG & Co.KG; National Electronic and Information Consortium (NP "NEICON"); FSUE "State Research Institute of Applied Problems (SRIAP)"; LLC "ASM Solutions"; JSC "SCB ORION"; LLC "Transoil".

In 2018 the Institute researchers have delivered 343 presentations at 117 conferences, published over 400 works including:

- 51 publications indexed in the WoS (out of them 30 articles – in the journals, including 4 articles in the Q1 journals);
- 149 publications indexed in the Scopus (out of them 40 articles – in the journals, including 6 articles in the Q1 journals);
- 229 publications indexed in the RSCI system (out of them 83 articles – in the journals from the current list of the Higher Attestation Commission (VAK).

Certain results of the Institute intellectual activity have been proved by obtaining one patent for invention and 27 certificates of state registration of computer programs.

During 2018 The Institute took part in the organizing of 7 international scientific conferences; proceedings of 4 conferences are indexed in the international data bases WoS/Scopus.

Currently the Institute staff consists of 220 members among them: 12 Honored Scientists of the Russian Federation, 1 Corresponding Member of RAS, 1 Professor of RAS, 41 full professors and 58 scientists bearing Ph. D. degrees. During their work in the Institute its 32 members are bestowed the state awards, 2 – the Honorary Badges of Inter-parliamentary Assembly of CIS Countries, 31 – are the winners of the Government of the Russian Federation and the St. Petersburg Government prizes.

SPIIRAS has the state accreditation of educational activities valid until 05/18/2022, and has a right to perform the educational activity in accordance with the license No. 2719 issued on 04/04/ 2012 by the Federal Service for Supervision in the Sphere of Education and Science in the following areas of post-graduate students' training:

– 09.06.01 Informatics and Computer Science

a) direction "System analysis, control and information processing" (05.13.01);

b) direction "Mathematic- and software of computers, computer complexes, and computer networks" (05.13.11);

– 10.06.01 Information Security

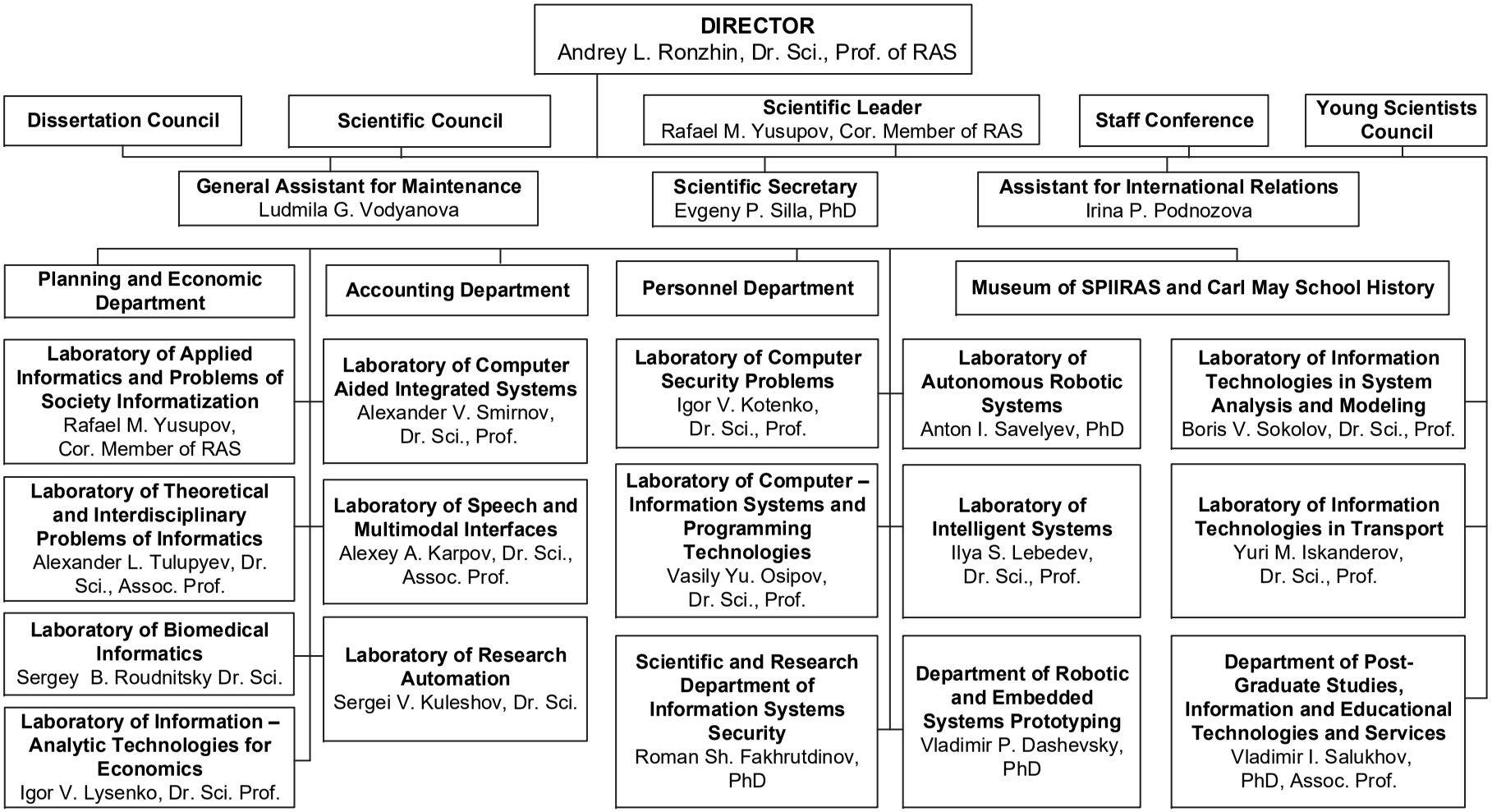
a) direction "Methods and systems for information security, information assurance" (05.13.19).

Currently, the SPIIRAS post-graduate course counts 35 post graduate students.

The Doctoral Dissertation Council functions in the following specialities: 05.13.01 "System analysis, control, and information processing"; 05.13.11 "Mathematic- and soft- ware of computers, computer complexes, and computer networks"; 05.13.19 "Methods and systems for information security, information assurance". In 2018 eight PhD and one doctoral theses in engineering have been defended.

The Museum of SPIIRAS and Carl May School is established and maintained at the Institute that currently occupies the building that used to be the above mentioned school premises. 40 members of the Russian Academy of Sciences and the Academy of Fine Arts, 156 Full Professors, two ministers, seven governors, four members of the State Council, twenty generals and admirals, three Heroes of Socialist Labor, two pilot-cosmonauts G.M. Grechko and A.I. Borisenko are among the C. May School alumni.

Using the Museum's factual database the Institute scientists run enlightenment and educational activities at the secondary and higher schools of St. Petersburg promoting, at that, the best scientific, pedagogic, cultural and ethical traditions of the Russian education and science.



SPIIRAS Economical Agencies

LLC «Strategic Information Technoligies» (SIT)	LLC «R&D Center of Cryptography SPIIRAS» (R&DCC SPIIRAS)	LLC «R&D Center for Innovative Space Technologies SPIIRAS» (R&DCIST SPIIRAS)

Organization of Conferences, Participation in Exhibitions

- 26-th Euromicro International Conference on Parallel, Distributed, and Network-Based Processing (PDP-2018), www.pdp2018.org, March 21-23, 2018, Cambridge University, Cambridge (UK). (*Kotenko I.V.*).
- XIII International Conference on Electromechanics and Robotic "Zavalishin's Readings" (ER(ZR)-2018). http://suai.edu.ru/conference/zav-read. April 18-21, 2018, St. Petersburg (Russia). (*Ronzhin A.L.*).
- International Summer School on the EC program ERASMUS: InMotion – Innovative teaching and learning strategies in open modeling and simulation environment for student-centered engineering education 2018, http://inmotion-project.net, June 26-July 08, 2018, St. Petersburg (Russia). *(Sokolov B.V.).*
- 2018 IEEE Northwest Russia Conference on Mathematical Methods in Engineering and Technology (MMET NW 2018), http://mmtt.sstu.ru. September 10-14, 2018, St. Petersburg (Russia). *(Sokolov B.V.).*
- 20-th International Conference "Speech and Computer" SPECOM-2018. http://specom.nw.ru, September 18-22, 2018, Leipzig (Germany). (*Karpov A.A.*).
- 3-rd International Conference "Interactive Collaborative Robotics" ICR-2018. http://specom.nw.ru/icr2018.html, September 18-22, 2018, Leipzig (Germany). (*Ronzhin A.L.*).
- IV Interregional Theoretical and Practical Conference: "Advanced Lines of Development in National Information Technologies". September 18-22, 2018, Sevastopol (Crimea). (*Yusupov R.M.*).
- 10-th Conference "Information Technologies in Control (ITC-2018) in the framework of 11 Russian Multiconference on Control Problems (RMCCP-2018)", http://www.elektropribor.spb.ru/nauchnaya-deyatelnost/konferentsii/78/. State Research Center of the Russian Federation, JSC "Concern "CRI "Electropribor". October 2-7, 2018, St. Petersburg (Russia). (*Yusupov R.M.*).
- XVI St. Petersburg International Conference "Regional Informatics (RI-2018) ", http://spoisu.ru/conf/ri2018, October 24-26, 2018, St. Petersburg (Russia). (*Yusupov R.M.*).

- 4-th International Scientific School "Incident Management and Countering Targeted Cyber-Physical Attacks in Distributed Large-Scale Critical Systems" (IM&CTCPA 2018), http://www.comsec.spb.ru/en/imctcpa, November 21-23, 2018, St. Petersburg (Russia). (*Kotenko I.V.*).
- 4-th International Scientific Conference "Technology Prospect within the Eurasian Space: New Markets and Points of Economic Growth". December 13-15, 2018, St. Petersburg (Russia). (*Kuleshov S.V.).*

Conferences to be Organized by SPIIRAS in 2019

- 8-th Interdisciplinary Workshop "Russian Speech Analysis" AP3-2019, http://phonetics.spbu.ru/?q=seminar-ar3, January 18, 2019, St. Petersburg (Russia). (articles are indexed in the RSCI system).
- XIV International Conference on Electromechanics and Robotic "Zavalishin's Readings" (ER(ZR)-2018). http://suai.edu.ru/conference/zav-read, April 17-20, 2019, Kursk (Russia). (articles are indexed in the WoS, Scopus, RSCI systems).
- V All-Russian Theoretical and Practical Workshop "Unmanned Vehicles Artificial Intelligence Elements" (UV-AI-2019), http://2019.ai-uv.ru/. May 22-24, 2019. St. Petersburg (Russia), (*Ronzhin A.L.*). (articles are indexed in the RSCI system).
- 5-th International Theoretical and Practical Conference "Simulation and Complex Modeling in Marine Technology and Maritime Transport Systems" (SCM MTMTS-2019), http://simulation.su/static/ru-ikm-mtmts-2019.html. St. Petersburg (Russia), July 10, 2019. (*Sokolov B.V.*). (articles are indexed in the RSCI system).
- 21-th International Conference "Speech and Computer" SPECOM-2019. http://specom.nw.ru/. Istanbul (Turkey), August 20-25, 2019. (*Ronzhin A.L.*). (Proceedings in Springer, LNCS: articles are indexed in the WoS, Scopus, RSCI systems).
- 4-th International Conference "Interactive Collaborative Robotics" ICR-2019. http://specom.nw.ru/icr2018.html. Istanbul (Turkey), August 20-25, 2019. (*Karpov, A.A.*). (Proceedings in Springer, LNCS: articles are indexed in the WoS, Scopus, RSCI systems).
- V Interregional Theoretical and Practical Conference: "Advanced Lines of Development in National Information Technologies",

http://pnroit.code-bit.com. Sevastopol (Russia), September 18-22, 2019. (*Yusupov R.M.*)

- 13-th International Symposium on Intelligent Distributed Computing (IDC 2019), https://idc2019.ru/index.html. St. Petersburg (Russia), October 7-9, 2019. (*Kotenko I.V.*). (Proceedings in Springer, Studies in Computational Intelligence: articles are indexed in the WoS, Scopus, RSCI systems)
- 9-th All-Russian Theoretical and Practical Conference "Simulation. The Theory and Practice" IMMOD-2019, http://simulation.su/static/ru-immod-2019.html. St. Petersburg (Russia), October 16-18, 2019. *(Sokolov B.V.).* (articles are indexed in the RSCI system).
- XI St. Petersburg Interregional Conference "Information Security of the Russian Regions (ISRR-2017) ", http://www.spoisu.ru/conf/ibrr2019. St. Petersburg (Russia), October 23-25, 2019 *(Yusupov R.M.).*
- 5-th International Scientific School "Incident Management and Countering Targeted Cyber-Physical Attacks in Distributed Large-Scale Critical Systems" (IM&CTCPA 2019), http://www.comsec.spb.ru/en/conferences. St. Petersburg (Russia), October 28-30, 2019. (*Kotenko, I.V.*) Publication in "Systems of Control, Communication and Security" (articles are indexed in the Scopus, RSCI systems).

International Cooperation

In 2018 SPIIRAS continued interactions and international scientific cooperation through international contracts, agreements, grants, has further proceeded with the established R&D contacts, information exchange; a number of international scientific centers SPIIRAS keeps in touch with accepted the Institute scientists delegated to participate in joint projects, conferences and other meetings outside Russia. In addition SPIIRAS put a sincere effort in receiving international scholars, professionals and delegations on the Institute premises; international conferences were organized and held. The following professional contacts are worth mentioning and include:

- National Academy of Sciences of Belarus, the Belarusian State University, the Academy of Belarus Ministry of Domestic Affairs,

Institute of National Security of Belarus, The Belarusian State University of Informatics and Radioelectronics (Belarus);
- Institute of Information and Communication Technologies, Laboratory of Telematics, Space Research and Technology Institute of the Bulgarian Academy of Sciences (Bulgaria);
- University of West Bohemia, Technical University of Ostrava (Czechia);
- University of Berlin, University of Bremen (EC Program: ERASMUS), FESTO AG & Co.KG; Leipzig University of Telecommunications, Fraunhofer Institute, University of Rostock; Ulm University (Germany);
- Cyprus University of Technology (Greece);
- University of Helsinki (Finland);
- University Paris VII, Paul Sabatier University (Toulouse III) (France);
- National Academy of Sciences of the Republic of Kazakhstan; The L. N. Gumilyov Eurasian National University (Kazakhstan);
- Riga Technical University (Latvia);
- Institute of Mathematics and Informatics of the Academy of Sciences of Moldova (Moldova);
- Poznań Economics University (Poland);
- Faculty of Technical Sciences at the University of Novi Sad (Serbia);
- The University of Ljubljana (Slovenia);
- National University of Distance Education (Spain);
- Jonkoping University (Sweden);
- Bosphorus University, Erzurum Technical University (Turkey);
- University of Hertfordshire (UK);
- Yale University, University of Northern Iowa (USA);
- Academy of Sciences of Uzbekistan (Uzbekistan);
- Research institutions of Vietnam Academy of Science and Technology (Vietnam),

as well as a number of EC institutions participating in programs like TEMPUS and ERASMUS.

The research works were done on the contracts and orders by Ford Motor Company (USA); the Secretariat of the CIS Interparliamentary Assembly; the EC Program TEMPUS; University of West Bohemia in Plzen (Czechia); Leipzig University of Telecommunications, FESTO AG & Co.KG.(Germany); Erzurum Technical University (Turkey); Faculty of

Technical Sciences at The University of Novi Sad (Serbia); Vietnam Academy of Science and Technology (Vietnam); Huawei Technologies, Co., Ltd. (China).

Intensive scientific exchange totally comprised 47 business trips of 28 SPIIRAS scientists: 47 trips to International Conferences, Congresses, Workshops and Exhibitions and 10 had been made to the meetings related to the current research projects.

In turn SPIIRAS received quite a few international scholars, for instance, directly at the Institute 97 scientists and doctoral students from 22 countries had been received including one – from Austria; two – from Belarus; three – from Bulgaria; one – from Venezuela; ten – from Vietnam, nineteen – from Germany, two – from Egypt, seven – from Spain; five - from Kazakhstan, one- from China, twenty five – from Malaysia; two – from Mexico; two – from Myanmar; one – from Portugal; one – from Serbia; five – from Slovenia; one – from Taiwan; one – from Turkey; one – from Uzbekistan; two – from France; four – from Czechia; one – from Sweden.

Links with the Higher School and Branch Science

The Institute administers five basic departments in the leading St. Petersburg universities as well as six joint research laboratories.

Basic Departments:

- "Research Automation" at The St. Petersburg State Electrical Engineering University, established in 1979.
- "Distributed Intelligent Automation Systems" at The St. Petersburg State Polytechnic University, established in 2009.
- "Information Security" at The St. Petersburg State University of Transport Communications, established in 2010.
- "Information Systems and Technologies in Economics" at The St. Petersburg University of Economics, established in 2017.
- "Information Technologies in Logistics" at The St. Petersburg School of Economics and Management NRU HSE, established in 2017.

Research Laboratories:

- R&D Laboratory of Information Technologies in Transport Systems, Power Engineering, Automation and Modeling Systems at Mari State Technical University, established in 2012.

- International Research Laboratory "Intelligent Proactive Protected Technologies and Systems" at ITMO University, established in 2014.
- International Research Laboratory "Intelligent Technologies for SocioCyberPhysical Systems" at ITMO University, established in 2014.
- International Research Laboratory "Information Security of Cyber Physical Systems" at ITMO University, established in 2017.
- Virtual Joint Laboratory at The Military Teaching and Research Center of the RF Air Force "Military Air Force Academy", Voronezh, established in 2015.
- Joint Research Laboratory for Robotic Systems "Design and Programming at St. Petersburg State University of Aerospace Instrumentation, established in 2016".

The Institute also has cooperation with a number of universities in St. Petersburg, Moscow and other cities: Russian State Pedagogical University, Moscow State University, Moscow Engineering and Physical Institute, Moscow Physical and Technical Institute, Moscow State Technical University, Astrakhan State University, Petrozavodsk State University, South Federal University, Northern Caucasian State Technological University, Naval Academy named after N.G. Kuznetsov, Mozhaysky Military Space Academy and other.

SPIIRAS Scholars deliver lectures for the students of the basic departments and other higher schools in the advanced areas of informatics, information and telecommunication technologies, engage students in research activities, encourage the most capable ones to joint SPIIRAS post-graduate course, teach courses at SPIIRAS centers: Research and Education Center of Computer Studies (RECCS); Research and Education Center "Technologies of Intelligent Space"; Innovation and Education Center of Space Services; Educational Center for Training Certified Specialists in Processing Data of the Earth Remote Sensing.

The city seminar "Informatics and Computer Technologies" (the seminar leader is Prof. Baranov S. N., doctor of physics and mathematics) has been transformed in the continuing city seminar "Informatics and Automation" (the seminar leader is Prof. Yusupov R. M., Corresponding Member of RAS) at the Scientific Council for Informatization of St. Petersburg. The seminar on the one hand is aimed at maintaining professional exchange of latest scientific developments in informatics and computer technologies at the city level and on the other hand at involving

young researchers in submitting presentations on their own in front of competent scientists. Thus, the seminar contributes to integration of St. Petersburg higher school and academic science, clearly recognizes talented young people and fosters their professional growth.

Major Publications

Monographs

- Abramov M.V., Tulupyeva T.V., Tulupyev A.L. Social Engineering Attacks: Social Networking and Users' Protection Evaluation: St. Petersburg: RIC GUAP/EPC SUAI, 2018.
- Vus M.A. ICT regulation in the post-Soviet space/Introduction by Yusupov, R. M., Corresponding Member of RAS. St. Petersburg: Publisher "Legal Center". Publishing Series "Right of the XXI century". 2018. ISBN 978-5-94201-000-0.
- Ignatjev M.B., Marley V.E., Mikhailov V.V., Spesivtsev A.V. Modeling of Weakly Formalized Systems Based on Explicit and Implicit Expert Knowledge. St. Petersburg: POLYTEKH-PRESS. 2018. 501 p.
- Mikoni S.B., Sokolov B.V., Yusupov R.M. Qualimetry of Models and Polymodel Complexes. M. Nauka. 2018.
- Osipov V.Yu., Kalmatsky A., Vodyakho A.I., Zhukova N.A., Glebovsky P.A. Cognitive Monitoring of Telecommunication Networks. Monoghraph. St. Petersburg: Publisher ETU "LETI". 2018. 204 p.

Conference Proceedings

- Proceedings of the 20th International Conference on Speech and Computer SPECOM-2018, Leipzig, Germany, Springer, LNAI 11096, 2018, https://link.springer.com/book/10.1007/978-3-319-99579-3.
- Proceedings of the 3rd International Conference on Interactive Collaborative Robotics ICR-2018, Leipzig, Germany, Springer, LNAI, 11097, 2018, https://link.springer.com/book/10.1007/978-3-319-99582-3.
- Proceedings of 26-th Euromicro International Conference on Parallel, Distributed, and Network-Based Processing (PDP 2018), https://www.computer.org/csdl/proceedings/pdp/2018/4975/00/index.html.
- Proceedings of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" – 2018.

St. Petersburg, Russia, April 18-21, 2018. A. Ronzhin and V. Shishlakov (Eds.), MATEC Web of Conferences, Vol. 161, 2018, https://www.matec-conferences.org/articles/matecconf/abs/2018/20.

- Regional Informatics and Information Security. Proceedings. Vol. 5 / SPOISU. SPb., 2018 549 p. ISBN 978–5–907050–46–4, http://www.spoisu.ru/files/riib/riib_5_2018.pdf.
- Proceedings of the Conference "Information Technologies in Control". (ITU-2018). Spb: JSC "Concern Central Scientific and Research Institute Elektropribor". 2018. 628 p. ISBN 978-5-91995-7.

Scientific Journal "SPIIRAS Proceedings"

Print Media and Electronic Media – "SPIIRAS Proceedings" Journal has been published since 2002, in VAC list since 2011, in the international data base SCOPUS since 2016 (CiteScoreTracker 2017: 0,58, SJR:0,16). ISSN: 2078-9181 E-ISSN: 2078-9599. Subscription Index (Catalogue "Post of Russia"): П5513. Languages: Russian, English. Publication Frequency: 6 issues a year.

Starting December 2015 the Journal publishes papers on two groups of specialities: 05.13.00 Informatics, Computer Science and Control; 01.01.00 Mathematics. The Journal subject with regard to AJSC Scopus: Computer Science. The journal main headings:

- Mathematical Modeling and Applied Mathematics.
- Artificial Intelligence, Data and Knowledge Engineering.
- Digital Information and Telecommunication Technologies.
- Robotics, Automation and Control Systems.
- Information Security.

Full-text papers' versions are available on the journal site: http://proceedings.spiiras.nw.ru/ .

Major awards

Yusupov R.M. – Honorary Badge of the IPA CIS "For Merit in the Field of Press and Information"/ Resolution of the IPA CIS of April 123, 2018, No. 24: "For considerable contribution to forming and developing the common information space of the CIS member States, implementation of cooperation ideas in the field of press and information".

Vus M.A. – Honorary Badge of the IPA CIS "For Merit in the Field of Press and Information"/ Resolution of the IPA CIS of April 123, 2018, No. 24: "For considerable contribution to forming and developing the common information space of the CIS member States, implementation of cooperation ideas in the field of press and information".

Kipyatkova I.S. – Prize of the St. Petersburg Government and St. Petersburg Scientific Center of the Russian Academy of Sciences for outstanding scientific results in science and technology. Nomination: natural and technical sciences – the prize named after L. Euler (for young scientists under 35).

Vorobjev V.I. – Honorary Certificate, FASO Russia. Order No. 12п of April 27, 2018.

Podnozova I.P. – Gratitude, FASO Russia. Order No. 12п of April 27, 2018.

Abramov M.V. – Winner of the competition for the Russian Federation President's scholarship for young scientists and postgraduate students carrying out advanced research and developments.

Doynikova E.V. – Winner of the competition for the Russian Federation President's scholarship for young scientists and postgraduate students carrying out advanced research and developments.

Pavlyuk N.A. – Winner of a competitive selection for the RF Government Scholarship in priority areas of training for 2018/2019 academic year.

Azarov A.A. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Budkov V.Yu. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Desnitsky V.A. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Doynikova E.V. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Kipyatkova I.S. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Novikova E.S. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young candidates of sciences at higher schools, branch and academic institutions located in St. Petersburg.

Abramov M.V. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young scientists at higher schools, branch and academic institutions located in St. Petersburg.

Verkholyak O.V. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young scientists at higher schools, branch and academic institutions located in St. Petersburg.

Vitkova L.A. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for young scientists at higher schools, branch and academic institutions located in St. Petersburg.

Pavlyuk N.A. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for post-graduate students at higher schools, branch and academic institutions located in St. Petersburg.

Stolyarova V.F. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for post-graduate students at higher schools, branch and academic institutions located in St. Petersburg.

Rudavin N.N. – Grant- subsidy from the Committee on Science and Higher Education, SPb Government, for students at higher schools, branch and academic institutions located in St. Petersburg.

Kashevnik A.M. – Winner’s Diploma of the All-Russian contest for the best science book of 2017 "Novel Design and the Applications of Smart-M3 Platform in the Internet of Things: Emerging Research and Opportunities".

MAIN RESEARCH RESULTS OF SPIIRAS LABORATORIES

Laboratory of Applied Informatics and Problems of Society Informatization

Head of laboratory: Corresponding Member of the RAS, Honored Scientist of the Russian Federation, Winner of the RF Government Prize, Honorary Academician of Tatarstan Academy of Sciences, Emeritus Professor of the Military Space Academy named after A.F. Mozhaisky, Honorary Doctor of Petrozavodsk State University and St. Petersburg University of Management and Economics, Head of basic department at SPb Electrotechnical University "LETI'" Professor of SPbSU, SPIIRAS Scientific Adviser, Dr. Tech. Sci., Professor Rafael M. Yusupov – scientific fundamentals of computer science, Informatization problems of society and regions, Information and National Security, Model's qualimetry, yusupov@iias.spb.su.

Laboratory staff: 14 members.

Research activities – scientific foundations of Computer Science, problems of development of information society in the world, countries and regions, Information and National security, immunocomputing, syntax-directed data processing, mathematical modelling and simulation of complex systems and processes, methods for the synthesis of optimal control, integrated simulation of the radiation fields of natural environments in the problems Earth remote sensing, space geoinformatics.

Research fellows and brief information of the research-work direction

Chief researcher PhD (Dr. of Phys.-Math. Sci.), Professor, Honored Scientist of the Russian Federation, Winner of the RF Government Prize – Oleg I. Smokty – remote sensing of the environment from space, information providing and technology connected with the modeling for radiation fields of systems "object-environment", radiative transfer theory, space geoinformatics, lai@iias.spb.su.

Leading researcher PhD (Dr. Phys.- Math.Sci.) – Alexander O. Tarakanov – basic research and mathematical modeling of the principles of information processing by proteins, immunocomputing. Sea surface temperature and global modeling, and forecast, tar@iias.spb.su.

Leading researcher PhD (Dr. of Tech. Sci.), Professor – Sergey A. Soldatenko – mathematical modeling of geophysical processes, the sensitivity of deterministic and stochastic dynamic systems, information support of modeling and forecasting processes occurring in the Earth system, variational methods of assimilation of information, the theory of radiative transfer, remote sensing of the Earth from space, technology and information support of modeling the natural radiation field systems, space geoinformatics, soldatenko@iias.spb.su.

Leading researcher PhD (Dr. of Tech. Sci.) – Leonid N. Sorokin – problems of the impact of environmental factors on information systems, ensuring reliability of spacecraft electronic equipment under the influence of space ionizing radiation, designing of the estimation of the methods, modelling and research of the radio receiver resistance to high-intensity electromagnetic influence and protection in emergency situations, sorokinln@mail.ru.

Senior researcher PhD (Cand. of Tech. Sci.) two times Winner of the RF Government Prize – Mikhail A. Vus – information security challenges, Information and National Security, norms of the low in informatics, legal aspects of the international relations and security, mixail-vys@yandex.ru.

Senior researcher PhD (Cand. of Tech. Sci.) – Vladislav S. Blum – mathematical modeling and analysis of primary medical information flows, as well as problems of security for Public Health, vlad@blum.spb.su, lai_spiiras@iias.spb.su.

Senior researcher Ph.D Cand. Tech. Sci. – Vladimir P. Ivanov – mathematical modeling of complex processes, information security, optimal control of systems, application of the envelope method to applied problems of aircraft control, game control problems, layout of an automation device on electrically controlled polymer composites basis, vpivanov.spb.su@gmail.com.

Senior researcher PhD (Cand. of Tech. Sci.) – Andrey Yu. Perevarykha – modeling of extreme conditions in the dynamics of biosystems and analysis of the development and passage of invasive processes, temp_elf@mail.ru

Senior researcher PhD (Cand. of Tech. Sci.) – Lyudmila N. Fedorchenko – syntax-directed data processing; methods and algorithms of grammar regularization; software development supporting technology of syntactically oriented data processing, lnf@iias.spb.su.

Senior researcher PhD (Cand. of Tech. Sci.) Mikhail V. Kharinov – the model of detection of images of objects in terms of a network formed by dynamic Sleator-Tarjan trees and address cycles; the development of the apparatus of hypercomplex numbers (quaternions and octaves) for the application in science and technology, khar@iias.spb.su,

Junior researcher MS, SPIIRAS post-graduate study alumni Igor G. Khanykov – the development of image segmentation algorithms with a hierarchical data structure, igorioniak@mail.ru, igk@iias.spb.su.

Junior researcher Alexey S. Usychenko – modeling the effects of electromagnetic pulses (EMP) on radio engineering, electromechanical and digital electronic systems, developing methods for estimating the energy characteristics of EMP emitters. Spectral analysis and digital signal processing, a.usychenko@gmail.com.

Thesis defense

Junior researcher Khanykov I.G. has successfully graduated the postgraduate studies of SPIIRAS, defended the graduate project entitled "The isolation of the composite and color-homogeneous objects in fill-HD images" for the professional qualification. By the decision of the Examination Commission dated on July 03, 2018 Khanykov I.G. is qualified as "Researcher. Instructor-Research".

Post-graduate students

Buslavskiy A.N. The development of data structure for the high-speed object detection in various color images. Specialty 05.13.11. Research advisor – Kharinov M.V.

Khanykov I.G. The development of methods of isolation of composite and homogenous objects on full-HD images. Specialty 05.13.11. Research advisor – Kharinov M.V.

Grants and projects

Yusupov R.M. – Project with the IPA CIS Secretariat of recommendations "On the ethics of nanotechnologies".

Yusupov R.M. – Project of the IPA CIS Secretariat of development on a model state law "On the Development of the Information Society".

University courses

SPbSUAI: Institute of Technologies of Entrepreneurship, the Chair of Information Technologies of Entrepreneurship: lectures "Intellectual data

analysis", "Linguistic support of information systems", "Information-retrieval systems". Workshop on the course of lectures – Blum V.S.

SPbSUAI: courses of lectures: "Information Technologies in Medicine" – Ivanov V.P.

SPbSU: Faculty of Medicine, chair of Medical and Special Knowledge: "Life Safety" – Sorokin L.N.

SPbSU: Math.-Mech. Faculty, Department of Computer Science. Lectures of Assistant Professor: "Theory of Formal languages and Translations" and practical lessons on the course of lectures – Fedorchenko L.N.

Scientific and organizational activities

The 10th Conference "Information Technologies in Control (ITU-2018)" within the framework of the 11th Russian Multiconference on Control Issues (RMPU-2018), Chairman of the Organizing Committee of the Conference – R.M. Yusupov, Scientific Secretary of the Conference – Fedorchenko L.N.

XVI St. Petersburg International Conference "Regional Informatics (RI-2018)", Chairman of the Organizing Committee of the Conference – Yusupov R.M.

IV Interregional Scientific and Practical Conference "Perspective Directions for the Development of Domestic Information Technologies" – Yusupov R.M.

Conferences

All-Russian Scientific and Practical Conference "Information and communication model of interaction between the state and society", March 29, 2018, St. Petersburg, Russia – Vus M.A., Yusupov R.M.

VIII International Scientific and Practical Conference "Law and Information: Questions of Theory and Practice", April 20, 2018, St. Petersburg, Russia – Vus. M.A.

Expert Advisory Council of the IPA CIS-RCC, May 31, 2018, St. Petersburg, Russia – Vus M.A.

The 37th All-Russian Conference with International Participation "School Informatics and Problems of Sustainable Development", April 19-25, 2018, St. Petersburg, Russia – Vus M.A.

The Interdepartmental Scientific and Practical Conference "Model Legislation of the CSTO Member States and the CIS Member States as a

Tool for Ensuring Security and Countering New Challenges and Threats", November 16, 2018, Moscow, Russia – Vus M.A.

The International Scientific and Practical Conference "The Information Revolution and the Challenges of the New Era — Incentives for the Formation of Modern Approaches to Information Security", November 29-30, 2018, Minsk, Republic of Belarus – Vus M.A.

Conference: "Automated Information Systems in Medicine", April 27, 2018, St. Petersburg, Russia – Blum. V.S.

Conference "IT in Healthcare: Development Continues", June 5, 2018, Moscow, Russia – Blum V.S.

XI All-Russian Scientific and Practical Conference "Innovative technologies and technical means for special purposes", November 15-16, 2018, St. Petersburg, Russia – Ivanov V.P.

XXII Russian Conference "Theoretical bases and generation of numerical algorithms of solving mathematical physics problems" devoted to K.I. Babenko, September 3-8, 2018, Novosibirsk, Russia – Perevaryukha A.Yu.

International workshop on "Dynamical systems in science and technologies" (DSST–2018). September 17-21, 2018, Alushta, Crimea, Russia – Perevaryukha A.Yu.

XIV Vladikavkaz Youth Mathematical School. July 16-21, 2018, Village Tsey, Russia – Perevarykha A.Yu.

IX Youth Ecological Conference "Northern Palmira", November 22-23, 2018, St. Petersburg, Russia – Perevaryukha A.Yu.

International Conference "Dynamical systems: stability, control, optimization" (DSSCO18), dedicated to the 100th anniversary of Ye.A. Barbashin, September 24-29, 2018, Minsk, Republic of Belarus – Vus M.A.

World Summit on Climate Change and Global Warming, Expert Opinion on Environmental Biology, June 21-22, 2018, Paris, France – Soldatenko S.A., Yusupov R.M.

AMOS-ICSHMO 2018 Conference, February 5-9, 2018, Sydney, Australia– Soldatenko S.A.

The 11th International Conference on Security of Information and Networks (SIN-18), September 10-12, 2018, Cardiff, UK – Fedorchenko L.N.

The 10th Conference on Information Technologies in Control (ITU-2018) within the framework of the 11th Russian Multiconference on Control Problems (RMKPU–2018), October 2-4, 2018, St. Petersburg, Russia –

Yusupov R.M., Blum V.S., Ivanov V.P., Fedorchenko L.N., Kharinov M.V., Khanykov I.G.

International Conference "Polynomial Computer Algebra'2018", 16-21 April, 2018, St. Petersburg, Russia – Fedorchenko L.N.

XVI St. Petersburg International Conference "Regional Informatics" and Interregional Conference "Information Security of Russian Regions", St. Petersburg, October 24-26, 2018 – Yusupov R.M., Blum V.S., Vus M.A., Ivanov V.P., Perevarykha A.Yu., Sorokin L.N., Fedorchenko L.N., Usychenko A.S., Kharinov M.V., Khanykov I.G.

International Russian IEEE Conference "Automation" ("RusAutoCon"), 9-16 September, 2018, Sochi, Russia – Kharinov, M.V., Buslavsky, A.N.

The 28th International Conference on Computer Graphics and Computer Vision "GraphicCon 2018", September 24-27, 2018, Tomsk, Russia – Kharinov M.V.

XIII International Conference "Applied Optics-2018" ("PO-2018"), December 18-21, 2018, St. Petersburg, Russia – Kharinov M.V, Khanykov I.G.

XXVII International Scientific and Practical Workshop "The Modern Technologies in the Tasks of Control, Automation and Information Processing", 14-20 September, 2018. Alushta, Russia – Khanykov I.G.

Membership in Russian and international organizations, editorial boards of journals, etc.

Yusupov R.M. – Member of the Scientific Council of the Russian Academy of Sciences "Scientific Telecommunications and Information Infrastructure"; Member of the Scientific Council of the Russian Academy of Sciences on the Theory of Controlled Processes and Automation; Honorary Professor of the Military Space Academy named after A.F. Mozhaysky; Member of the Russian National Committee on Industrial and Applied Mathematics; Member of the Council of the Russian Academy of Sciences "High-performance computing systems, scientific telecommunications and information infrastructure; Member of the Presidium of the Saint Petersburg Scientific Center of RAS; Member of the editorial committee of the international journal "Current problems of aviation and aerospace systems"; Member of the Editorial Boards of Magazines "Warfare, Politics, Conversion", "Computer Science and its Applications", "Telecommunications", "Information Control Systems", "Mechatronics, Automation and Control",

International Magazine "Problems of Control and Computer Science", Journal of Intelligent Control Neurocomputing and Fuzzy Logic (USA), "Cybernetics and information technologies Bulgarian Academy of Sciences", "Control Systems and Machines" (Kiev, Ukraine), "Information and Space", Journal of the University Water Communications, etc.

Smokty O.I. – Member of the International Astronautical Federation (IAF), Member of the Russian Geographical Society (RGO), full-Member of the International Academy of Astronautics (IAA).

Vus M.A. – Deputy Chairman of the Organizing Committee of the Annual All-Russian Conference with International Participation "School Informatics and the Problems of Sustainable Development"; Member of the Editorial Board of the magazine "Informatization and Communication".

Ivanov V.P. – Member of the Section of the History of Aviation and Cosmonautics of St. Petersburg Branch of the Russian National Committee of the History and Philosophy of Science and Technology at the Presidium of the Russian Academy of Sciences; Member of the Writers' Union of Russia.

Sorokin L.N. – Member of the Editorial Board of the journal "Applied Problems of Safety of Technical and Biotechnical Systems" Federal State Unitary Entrepreneurship "State Research Institute for Applied Problems" (GosNIIPP).

Fedorchenko L.N. – Scientific Secretary of the ongoing permanent city seminar at the Scientific Council on Informatization of St. Petersburg "Informatics and Automation".

Intellectual property

Official registration of the computer program "The program for calculation the absorbed doses of electrons and protons at arbitrary points of 3D-models of objects in SolidWorks CAD and the equivalent flux (fluence) of protons on the surfaces of their components ("Dose-Fluence" Program) ". State registration certificate No. 2018665417 – Korotin A.A., Sorokin L.N., Schevaev A.A., Usychenko A.S

Official registration of the computer program "The program of hierarchical clustering of color image pixels by the Ward method with buffering and taking into account repetitions of the minimum increments of the total square error". State registration certificate No. 2018661794 – Kharinov M.V, Buslavskiy A.N.

Recent results

1. Algorithm for the numerical solution of linear singular integral equations for determining photometric invariants of the scalar radiation fields of a uniform layer of arbitrary optical thickness in the visible range of 400–850 nm based on the principle of mirror imaging (symmetry) has been developed [11].

2. Method for designing climate control systems with minimum consumption of resources in order to level the effects of global warming on the basis of optimal control theory has been developed [4].

3. Digital model of compression of artificial muscles based on electrically-controlled hydrogel composites has been developed, the processes of compressing samples of hydrogels under the influence of electric current, which have practical value for use in actuators of automation and robotics down to the nano-level, have been experimentally investigated [7].

4. Model law "On the development of the information society" was developed, taking into account the results of a retrospective analysis of strategic documents and aimed at creating the foundations for the legal regulation of the formation of the information society [3].

5. New extreme model and scenarios for the development of aggressive primary invasion in the body based on modifications of the systems of differential equations with delay, allowing to predict the development of the infectious process have been developed [9].

6. Model for preliminary selection of objects based on the generation of several representations of an image in gray tones and filtering objects of interest ordered by size by the set brightness thresholds, which allows automatic detection of objects on images of previously unknown content, has been developed [12].

7. New method for designing parallel reactive systems (ReSyD) has been developed using a high-level automaton programming language based on a new method of composition of software automaton objects, which improves the quality of special software (STR) and is tested in a special astrophysical observatory (SAO RAS) [29].

8. Method and software for calculating absorbed doses of electrons and protons at arbitrary points in 3D models of objects in SolidWorks CAD and the equivalent flux of protons on the surfaces of their components (Dose-Fluence program) used in the early stages of spacecraft design to determine the local radiation conditions at the locations of semiconductor electronic

products sensitive to the effects of charged particles of outer space have been developed [34].

9. Computer simulation models and programs, which provide to set the shape and duration of the voltage pulse generators and select the distributed parameters of the lines, solve the problem of synthesizing high power bipolar SRI generators with optimal spectral and energy characteristics in the required frequency band have been developed [34, 41].

Awards

Yusupov R.M., Vus M.A. – Badge of the IPA CIS "For merits in the field of press and information" / Resolution of the Council of the IPA CIS dated April 12, 2018 No. 24: printing and information. ["Newsletter of the IPA CIS", No. 69.2018. Part I. P.145–148].

References

Articles prepared jointly with foreign organizations:

1. *Borroto-Escuela D.O., Tarakanov A.O., Brito I., Fuxe K.* Glutamate heteroreceptor complexes in the brain // Pharmacological Reports. 2018. vol. 70. Issue 5. pp. 936–950. DOI:10.1016/j.pharep.2018.04.002.

Monographs:

2. *Yusupov R.M., Miconi S.V., Sokolov B.V.* Qualimetry of models and multi-model complexes. M. Nauka. 2018. (In Russ.).
3. *Vus. M.A.* The regulations in ICT in the Postsoviet area // SPb.: Legal Center Publishing House. Series "The Law of the XXI Century". 2018. ISBN 978-5-94201-000-0. (In Russ.).

Papers published in editions, indexed by WoS, Scopus:

4. *Soldatenko S.A., Yusupov R.M.* "Optimal Control of Aerosol Emissions into the Stratosphere to stabilize the Earth's Climate" // Izvestya, Atmospheric and Oceanic Physics. 2018. vol. 54. Issue 5. pp. 480–486.
5. *Soldatenko S.A., Yusupov R.M.* Optimal control of artificial sulfate aerosols usage to mitigate global warming // Atmospheric and Oceanics Optics. 2018. Issue 31. vol. 10. pp. 821–828. (In Russ.).
6. *Soldatenko S.A.* Estimating the impact of artificially injected stratospheric aerosols on the global mean surface temperature in the 21th century // Climate. 2018. vol. 6(4). pp. 85.

7. *Ivanov V.P., Dmitriev I.Yu., Elyashevich G.K.* Artificial muscles on the expecting polymers as a model of the muscular devices of Biomechanical systems // Russian Journal of biomechanics. 2017. Issue 21. vol. 4. pp. 397–402. (In Russ.).
8. *Perevaryukha A.Yu.* Comparative modeling of two special scenarios of extreme dynamics in forest ecosystems: Psillides in Australia and spruce budworm moth in Canada // Journal of Automation and Information Sciences. 2018. vol. 50. Issue 5. pp. 22–33.
9. *Perevaryukha A.Yu.* Scenarios of the passage of the "population bottleneck" by an invasive species in the new model of population dynamics // Izvestiya Vysshikh Uchebnykh Zavedeniy. Prikladnaya Nelineynaya Dinamika. 2018. vol. 5. pp. 63–80.
10. *Perevaryukha A.Yu.* Phenomenological computational model for the development of a population outbreak of insects with its bifurcational completion // Mathematical Models and Computer Simulations. 2018. vol. 10. Issue 4. pp. 501–511.
11. *Smokty O.I.* Modeling of radiation fields of a flat anisotropic-scattering homogeneous layer of arbitrary optical thickness // SPIIRAS Proceedings. 2018. vol. 1(56). pp. 214–242. (In Russ.).
12. *Kharinov M.V., Buslavsky A.N.* Object Hierarchy in a Digital Image // 2018 International Russian Automation Conference (RusAutoCon). 2018. pp. 1–6. DOI: 10.1109/RUSAUTOCON.2018.8501745. URL: https://ieeexplore.ieee.org/document/8501745.

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

13. *Ivanov V.P., Dmitriev I.Yu., Vlasov P.V., Elyashevich G.K.* Electrically controlled polymer hydrogels as active element of actuators for automatics // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. Issue 8. vol. 4. pp. 606–613. DOI: 10.17586/2226–1494–2018–18–4–606–613. (In Russ.).
14. *Mikhailov V.V., Perevaryukha A.Yu., Reshetnikov Yu.S.* Model of fish population dynamics with calculation of individual growth rate and hydrological situation scenarios // Information and Control Systems. 2018. vol. 95(4). pp. 31–38.
15. *Perevaryukha A.Yu.* Model for the survival rate of introduced juvenile sturgeon in Caspian Sea with the nonlinear velocity of the individual's growth rate // Nonlinear world. 2018. Is. 16. vol.1. pp.54–63. (In Russ.).

16. *Mikhailov V.V., Perevaruha A.Yu.* Simulation of the process of rapid eutrophication of major lake and its impact on the welfare of the autochthonous ichthyofaunal // Nonlinear World. 2018. Issue 16. vol. 4. pp. 45–53. (In Russ.).
17. *Perevaryukha A.Yu.* Phenomenological computational models for passing outbreaks of insects with its bifurcation completion // Mathematical modeling. 2018. Issue 30. vol. 1. pp. 40–54. (In Russ.).
18. *Fedorchenko L.N.* Building a recognizer for the Yard language using a syntactical graph scheme // Bulletin of the Buryat State University. Mathematics and Computer Science. 2018. vol. 1. pp. 66–82. DOI: 10.18101/2304–5728–2018–1–66–82. (In Russ.).
19. *Fedorchenko L.N., Afanasyeva I.V.* The method of describing systems with complex behavior on the principles of generalized automata // Bulletin of the Buryat State University. Mathematics, Informatics. 2018. vol. 4. pp. 16–21. (In Russ.).
20. *Khanykov I.G.* The Classification of Image Segmentation Algorithms // Izv. vuzov. Priborostroenie. 2018. Issue. 61. vol. 11. pp. 978–987. DOI: 10.17586/0021–3454–2018–61–11–978–987. (In Russ.).
21. *Khanykov I.G.* Methods for Accelerating the Classical Ward Method for Clustering Pixels of Image // Bulletin of the Buryat State University. Mathematics, Informatics. 2018. vol. 3. pp. 60–71. DOI: 10.18101/2304–5728–2018–3–60–71. (In Russ.).
22. *Yusupov R.M., Vus M.A.* Model Law of the CSTO "On State Secrets" // Dialogue: Politics. Law. Economy. 2018. vol. 2. pp. 5–13. (In Russ.).
23. *Yusupov R.M., Sokolov B.V. et al.* Methodological and methodical foundations of the theory of quality assessment of models and polymodel complexes // Information and space. 2018. vol. 3. pp. 36–43. (In Russ.).
24. *Kharinov M.V.* On RMS, the K-means method and trees as applied to image processing // Proceedings of the 28th International Conference on Computer Graphics and Vision (Grafikon'2018) //. pp. 180–184.
25. *Blum V.S.* Methods of digitalization of information flow in the clinical sphere of public health. // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU-2018). SSC JSC Concern CSRI Elektropribor. 2018. pp. 296–306. (In Russ.).
26. *Ivanov V.P.* Method of adaptation of optimum control for dynamic systems // Proceedings of the 11th Russian Multiconference on Control

Problems "Information Technologies in Control" (ITU-2018). SSC JSC Concern CSRI Elektropribor. pp. 224–233. (In Russ.).
27. *Kharinov M.V.* The Modernization of the Information Technologies in the Field of Image Processing // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU-2018). 2018. pp. 333–339. (In Russ.).
28. *Khanikov I.G.* Three-step image segmentation flowchart // Information Technologies in Control (ITU-2018) // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU-2018). SSC JSC Concern CSRI Elektropribor. 2018. pp. 339–341. (In Russ.).
29. *Afanasyev I.V., Levonevsky D.K., Novikov F.A., Fedorchenko L.N.* Formal model and methods for describing systems with complex behavior on the principles of generalized automata // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU-2018). SSC JSC Concern CSRI Elektropribor. 2018. pp. 67–76. (In Russ.).
30. *Yusupov R.M.* Computer science on the eve of its seventieth birthday // Regional Informatics and Information Security (RIIB-2018). 2018. vol. 5. pp. 5–9. (In Russ.).
31. *Kharinov M.V.* Features of Information Technologies for Detecting Objects in the Image Processing // Regional Informatics and Information Security (RIIB-2018). 2018. vol. 5. pp. 59–61. (In Russ.).
32. *Khanykov I.G.* The Technique of High-speed Approximation of the Image by a Hierarchical Sequence of Approximations // Regional Informatics and Information Security. 2018. vol.5. pp. 54–58. (In Russ.).

Other Publications:

33. *Schemeleva I.S., Kharinov M.V.* The product of three eight-dimensional hypercomplex numbers (octaves) // Scientific community of students: Interdisciplinary Researches: Proceedings of XXXVI International student Scientific and Practical Conference on. 2018. vol. 1(36). pp. 272–282. (In Russ.).
34. *Sorokin L.N., Usychenko A.S.* The use of the CST STUDIO SUITE simulation environment in applied studies of the formation and emission of bipolar ultrashort electromagnetic pulses // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 348–349. (In Russ.).

35. *Kharinov M.V.* Product of three octonions // 2018. arXiv preprint. 10 p.
36. *Kharinov M.V.* Symmetry of the triple octonionic product // 2018. arXiv preprint arXiv:1806.05494. 14 p. URL: https://arxiv.org/abs/1806.05494.
37. *Yusupov R.M., Bondurovsky V.V., Vus M.A.* On the project of model law for the CSTO "On State Secrets" // Proceedings of the International Scientific and Practical Conference "Theoretical and applied problems of information security". Minsk: Academy of the Ministry of Internal Affairs. 2018. pp. 19–23. (In Russ.).
38. *Yusupov R.M., Okhtilev M.Yu., Sokolov B.V.* Methodology and intellectual information technologies of situational management in emergency situations // Proceedings of the IV Interregional Scientific and Practical Conference. 2018. pp. 11–16. (In Russ.).
39. *Yusupov R.M., Bondurovsky V.V., Vus M.A.* Model law of the Collective Security Treaty Organization "On State Secrets" // Proc. of the VII International Scientific and Practical Conference "Law and Information: Theoretical and Practical Issues". 2018. pp. 97–108. (In Russ.).
40. *Blum V.S.* Model of complete, reliable and available for digital processing of information flow in the clinical sphere of public health // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 418–420. (In Russ.).
41. *Sorokin L.N., Usychenko A.S.* The study of the formation of bipolar ultrashort voltage pulses of high power on the basis of simulation. // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 348–349. (In Russ.).
42. *Fedorchenko L.N.* Methods and algorithms for generating tests on the syntactic structure of the "KSR"-language // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 49–50. (In Russ.).
43. *Khanykov I.G.* The Typical Block-scheme of Approaching the Image by Means of the Hierarchy of Approximations // Proceedings of the XXVII International Scientific and Technical Conference "Modern Technologies in Control, Automation and Information Processing". 2018. pp. 235–236. (In Russ.).
44. *Khanykov I.G.* The Model of the High-speed Clustering of the Image Pixels on Wards method Basis // Theses of the 12-th International Conference on Intelligent Data Processing (IDP–2018). 2018. pp.112–113. DOI: 10.30826/IDP201851. (In Russ.).

Laboratory of Theoretical and Interdisciplinary Problems of Informatics

Head of the Laboratory: Dr. Phys. and Math. Sci., Assoc. Prof. Alexander L. Tulupyev – representation and processing of data and knowledge with uncertainty, Data Science, Information Science, application of mathematical methods and informatics to socio-cultural research, probabilistic graphical models, Bayesian networks, methods of Biostatistics and mathematical models in Epidemiology, alexander.tulupyev@gmail.com.

Laboratory Staff: 9 members and 1 Ph.D. student.

Research Activities – theoretical and technological principles, algorithms and software tools for Bayesian networks, probabilistic graphical models, logic-probabilistic graphical models, relational-probabilistic models and other models based on probability and degree of belief models of cognitive systems, socio-technical systems (including information security), biosocial systems, systems for decision-making under uncertainty; theory and technology of programming; sets of methods, techniques, tools and languages for data storage, processing and analysis in interdisciplinary research; technological principles and software tools for behavior analysis in social networks.

Research fellows and brief information of the research-work direction

Senior Researcher, PhD in Med., Dr. Sci., Assoc. Prof. – Tatiana V. Krasnoselskikh – the rationale and development of modern multidisciplinary STI prevention strategies for the high risk populations. tatiana.krasnoselskikh@gmail.com.

Senior Researcher, PhD in Psychology, Assoc. Prof. – Tatiana V. Tulupyeva – application of mathematical methods and informatics to humanities research, informatization of the psychology research management and conduct, biostatistics methods and mathematical models in epidemiology psychology of personality, psychology of management. tvt100a@mail.ru.

Senior Researcher, PhD in Phys. and. Math. – Alena V. Suvorova – probabilistic graphical models for modelling of the socially significant behaviour on the base of incomplete data; indirect estimates of odds ratio

related to respondents behaviour under uncertainty, machine learning in social sciences. suvalv@mail.ru.

Senior Researcher, PhD in Tech. – Artur A. Azarov – analysis of the protection of information systems, socio-engineering attack on the users of information systems, social computing, models of information dissemination in social networks. artur-azarov@yandex.ru.

Researcher – Maksim V. Abramov – construction estimates that aggregate psychological, structural, social, cultural-anthropological factors for analyzing the security of information system users from social engineering attacks based on probability graphic models. mva16@list.ru.

Junior Researcher – Valeriya F. Stolyarova – probabilistic aspects of the algebraic Bayesian networks theory: local learning; experiments design in epidemiology and medicine, statistical and probabilistic analysis, probabilistic graphical models and copulas in risk assesment. valerie.stoliarova@gmail.com.

Junior Researcher – Aleksandra V. Toropova – evidence coherence diagnostics on models for risky behavior rate estimate, Bayesian belief networks. alexandra.toropova@gmail.com.

Junior Researcher – Ekaterina A. Malchevskaya – probabilistic logical inference in Bayesian networks: analysis, algoritmization and program realization, katerina.malch@gmail.com.

Junior Researcher – Nikita A. Kharitonov – probabilistic graphical models, algebraic Bayesian networks: local and global logical probabilistic inference (analysis, algorithmization, software implementation, statistical experiments); global structures. nikita.kharitonov95@yandex.ru.

Dissertation defense

Abramov M.V. "Methods and algorithms for analyzing the protection of users of information systems from social engineering attacks: estimation of model parameters", Candidate of Technical Sciences in specialty 05.13.19 – Methods and systems of information security, information security (Scientific Advisor – Ph.D. in Phys. and Math. Sc., Dr. Sci., A.L. Tulupyev).

Zolotin A.A. "Matrix-vector equations of local a posteriori inference in algebraic Bayesian networks", Candidate of Physical and Mathematical Sciences, specialty 05.13.17 – Theoretical Foundations of Computer Science (Scientific advisor – Ph.D. in Phys. and Math. Sc., Dr. Sci., A.L. Tulupyev).

Post-graduate students

PhD student – Stoliarova V.F. – Probabilistic graphical models in methods and algorithms for analysis of risks associated with respondents' behavior. – Research advisor – A.L. Tulupyev

Grants and projects

Tulupyev A.L. – RFBR project No. 18-01-00626-a, Methods for representation, truth estimates synthesis, and machine learning in algebraic Bayesian networks and related models of knowledge with uncertainty: probabilistic-logic approach and graph systems (2018–2020).

Suvorova A.V. – RFBR project No. 16-31-60063-mol-a-dk, Methods for design and evaluation of probabilistic graphical models for latent social processes (2016–2018).

Abramov M.V. – RFBR project No. 18-37-00323-mol-a, Social engineering attacks in corporate information systems: approaches, methods and algorithms for identifying the most probable traces (2018–2019).

Azarov A.A. – RFBR project No. 18-31-00340-mol-a, Methods for analyzing the stability of the informational systems users social connection structure to the social engineering attack actions of the malefactor on the basis of the application of genetic algorithms (2018–2019).

Abramov M.V. – Government of St. Petersburg, Committee on Science and Higher Education, grant for young scientists and PhD scientists, project "Models, methods and algorithms for calculating probabilistic estimates of the degree of protection of users of information systems from socially engineering attacks of an attacker, based on the processing of the profile of user vulnerabilities and the profile of the competencies of the attacker" (2018).

Azarov A.A. – Government of St. Petersburg, Committee on Science and Higher Education, grant for young scientists and PhD scientists, project "The use of a genetic algorithm to assess the of information systems users sustainability from social engineering attack actions, as well as for redistribution of their access rights" (2018).

Stoliarova V.F. — Government of St. Petersburg, Committee on Science and Higher Education, grant for PhD students, project "Possibilities and advantages of the copula method application to the problem of modelling of a persons behaviour intensity based on the data on last episodes" (2018).

University courses

SPSU: Faculty of Mathematics and Mechanics, Computer Science Department: "Data Science: software systems", "Bayesian network theory", "LaTeX presentations and scientific publications", "Advanced Computer Science 1" – Tulupyev A.L.

SPSU: Faculty of Mathematics and Mechanics, Computer Science Department: "Data Science: Essentials of the data analysis and data processing", "Technologies of Professional Communication", "Project Team Communication Psychology", "LaTeX presentations and scientific publications" – Tulupyeva T.V.

SPSU: Faculty of Mathematics and Mechanics, Computer Science Department: "Data Science: Essentials of the data analysis and data processing", "Data Science: software systems", "Models and architectures of programs and knowledge", "Bayesian network theory", "Applied technologies for social networks analysis and modeling", "Frequency methods for analyzing information", "Content Management Systems" – Abramov M.V.

HSE: "Mathematcal foundations of data analysis", Data Science minor: "Programming with Data and Reproducible Research", "Data Analysis and Data Technologies", "Data Mining and Elements of Machine Learning", "Applications and Practice of Data Science" – Suvorova A.V.

PSPbGMU named by I.P. Pavlov: Department of Dermatovenereology with a clinic; Therapeutic, Dental and Pediatric Faculties: "Dermatovenereology", "Paraneoplastic dermatosis"; Faculty of Postgraduate Education: "Fundamentals of Diagnosis of Skin Diseases", "Fundamentals of External Therapy of Skin Diseases", "Erythema", "Nail Diseases", "Syphilis", "Sexually Transmitted Infections" – Krasnoselskikh T.V.

International cooperation

Suvorova A.V., Tulupyev A.L., Tulupyeva T.V. — AITRP (AIDS International Training and Research Program), Yale School of Public Health, Yale University, USA.

Tulupyev A.L. — organization of section at EUSFLAT 2019 with Institute for Research and Applications of Fuzzy Modeling (IRAFM), University of Ostrava, Czech Republic.

Participation in conferences and exhibitions

22nd International AIDS Conference (AIDS 2018). Amsterdam, Netherlands, July 23-27, 2018 – Suvorova A.V.;

3rd International Scientific Conference "Intelligent Information Technologies for Industry", September 17-21, 2018, Sochi, Russia– Abramov M.V., Suvorova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

XXI International Conference on Soft Computing and Measurements (SCM-2018). May, 23-25, 2018, St. Petersburg– Abramov M.V., Azarov A.A., Malchevskaya E.A., Stoliarova V.F., Suvorova A.V., Toropova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

The 1st IEEE International Conference on Industrial Cyber-Physical Systems, May, 15-18, 2018, St.Petersburg – Abramov M.V., Tulupyev A.L.;

Russian Practical Conference "Master Studies Space: global to local", April, 16-17, 2018, Kazan– Suvorova A.V.;

Sixteenth Russian Conference on Artificial Intelligence (RCAI-2018), September, 24-27, 2018, Moscow – Abramov M.V., Suvorova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

The second international scientific-practical conference Fuzzy Technologies in the Industry – 2018 (FTI 2018), October, 23-25, 2018, Ulyanovsk – Abramov M.V., Azarov A.A., Suvorova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

10th International Conference on Social Informatics (SocInfo 2018), September, 25-28, 2018, St. Petersburg – Suvorova A.V.;

"Information technologies in management" (ITU - 2018), October, 2-4, 2018, St. Petersburg – Abramov M.V., Azarov A.A., Suvorova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

XVI St. Petersburg International Conference "Regional Informatics (RI-2018)", October, 24-26, 2018, St. Petersburg – Abramov M.V., Azarov A.A., Stoliarova V.F., Suvorova A.V., Toropova A.V., Tulupyev A.L., Tulupyeva T.V., Kharitonov N.A.;

Networks in the Global World. Principles behind Structures: Patterns of complexity in European societies and beyond (NetGloW'18), July, 4-6, 2018, St. Petersburg – Suvorova A.V., Tulupyeva T.V.;

School-seminar on Artificial Intelligence, 2018, Tver – Abramov M.V., Kharitonov N.A., Malchevskaya E.A.;

XVIII All-Russian Congress of Dermatovenerologists and Cosmetologists, May, 15-18, 2018, Moscow – Krasnoselskikh T.V.;

III St. Petersburg Forum on HIV Infection with International Participation, October, 4-5, 2018, St. Petersburg – Krasnoselskikh T.V.;

XII Scientific-practical conference for dermatovenerologists and cosmetologists "St. Petersburg dermatological readings", October, 25-27, 2018, St. Petersburg – Krasnoselskikh T.V.

Membership in Russian and International societies, editorial boards, etc.

Tulupyev A.L. — expert of the Russian Academy of Sciences, member of the Russian Association of Fuzzy Systems and Soft Computing, IEEE (Institute of Electrical and Electronics Engineers) member, ACM (Association for Computing Machinery) member, INSTICC (Institute for Systems and Technologies of Information, Control and Communication) member, editorial board member of Fuzzy Systems and Soft Computing Journal, Herald of Tver State University. Series: Applied Mathematics, Soft Computing and Measurement Journal.

Krasnoselskikh T.V. – member of St. Petersburg V.M. Tarnovsky Medical Research Association of Dermatovenerologists.

Suvorova A.V., Abramov M.V., Kharitonov N.A., Stoliarova V.F. — IEEE (Institute of Electrical and Electronics Engineers) members.

Recent results

1. We have proposed approaches to identify the most likely trajectory of the spread of a social engineering attack between two users, taking into account data from social networks: estimates of the intensity of user interaction, their propensity for threatening behavior; and creating the basis for the analysis of possible propagation paths of multi-path social engineering attacks, which, in turn, makes it possible to search for the formulation of backtracking tasks in the form acceptable for solutions [6, 17, 26].

2. Probabilistic models based on machine learning methods for automatic classification of text posts in a social network were proposed, that allows more quick analysis of the psychological characteristics and conducting rapid diagnostics for various applications, including assessing

the degree of vulnerabilities in analyzing socio-engineering attacks and diagnosing students to create a personalized learning program [29, 44].

3. Properties of the model for respondents' socially significant behavior based on the Bayesian Belief network were explored: options for combining expert knowledge and statistical data on model structure learning were studied, various classes of models were examined. It was shown that the proposed model shows good prediction quality, allows extensions and has the potential to analyze problems related to the evaluation of behavior, allowing decision support when it's impossible to get data from regular observation [12, 14, 15].

4. New criteria for quantitative assessment of value contradictions have been developed; the information content of the criteria in predicting the success of the formation of professional competence and assessing the effectiveness of a person's adaptation to unfavorable socio-psychological conditions is shown. The obtained results testify to the prospects of using the developed psychodiagnostic criteria in the practice of psychological and personnel counseling, psychological support of the educational process, and also to assess the intensity of social and psychological adaptation [3, 23].

5. Theoretical and statistical estimates of complexity and estimates of sensitivity of various types of logical probabilistic inference were achieved, formalization of scalable types of global structures was offered, approaches for fusion of algebraic Bayesian networks were proposed; the results expand the theory of algebraic Bayesian networks and give a way to consider inaccuracy, non-numeric character of raw data, and also relaxation of assumptions about the independence of events in social computing research. [4, 9, 10].

6. A method for changes of the user's protection level analysis in case of malefactor's social engineering attacks in the event of a changes in the structure of communications between users was proposed. This approach allows determining the optimal structure of the user's social relationships graph including the distribution of access rights among users of an information system that is most resistant to the socio-engineering attacks [7, 18, 30].

References:

Papers prepared jointly with foreign organizations:

1. *Khlobystova A.O., Abramov M.V., Tulupyev A.L., Zolotin A.A.* Search for the shortest trajectory of a social engeneering attack between a pair

of users in a graph with transition probabilities // Information and Control Systems. 2018. vol. 6. pp. 33–40. (Scopus). (In Russ.).

Monographs:

2. *Abramov M.V., Tulupyeva T.V., Tulupyev A.L.* Social engineering attacks: social networks and user security estimates. SPb: PC GUAP. 2018. 300 p. (In Russ.).

Papers published in editions indexed by WoS, Scopus

3. *Golyanich V.M., Bondaruk A.F., Shapoval V.A., Tulupyeva T.V.* Value contradictions as psychodiagnostic criteria of professional competence and an intrapersonal conflict. Eksperimental'naya psikhologiya // Experimental psychology (Russia). 2018. Issue 11. vol. 3. pp. 120–139. DOI:10.17759/exppsy.2018110309. (In Russ.).
4. Zolotin A. A., Tulupyev A. L. Sensitivity Statistical Estimates for Local A Posteriori Inference Matrix-Vector Equations in Algebraic Bayesian Networks over Quantum Propositions // Vestnik St. Petersburg University, Mathematics. 2018. vol. 51. Issue 1. pp. 42–48. (WoS, Scopus, SJR=0,22, Q4).
5. *Abramov M.V., Slezkin N.E., Tulupyeva T.V.* Aggregating data from social networks to determine the most likely configuration of missing meta-profile settings for a user // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
6. *Abramov M.V., Tulupyev A.L., Suleimanov A.A.* Estimating the probability of compromising a critical document at multi-step social engineering attacks // XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
7. *Azarov A., Suvorova A.* Aggregate Estimates for Probability of Social Engineering Attack Success: Sustainability of the Structure of Access Policies // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
8. *Bushmelev F., Azarov A., Tultpyeva T.* Approach to estimate the security level of critical documents based on the competence profile of malefactor // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).

9. *Kharitonov N.A., Berezin A.I.* Acyclic Algebraic Bayesian network maths presentation synthesis // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
10. *Malchevskaya E.A., Stoliarova V.F.* Sensitivity of the Local Posterior Inference Evidence Probability Estimate in Algebraic Bayesian Networks: Computational Experiments // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
11. *Stoliarova V.F.* Modelling of the Copula for Dependency of Two Inter-Episode Interval Lengths in Gamma–Poisson Model of Person's Behavior // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
12. *Toropova A., Suvorova A.* Approaches to the processing of noisy data in socially significant behavior model // 2018 XXI IEEE International Conference on Soft Computing and Measurements (SCM). 2018. (Scopus).
13. *Kharitonov N.A., Malchevskaia E.A., Zolotin A.A., Abramov M.V.* External consistency maintenance algorithm for chain and stellate structures of algebraic Bayesian networks: statistical experiments for running time analysis // Advances in Intelligent Systems and Computing. Proceedings of the Second International Scientific Conference "Intelligent Information Technologies for Industry". 2018. pp. 23–30. (Scopus).
14. *Suvorova A., Tulupyev A.* Learning Bayesian Network Structure for Risky Behavior Modelling // Advances in Intelligent Systems and Computing. Proceedings of the Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18). Springer. 2018. C. 58–65. (Scopus).
15. *Toropova A.* Synthesis and learning of socially significant behavior model with hidden variables // Advances in Intelligent Systems and Computing. Proceedings of the Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18). Springer. 2018. C. 76–84. (Scopus).
16. *Dornostup O., Suvorova A.* Network Structure of e-Shops Profile as Factor of Its Success: Case of VK. com // 10th International Conference on Social Informatics (SocInfo 2018). 2018. pp. 40–50. DOI: 10.1007/978-3-030-01159-8_4. (Scopus).

17. *Suleimanov A., Abramov M., Tulupyev A.* Modelling of the social engineering attacks based on social graph of employees communications analysis // Proceedings of 2018 IEEE Industrial Cyber-Physical Systems (ICPS). 2018. pp. 801–805.
18. *Azarov A., Suvorova A., Tulupyeva T.* Changing the information system's protection level from social engineering attacks, in case of reorganizing the information system's users' structure // Proceedings of the II International Scientific and Practical Conference "Fuzzy Technologies in the Industry – FTI 2018". CEUR Workshop Proceedings. pp. 56–62. (Scopus).
19. *Khlobystova A.O., Abramov M.V., Tulupyev A.L.* Identifying the most critical trajectory of the spread of a social engineering attack between two users // Proceedings of the II International Scientific and Practical Conference "Fuzzy Technologies in the Industry – FTI 2018". CEUR Workshop Proceedings. pp. 38–43. (Scopus).
20. *Suvorova A.* Exploring Bayesian belief network for risky behavior modelling: discretization and latent variables // Proceedings of the II International Scientific and Practical Conference "Fuzzy Technologies in the Industry – FTI 2018". CEUR Workshop Proceedings. pp. 63–70. (Scopus).
21. *Tulupyev A., Kharitonov N., Zolotin A.* Algebraic Bayesian networks: consistent fusion of partially intersected knowledge systems // Proceedings of the II International Scientific and Practical Conference "Fuzzy Technologies in the Industry – FTI 2018". CEUR Workshop Proceedings. pp. 109–115. (Scopus).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

22. *Abramov M.V.* Automation of the social networks websites content analysis in the problems of forecasting the protection of the information systems users from social engineering attacks // Automation of Control Processes. 2018. vol. 1(51). pp. 34–40. (In Russ.). (impact factor – 0,442).
23. *Golyanich V.M., Bondaruk A.F., Tulupyeva T.V.* Valuable and psychodynamic determinants of professional competence of sales managers // Scientific notes of the Lesgaft University. 2018. vol. 9(163). pp. 325–330. (In Russ.).

24. *Zolotin A.A., Tulupyev A.L.* Estimation of the sensitivity of the equations of the local a posteriori inference in algebraic Bayesian networks over quanta-propositions // Bulletin of St. Petersburg University. Series 1. Mathematics. Mechanics. Astronomy. 2018. Issue 63. vol. 1. pp. 55–64. (In Russ.).
25. *Suvorova A.V., Tulupyev A.L.* Structure Synthesis of Bayesian Belief Network for Risky Behavior Rate Estimates. Informatsionno-upravliaiushchie sistemy [Information and Control Systems]. 2018. vol. 1 (92). pp. 116–122. (In Russ.). (impact factor –0,431).
26. *Abramov M.V., Tulupyev A.L., Suleimanov A.A.* Problems of analysis of user protection from social engineering attacks: construction of the social graph on information from social networks websites // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. vol. 2. pp. 313–321. DOI: 10.17586/2226-1494-2018-18-2-313-321. (In Russ.). (impact factor –0,465).
27. *Kharitonov N.A.* Maintaining the internal consistency of algebraic Bayesian networks with a linear and star-shaped structure: statistical estimates of complexity // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. T. 6. (In Russ.). (impact factor –0,465).
28. *Stoliarova V.F.* Copulae and dependence modelling: indirect estimates of a person's risky behavior intensity // Computer Tools in Education. 2018. vol. 3. pp. 21–36. (In Russ.). (impact factor –0,200).
29. *Suvorova A.V., Smirnova K.R., Budin E.A., Tulupyeva T.V., Tulupyev A.L., Abramov M.V.* Research project as a tool for teaching text analysis: class prediction for publication on social network site // Computer Tools in Education. 2018. Issue 3. pp. 49–64. (In Russ.). (impact factor –0,200).
30. *Azarov A.A., Suvorova A.V., Tulupyev A.L., Tulupyeva T.V.* Evaluation probability of success of the social engineering attack actions of malefactor based on a random process with discrete time // Soft measurements and calculations. 2018. vol. 6(7). pp. 80–86. (In Russ.).
31. *Abramov M.V., Slezkin N.E., Tulupyeva T.V.* Aggregating data from social networks to determine the most likely configuration of missing meta-profile settings for a user // Proceedings of XXI International

conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 118–121. (In Russ.).
32. *Azarov A.A., Suvorova A.V.* Aggregate estimates for probability of social engineering attack success: sustainability of the structure of access policies // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 126–129. (In Russ.).
33. *Bushmelev F.V., Tulupyeva T.V., Azarov A.A.* Approach to estimate the security level of critical documents based on the competence profile of malefactor // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 70–72. (In Russ.).
34. *Malchevskaya E.A., Stoliarova V.F.* Sensitivity estimates for evidence of local a posteriori inference in algebraic Bayesian networks: computational experiments // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 89–92. (In Russ.).
35. *Stoliarova V.F.* Modelling of the Copula for Dependency of Two Inter-Episode Interval Lengths in Gamma–Poisson Model of Person's Behavior // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 122–125. (In Russ.).
36. *Suleimanov A.A., Abramov M.V., Tulupyev A.L.* Estimating the probability of compromising a critical document at multi-step social engineering attacks // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 130–133. (In Russ.).
37. *Toropova A.V., Suvorova A.V.* Approaches to the processing of noisy data in socially significant behavior model // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 138–140. (In Russ.).
38. *Kharitonov N.A., Berezin A.I.* Synthesis of the mathematical representation of an acyclic algebraic Bayesian network // Proceedings of XXI International conference on Soft Computing and Measurements (SCM-2018). 2018. Issue 1. pp. 141–143. (In Russ.).

39. *Azarov A.A., Suvorova A.V., Tulupyeva T.V.* Analysis of the development of the social engineering attack as a random process with discrete time: forming a list of most vulnerable users // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU–2018). St. Petersburg: SSC JSC Concern CSRI Elektropribor. 2018. (In Russ.).
40. *Toropova A.V.* Model of socially significant behavior with hidden variables in human resources management // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU–2018). St. Petersburg: SSC JSC Concern CSRI Elektropribor. 2018. pp. 285–289. (In Russ.).
41. *Shalamov R.A., Abramov M.V., Tulupyeva T.V., Azarov A.A.* Automation of the estimation of the degree of expression of psychological peculiarities of users in personnel management: testing in the social network // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU–2018). St. Petersburg: SSC JSC Concern CSRI Elektropribor. 2018. pp. 497–500. (In Russ.).
42. *Kharitonov N.A.* Algorithm for constructing a non-uniform mathematical structure of algebraic Bayesian networks // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU–2018). St. Petersburg: SSC JSC Concern CSRI Elektropribor. 2018. pp. 77–79. (In Russ.).
43. *Khlobystova A.O., Abramov M.V., Tulupyev A.L.* Identification of the most probable trajectors of socio-engineering attacks in management of risks associated with users // Proceedings of the 11th Russian Multiconference on Control Problems "Information Technologies in Control" (ITU–2018). St. Petersburg: SSC JSC Concern CSRI Elektropribor. 2018. pp. 493–496. (In Russ.).

Other publications:

44. *Abramov M.V.* Estimation model of the information systems users protection from social engineering attacks developing on the attacker competences profile and the user vulnurabilities profile // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 539–540. (In Russ.).

45. *Azarov A.A., Abramov M.V., Shindarev N.A.* Automated analysis of company's employees profiles in social networks with the purpose of staff protection analysis from social engineering attacks // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 540–543. (In Russ.).
46. *Bagretsov G.I.* Construction of the vulnerabilities profile of the social network user in conditions of lack of information // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 543–544. (In Russ.).
47. *Bushmelev F.V., Kharitonov N.A.* The use of Bayesian networks in the analysis of the security of users of information systems from social engineering attacks // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 544–545. (In Russ.).
48. *Suvorova A.V.* Dynamics of stophivaids campaign on social networking site VKontakte // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 549–551. (In Russ.).
49. *Smirnova K.R., Budin E.A., Suvorova A.V., Tulupyeva T.V.* Automated of text posts classification for detection users psychological features // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 547–549. (In Russ.).
50. *Toropova A.V.* Use of socially significant behavior model as a bayesian belief network with hidden variables in sociocomputing // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 551–552. (In Russ.).
51. *Tulupyev A.L.* The logical-probabilistic approach to the fusion of knowledge systems with uncertainty based on algebraic Bayesian networks // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 552–554. (In Russ.).
52. *Tulupyeva T.V.* Interdisciplinarity in training of IT specialists // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 554–556. (In Russ.).
53. *Kharitonov N.A.* The use of parallel computing with the support of the consistency of algebraic Bayesian networks // Proceedings of XVI St.

Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 558–559. (In Russ.).
54. *Kharitonov N.A., Tulupyev A.L.* Possible approaches to the fusing and hybridization of algebraic Bayesian networks // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 559–560. (In Russ.).
55. *Khlobystova A.O., Abramov M.V.* Identifying the most critical trajectories of the spread of a multi-pass social engineering attacks // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 560–561. (In Russ.).
56. *Shalamov R.A., Tulupyeva T.V., Tulupyev A.L.* Automation of evaluation degree of expression of users psychological features in the social network // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 561–563. (In Russ.).
57. *Abramov M.V., Tulupyev A.L., Tulupyeva T.V.* Aggregation of data from social networks for restoring the fragment of meta-profile user // Proceedings of the Sixteenth Russian Conference on Artificial Intelligence (RCAI-2018). 2018. Issue 1. pp. 189–197. (In Russ.).
58. *Kharitonov N.A.* Software implementation of maintaining consistency in acyclic algebraic Bayesian networks: the structure of classes, processing algorithms and practical examples // Workshop on artificial intelligence: a collection of scientific papers. Tver: TvSTU. 2018. pp. 47–54. (In Russ.).
59. *Suleimanov A.A., Abramov M.V.* Automation of building a social graph of company employees based on the content they publish on social networks // Workshop on artificial intelligence: a collection of scientific papers. Tver: TvSTU. 2018. pp. 32–40. (In Russ.).
60. *Shindarev N.A., Abramov M.V.* Recursive algorithm for identifying employee user pages based on social network analysis // Workshop on artificial intelligence: a collection of scientific papers. Tver: TvSTU. 2018. pp. 23–31. (In Russ.).

Laboratory of Biomedical Informatics

Head of the laboratory: Dr. Tech. Sc., Prof. Sergei B. Rudnitsky – distance biometry, chronobiology, integrated signal processing, radio navigation; sbr@spiiras.ru.

Laboratory staff: – 6 members.

Research activities – development and research into new information technologies and hardware and software tools for processing electrophysiological signals and data mining of clinical and experimental data for biomedical diagnosis systems, functional state monitoring and clinical decision support.

Research fellows and brief information of the research-work direction

Senior Researcher, M.D., PhD. (Med.) – Evgeny L. Wasserman – research of human brain electric activity; design of psychophysiological testing systems; polygraphy; medical informatics as an academic discipline. ewasser@ev7987.spb.edu.

Researcher – Daria M. Denisova – investigations in human emotional sphere; design of psychological modelling methods of emotion-inducing situations; psychophysiology of stress; survival-oriented behaviour. dendm@spiiras.ru.

Researcher – Oleg V. Zhvalevsky – mathematical processing of biometric data; design of automation software; software application integration. ozh@spiiras.nw.ru.

Researcher – Nikolay K. Kartashev– research of human brain electric activity; study of safe computing environment design problems; design of psychophysiological testing systems; polygraphy; telemedicine. kolq@kolq.ru.

University courses

Herzen State Pedagogical University of Russia, Institute of Special Education and Rehabilitation, Department of Principles of Special Education: "Information technology in psychological and educational rehabilitation of disabled people", "Child neurology", "Psychopathology with a clinical picture of intellectual disorders" – Wasserman E.L.

Saint Petersburg State University, Faculty of Medicine, Department of Healthcare Management and Medical Law of SPbSU: "Informatics", "Medical informatics" – Wasserman E.L.

Participation in conferences and exhibitions

XVI Saint Petersburg International Conference "Regional Informatics (RI-2018)", October 24-26, 2018, Saint Petersburg — Wasserman E.L., Denisova D.M., Zhvalevsky O.V., Rudnitasy S.B.

VIII Baltic Congress on Child Neurology, June 7-8, 2018, Saint Petersburg — Wasserman E.L.

Automated information systems in medicine, April 27, 2018, St. Petersburg — Zhvalevsky O.V.

III International Conference "Ergo-2018: Human Factors in Complex Technical Systems and Environments", July 4-7, 2018, St. Petersburg — Zhvalevsky O.V., Rudnitsky S.B.

XXXI International Scientific Conference "Mathematical Methods in Engineering and Technology" (MMET-31), September 10-14, 2018, St. Petersburg — Zhvalevsky O.V.

XI Russian Multiconference on Management Problems (RMCMP-2018): conference "Information Technologies in Management" (ITM-2018) ", October 2-4, 2018, St. Petersburg — Zhvalevsky O.V.

Membership in Russian and International societies, editorial boards, etc.

Rudnitsky S.B. — RAS expert (ID # 2016-01-2675-2205), expert of Ministry of education and science of Russian Federation ("Directorate of Scientific and Technical Programs"), board of experts member for the development fund of the Center for the development and commercialization of advanced technologies "Skolkovo", member of specialized thesis committee at JSC "VNIIRA" of Concern Almaz Antey DS 409.016.01.

Recent Results

A conceptual model of mathematical processing of tensotremorograms is proposed, which is a hierarchy, at the lower level of which there are structural elements of the analyzed time series (events); successive ascent through the hierarchy is a process of sequential identification of models of various types; and at the top level, there is a final decision rule expressing the final result of the recognition

system, while the results of solving intermediate problems describe information about the functional state of the system for constructing movements in the form of diagnostic assessments and visual structural representations [5,11].

References:

Papers published in editions, indexed by WoS, Scopus:

1. *Wasserman L.I., Cherednikova T.V., Wasserman E.L., Wasserman M.V., Schelkova O.Yu,, Solov'yova E.V.* Psychological assessment of visual hemispatial neglect: standardization and approbation of the modified digit cancellation test // S.S. Korsakov Journal of Neurology and Psychiatry. 2018. Issue 118. vol. 2. pp. 45–51. DOI: 10.17116/jnevro20181182145-51. (Scopus, SJR=0,13, Q4).
2. *Wasserman E.L., Kartashev N.K., Roudnitsky S.B., Zhvalevsky O.V.* Complex measurement systems in medicine: from synchronized monotask measuring instruments to cyber-physical systems // Information technology in industry. 2018. vol. 6, no. 2. pp. 26–31.

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

3. *Zhvalevsky O.V.* Conceptual model for mathematical processing of tensotremorograms // Mathematical Methods in Engineering and Technology: proceedings of international scientific conference: 12 volumes. SPb: Izdatel'stvo Politekhnicheskogo universiteta. 2018. Issue 8. (In Russ.).
4. *Zhvalevsky O.V.* Construction of fractal identification scales for tensotremorogram classification: a problem statement // Regional Informatics and Information Security (RIIB-2018). 2018. vol. 5. pp. 382–385. (In Russ.).
5. *Zhvalevsky O.V.* Methods and models for automated Parkinson's disease diagnostics // Caspian Journal. Management and High Technologies. 2018. Issue 2. (In Russ.). (Impact factor – 0,757).
6. *Zhvalevsky O.V.* The use of time series preprocessing methods for tensotremorogram processing // Proceedings of the conference "Information Technologies in Management" (ITM-2018)". SPb: AO "Koncern "CNII "Elektropribor". 2018. pp. 349–357. (In Russ.).

Other publications:

7. *Wasserman E.L., Rudnitsky S.B.* The relevance of the development of methods and systems for the non-contact measurements of human physiological characteristics and the scope of their possible application // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 421–423. (In Russ.).
8. *Wasserman E.L.* Teaching the basics of applied informatics for medical students: unexpected trends // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 423–425. (In Russ.).
9. *Wasserman E.L.* Perspectives of e-health: what and how to teach students of medical schools // XVI Saint Petersburg International Conference "Regional Informatics (RI-2018) ". 2018. pp. 425–427. (In Russ.).
10. *Denisova D.M.* The need for information exchange and self-censorship in the context of psychophysiological wellness of Internet users // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 429–430. (In Russ.).
11. *Zhvalevsky O.V., Rudnitsky S.B.* On the issue of construction of software & hardware tools for functional state assessment in operators of complex systems // Proceedings of III International Conference "Ergo-2018: Human Factors in Complex Technical Systems and Environments". 2018. pp. 151–158. (In Russ.).
12. *Zhvalevsky O.V.* Construction of multi-level recognition system for Parkinson's disease diagnostics // Proceedings of the conference "Information Technologies in Management" (ITM-2018). SPb: AO "Koncern "CNII "Elektropribor". 2018. pp. 340–348. (In Russ.).
13. *Zhvalevsky O.V.* Application of fractal identification scale for tenzotremorogramms classification // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 425–427. (In Russ.).
14. *Wasserman M.V., Kolodiychuk E.A., Wasserman E.L., Sirbiladze G.K.* The effect of combined (trans-spinal and transcranial) micropolarization on the state of mental functions in children with speech development disorders // VIII Baltic Congress on Child Neurology. SPb: Chelovek i ego zdorovye. 2018. pp. 90. (In Russ.).

Laboratory for Information-Analytic Technologies for Economics

Head of laboratory: Dr. Tech. Sc., Prof. Igor V. Lysenko – modeling, technologies of information analysis, economic analysis of techno-organizational and socio-economic systems, planning–programming–budgeting and management, models and methods of technological processes planning in corporate governance systems, fuzzy numbers and fuzzy functions theory and its applications, ilys@iias.spb.su.

Laboratory staff: 6 members.

Research activities – modeling, information technologies, organizational, technical and socioeconomic systems research at various stages of their life cycle, public programs planning, models and methods for technological processes planning, development of the theory of fuzzy numbers and functions, the analysis and synthesis of organizational, technical, social and economic systems, estimation of systems potential, capabilities, efficiency of functioning, the mesoeconomic analysis, the theory of optimum control.

Research fellows and brief information of the research-work direction

Leading Researcher Dr. Tech. Sci. Prof. – Boris K. Grankin – modeling and system analysis for technical complexes functioning, advanced information technologies for technical complexes design, borisgrankin@mail.ru.

Leading Researcher Dr. Tech. Sci. – Alexey V. Fedorov – System analysis methodology and methods for rocket-space complexes design and exploitation, with application to economics; the problems of monitoring and diagnosing technical condition, afedor62@yandex.ru.

Senior Researcher PhD Assoc. Prof – Alexander S. Geida – transformational modeling theory, socio-economic systems capability and risks assessment and investigation, model based architecture of software for project management, geida@iias.spb.su.

Grants and projects

Grant of the Russian Foundation for Basic Research (RFBR) No. 16-08-00953 A "Conceptual and methodological foundations of theory of complex technical systems potentiality", 2016-2018.

Participation in conferences and exhibitions

The 5th All-Russian Scientific and Practical Conference "Problems and objectives of the pragmatic analytic". Non-profit association "Association ""Analytic", November, 2018 – Geida A.

The 22nd Conference of Open Innovations Association FRUCT 2018, May 15-18, 2018, Juvaskula, Finland – Geida A.

International scientific conference Mechanical Science and Technology Update, February 27-28, 2018, Omsk, Russia – Geida A.

Far East Conference "FasrEastCon", 2-4 October 2018, Vladivostok, Russia – Geida A.

All-Russian Scientific and Practical Conference "Modern technologies of digital economy decision making", November 17, 2018, Ural, Russia – Geida A.

The 23rd Conference of Open Innovations Association FRUCT, November 15-17, 2018, Bologna, Italy – Geida A.

St. Petersburg seminar at SPIIRAS for the scientific Council for Informatization of St. Petersburg "Informatics and automation", November 21, 2018 – Geida A.

International Conference "Applied Mathematics, Computational Science and Mechanics: Current Problems", December 17-19, 2018, Voronezh, Russia – Geida A.

Recent results

The fundamentals of the concept, methodology, models, methods and the prototype of the software tool for analytical study of the information technologies usage effectiveness in the course of operation of technological systems, which allows to automate the modeling of the functioning of systems and to predict their effectiveness, not previously modelled analytically, which makes it possible to use popular means of business and technological modeling to solve new actual problems have been developed [1,6].

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Papers published in editions, indexed by WoS, Scopus:

1. *Geida A., Lysenko I., Yusupov R., Ashimov A.* System Functioning Efficiency and Other System Operational Properties: Research

Problems, Evaluation Method // SPIIRAS Proceedings. 2018. vol. 5(60). pp. 241–270. (In Russ.). (Scopus, SJR=0,16, Q4).
2. *Geyda A.S., Lysenko I.V.* Information Technology Efficiency models for Agile systems functioning // Conference of Open Innovation Association FRUCT. 2018. vol. 22. pp. 313–319.
3. *Geyda A.S., Lysenko I.V.* Information technologies usage models during agile systems functioning // Journal of Physics: Conference Series. 2018. vol. 1050. pp. 012027. DOI: 10.1088/1742-6596/1050/1/012027.
4. *Geyda A.S.* Information technologies usage models for efficiency of agile systems functioning improvement // IOP Far East Conference Series: Materials Science and Engineering. 2018. Article 2.145.
5. *Geyda A.S.* Estimation of Information Technology Enabled Dynamic Capabilities Indicators // Conference of Open Innovation Association FRUCT Proceedings, 2018. vol. 23.
6. *Geyda A.S., Kalaydov M.V.* Models and methods for information technologies usage operational properties estimation // IS IT TPU Conference. Yugra polytehnical institute. 2018.
7. *Geyda A.S.* Information technology dynamic capability indicators analytical estimation. International Conference "Applied Mathematics, Computational Science and Mechanics: Current Problems". 2018.

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

8. *Geida A.* Models and methods of refined systems potential analytical estimation // Modern science-intensive technologies. 2018. vol. 1(22). (In Russ.).
9. *Geida A.* Methodological foundations of analytical estimation of economical systems digitalization performance // Fundamental researches. 2018. vol. 11 (part 2). pp. 211–215. (In Russ.). (Impact factor – 1,118).
10. *Geida A., Kalaidov M.* Conceptual and formal models of information technologies usage for agile systems functioning // STATE and BUSINESS. Modern Problems of Economics. X International conference. 2018. Issue 1. pp. 78–83. (In Russ.).

11. *Geida A., Grankin B.* Graphs numerical codes and their usage for structural and functional research of systems and control objects // Information Technologies in Control. 2018. (In Russ.).
12. *Geida A*. Analytical estimation of the agile technological system operational properties // Regional Informatics and Information Security (RIIB-2018). 2018. vol. 5. pp. 28–33. (In Russ.).

Other publications:

13. *Geyda A, Tsarev V.* Evaluation of improved systems operational properties with regard of information technologies usage on the example of usage of knowledge representation and process modeling diagram technologies // "Problems and objectives of pragmatic analytics". M.: non-profit association "Association "Analytica". 2018. (In Russ.).
14. *Geida A., Kalaidov M.* Methods of information technologies usage operational properties estimation // STATE and BUSINESS. Modern Problems of Economics. 2018. Issue 1. pp. 83–89. (In Russ.).

Laboratory of Computer Aided Integrated Systems

Head of the laboratory: Dr. Tech. Sc., Prof., Honored Scientist of the Russian Federation Prof. Alexander V. Smirnov – intelligent configuration management of virtual & networked organizations and knowledge logistics, smir@iias.spb.su; http://cais.iias.spb.su.

Laboratory staff: 19 members.

Research activities – methods and technologies for knowledge logistics and intelligent management of virtual resource networks.

Research fellows and brief information of the research-work direction

Senior Researcher PhD – Alexey M. Kashevnik – methods and technologies for knowledge management in intelligent environments, alexey@iias.spb.su.

Senior Researcher PhD – Tatiana V. Levashova – methods and technologies for ontology management, tatiana.levashova@iias.spb.su.

Senior Researcher PhD – Nikolai A. Mustafin – methods and models for complex decision support.

Senior Researcher PhD – Michael P. Pashkin – Internet-based technologies for group decision support, michael@.iias.spb.su.

Senior Researcher PhD – Andrew V. Ponomarev – methods and technologies for complex decision support, ponomarev@iias.spb.su.

Senior Researcher PhD – Sergey V. Savosin – methods and information technologies for business process management.

Senior Researcher PhD – Oksana V. Smirnova –methods and information technologies for ontology-oriented decision support, sov@oogis.ru.

Senior Researcher PhD Assoc. Prof. – Nikolai G. Shilov – models and methods for networked organization configuration, nick@iias.spb.su.

Senior Researcher PhD – Nikolai N. Teslya – smart space technologies, intelligent technologies for smart cities, digital ledger technologies, teslya@iias.spb.su.

Reseacher PhD – Igor B. Lashkov – technologies for dangerous situations prevention of vehicles based on mobile video measurements of driver behavior, igor-lashkov@ya.ru.

Researcher MSc – Maxim S. Shchekotov – mobile services and social media technologies, maxim.shchekotov@gmail.com.

Junior Reseacher MSc – Sergey A. Mikhailov – technologies for context-driven proactive decision support, mikhaylovsergeyandreevich@gmail.com.

Junior Reseacher MSc – Mikhail V. Petrov – technologies for ontology-oriented competence management, dragon294@mail.ru.

Junior researcher MSc Igor A. Ryabchikov – intelligent technologies for smart cities, digital ledger technologies.

Defense of theses

Bachelor Degree, 09.03.02 – Information Systems and Technologies (St.Petersburg State Electrotechnical University "LETI").

Svetlov A. "The Development of Crowd Computing System Based on Smart Contracts Technology" (supervisor – A. Ponomarev).

Scherbakov I. "Semantic Tagging of Large Collections of Objects with a Help of Crowdsourcing" (supervisor – A. Ponomarev).

Master Degree, 38.05.04 – Business Information Systems (ITMO University):

Ryabchikov I. "Development of Distributed Platform Based on BFT-SMaRt for Data Exchange between Supply Chain Participants" (supervisor – N. Teslya).

Stepanenko V. "Competence Management System Design for Residents of ITMO University" Technopark" (supervisor – A. Kashevnik).

Fedotov A.K. "Web-Application Development for Driver Behavior Offline Analysis Based on Data from Dangerous Situation Detection in Vehicle Cabin System" (supervisor – A. Kashevnik).

Taramov A. "Development of a Model of the Proactive Driver Support System Using Contextual Interaction of Services Based on Service-Oriented Architecture" (supervisor – N. Shilov).

Komzalov A. "Specification of Requirements to Proactive Personalized Intelligent Driver Assistance Systems" (supervisor – N. Shilov).

Reiz. A. (Germany) "Development of a Method to Match Diagrams in PowerPoint Slides to Enterprise Meta Models on the Basis of an ADOxx Meta Model Library" (supervisor – N. Shilov).

Oehmgen F. (Germany) "Crowdsourcing Patterns" (supervisor – A. Ponomarev).

Danilova V. "The development of a Decentralized User-Centric Recommender System Architecture" (supervisor – A. Ponomarev).

Master Degree, 09.04.02 – Information Systems and Technologies (St.Petersburg State Electrotechnical University "LETI"):

Treierova A. "Presentation of Context-Sensitive Personalized Information in Public Places" (supervisor – N. Shilov).

Grants and projects

Smirnov A. – Intelligent Content Management for on-Demand Personalized Tours in Smart Destinations (Ford Motor Company, USA, 2017-2019).

Smirnov A. – Knowledge Network for Language Experts (Festo, Germany, 2018-2019).

Smirnov A. – Methods and Models for Intelligent Decision Support Based on Human-Computer Cloud (the Russian Science Foundation, 2016-2018 – Grant No. 16-11-10253).

Teslya N. – Ontological Modelling of Blockchain-based Industrial Socio-Cyberphysical Systems (the Russian Science Foundation, 2017-2018 – Grant No. 17-71-10223).

Kashevnik A. – Development of Methodology and Models of Context-Driven Knowledge Sharing for Service-Oriented Decision Support Systems (the Russian Foundation for Basic Research, 2016-2018 – Grant No. 16-07-00462).

Pashkin M. – Development of Methods and Models of Intelligent Decision Support for Personalized Intangible Products Configuring (the Russian Foundation for Basic Research 2016-2018 – Grant No. 16-07-00375).

Ponomarev A. – Development of Methodology and Models for Decision-Support Systems Based on Crowd Computing (the Russian Foundation for Basic Research, 2016-2018 – Grant No. 16-07-00466).

Ponomarev A. – Development and Analysis of Quality Control Methods in Large-Scale Human-Computer Computation Systems (the Russian Foundation for Basic Research, 2016-2018 – Grant No. 16-37-60107 mol_dk).

Mustafin N. – Theoretical and Technological Foundations of Poly-Model Context-Aware Recommendation Systems (the Russian Foundation for Basic Research, 2016-2018 – Grant No. 16-07-00463).

Smirnov A. – Decision Support Models at Joint Activities of Socio-Cyberphysical System Participants (the Russian Foundation for Basic Research, 2017-2019 – grant № 17-07-00247).

Levashova T. – Models of Knowledge Acquisition by Resources of Socio-Cyberphysical Systems at Decision Making (the Russian Foundation for Basic Research, 2017-2019 – grant № 17-07-00248).

Savosin S. – Ontology Alignment Method Development Based on Composition of Neural Networks (the Russian Foundation for Basic Research, 2017-2019 – grant № 17-07-00328).

Teslya, N. – Development of Theoretical and Technological Foundations of Cognitive Assistants for Decision Making in Ontology Alignment (the Russian Foundation for Basic Research, 2017-2019 – grant № 17-07-00327).

Shilov N. – Development of Models for Vehicle Incidents Alerting based on Mobile Video Measurements of a Driver Behavior (the Russian Foundation for Basic Research, 2017-2020 – grant № 17-29-03284-ofi).

Teslya N. – Theoretical and Technological Foundations of the Formation and Decentralized Planning of the Intellectual Robots Coalition Behavior Based on Socio-inspired Self-organization and Smart Contracts (the Russian Foundation for Basic Research, 2017-2020 – grant № 17-29-07073-ofi, jointly with Prof. B. Sokolov lab, SPIIRAS).

Smirnova O. – Development of the Theoretical Framework of Context-Driven Information Integration for Decision Support in the Area of Marine Traffic Safety (the Russian Foundation for Basic Research, 2018-2020 – grant № 18-07-01203).

Smirnov A. – Development of Theoretical and Technological Foundations of Intelligent Decision Support in the Area of Integrated Urban Arterial Transportation Planning in Metropolitan Areas Taking into Account Preferences of Passengers of Various Social Groups ((the Russian Foundation for Basic Research, 2018-2020 – grant № 18-07-01272, jointly with Prof. B. Sokolov lab, SPIIRAS).

University courses

SPSEEU: Department of Information Technologies and Information Security: Intelligent Data Analysis – N. Shilov.

SPSEEU: Theory of Decision Making – A. Ponomarev.

SPSEEU: Functional and Logical Programming – A. Ponomarev.

ITMO University: Information Technologies and Programming Faculty: Information Technologies for Socio-Cyberphysical Systems – A. Smirnov.

ITMO University: Knowledge Management, Service-Oriented Intelligent Systems (Assoc. Prof. A. Kashevnik – N. Teslya.

SPIIRAS: Department of Post-Graduate Studies, Information & Educational Technologies, and Services – Technologies and Program Tools for Intelligent Systems Creation – A. Kashevnik, A. Ponomarev.

International cooperation

Smirnov A. – consulting of Ford Motor Company (USA) and Festo (Germany).

Participation in conferences and exhibitions

The 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" - 2018 (ER(ZR)-2018), April 18-21, 2018, St.Petersburg, Russia –Teslya N., Kashevnik A., Mikhailov S.

The 22st Conference of Open Innovations Association FRUCT, May 15-18, 2018, Jyvaskyla, Finland – Teslya N., Kashevnik A.

The DTGS: International Conference on Digital Transformation and Global Society, May 30 - June 2 2018, St.Petersburg, Russia – Petrov M.

The 2018 IEEE International Conference on Smart Computing, June 18-20, 2018, Taomina, Italy –Teslya N.

The IFIP 15th International Conference on Product Lifecycle Management (PLM 18), July 1-4, 2018, Turin, Italy –Smirnov A.

The 16th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2018), July 11-13, 2018, Bergamo, Italy –Smirnov A.

The First International Workshop on Blockchain and Smart Contract Technologies (BSCT), July 18-20, 2018, Berlin, Germany –Teslya N.

The 10th Workshop on Applications of Knowledge-Based Technologies in Business (AKTB 2018), July 18-20, 2018, Berlin, Germany –Shilov N.

The 18th International Conference on Next Generation Wired/Wireless Networking and 11th Conference on Internet of Things and Smart Spaces (NEW2AN 2018 and ruSMART 2018), August 27-29, 2018, St.Petersburg, Russia –Shilov N.

The Intelligent Systems and Technologies Conference (IS&IT'18), September 3-9, 2018, Divnomorskoe, Russia –Smirnov A.

The Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18), September 17-21, 2018, Sochi, Russia –Smirnov A.

The 20th International Conference on Speech and Computer (SPECOM 2018), September 18-22, 2018, Leipzig, Germany – Kashevnik A.

The Third International Conference on Interactive Collaborative Robotics (ICR 2018), September 18-22, 2018, Leipzig, Germany – Kashevnik A.

The 17th International Conference on Perspectives in Business Informatics Research (BIR 2018), September 24-26, 2018, Stockholm, Sweden –Smirnov A.

The 2018 International Conference on Intelligent Systems (IS), September 25-27, 2018, Madeira, Portugal –Kashevnik A.

The VI International Scientific & Practical Conference "Progress of Vehicles and Transport Systems", October 9-11, 2018, Volgograd, Russia – Kashevnik A.

The Scientific Conference of the Research Projects Presidential Funding Program Winners "Leaders of Science", November 1-2, 2018, Moscow, Russia –Kashevnik A.

The 23rd IEEE FRUCT Conference, November 13-16, 2018, Bologna, Italy – Petrov M., Kashevnik A., Smirnov A., Ponomarev A., Shchekotov M.

Membership in Russian and International societies, editorial boards, etc.

Smirnov A. – an expert of the Russian Ministry of Education and Science in the area "Information Technologies and Computational Systems", an expert of Analytical Center of Russian Government; a member of technical committee of IFAC TC 5.1 on Manufacturing Plant Control; a member of technical committee of IFIP TC WG5.1 on Global Product Development for the Whole Life-Cycle; a member of IEEE, a member of technical committee of IEEE SMC TC on Cyber-Physical Cloud Systems; a member of technical committee of IEEE SMC TC on Cognitive Situation Management, a honorary member of International Association "Institute for Systems and Technologies of Information, Control and Communication", and a fellow of the European Academy of Industrial Management. A member of Advisory Committee & Editor Boards: Journal on Information

Technologies and Computer Systems (Russian Academy of Sciences, Russia); Journal "Proceeding of the Institute for Systems Analysis of the Russian Academy of Sciences" (Russian Academy of Sciences, Russia) Journal on Artificial Intelligent and Decision Making (Russian Academy of Sciences, Russia; Scopus); Journal of Information & Control Systems (Russia, Scopus); Journal "SPIIRAS Proceedings" (SPIIRAS, Russia; Scopus), International Journal of Multiagent and Grid Systems (IOS Press, Scopus); International Journal of Data Analysis Techniques and Strategies (Inderscience Publishers, Scopus); Management and Production Engineering Review (the Polish Academy of Sciences, Scopus); International Journal of Product Lifecycle Management (Inderscience Publishers, Scopus).

Levashova T. – a member of Editor Board of Journal "Complex Systems Informatics and Modeling Quarterly" (RTU Press).

Kashevnik A. – a secretary of the Working Group on Smart Spaces, the Open Innovations Association FRUCT (Finnish-Russian University Cooperation in Telecommunications); an Editor of international Journal of Embedded and Real-Time Communication Systems (IGI Global).

Shilov N. – a member of Editor Board of international Journal of Embedded and Real-Time Communication Systems (IGI Global).

Ponomarev A. – a member of ACM, a member of Editor Board of international Journal of Embedded and Real-Time Communication Systems (IGI Global).

Intellectual property

PC program "The system for scientific team publication activity analysis", author N. Shilov, registration date Nov. 16, 2018, registration number №2018664460, URL: https://rosrid.ru/rid/ESX2RIRIRKUOS28JQHCGLERO.

Recent results

1. An ontology-oriented approach to describing mechanisms of interaction of socio-cyberphysical system participants has been developed that differs from existing ones due to integration of distributed digital ledger and smart space technologies, as well as application of the SUMO ontology (Suggested Upper Merged Ontology, IEEE Robotics and Automation Society), which enable the exchange of knowledge between the participants with the ability to control the authorship of new knowledge and the

distribution of existing knowledge between them, as well as application of consensus mechanisms to achieve new knowledge formation and coordination [13-15].

2. A scenario model for knowledge acquisition while decision making by cyber and social resources of socio-cyberphysical systems has been developed that describes scenarios of information interactions where the cyber resources acquire knowledge from the domain ontology, from each other, and from humans through information channels of Internet community, which ensures the convenience for various categories of users and the widespread availability of the resources of socio-cyber-physical systems for the interactions [12, 16].

3. A multi-criteria model of the preferences of a socio-cyberphysical system participant and a method of forming context-driven recommendations to participants of such systems have been developed that differ from existing ones due to the consideration of multiple criteria for evaluating objects (or situations) and automatic determination of the relative importance of the criteria depending on the context; and enabling solving of two major tasks of recommender system application: to rank objects according to the predicted subjective overall utility with given weights of particular criteria and to rank objects according to the predicted subjective overall utility in a given context [40, 43].

4. A service-oriented architecture of context-dependent audio and video tourist support system has been proposed based on the ontology-oriented integration of information and knowledge available in Internet services / resources that uses the "publish / subscribe" mechanism and generates personalized recommendations presented through a smartphone. It differs from existing approaches oriented to selection of one support scenario among available, due to its significantly higher flexibility and adaptability to tourist's preferences and current situation [7, 9].

5. A methodology for context-oriented recommender system creation aimed at preventing emergency situations by analyzing the driver's behavior in the vehicle cabin has been developed that differs from existing ones due to the usage of camera and smartphone's built-in sensors for mobile video measurements of driver's face images (face characteristics, head position), parameters the vehicle (acceleration, speed, trajectory) and parameters of the driver's environment (noise level and temperature in the cabin). The methodology enables design of vehicle active safety systems aimed at

monitoring the driver condition and generating recommendations to him / her [8, 17].

6. An approach to define a product configuration preferred by the customer from a set of alternatives has been proposed based on consideration of customer-specific value functions and weight significance as criteria. The criteria values are revealed based on the configured product ontology and customer profiling results obtained through analysis of the customer decisions in the processes of configuring or purchasing various products. The approach has been approved by examples of a preferred configuration definition for a mobile operator product and for industrial automation products [1-4].

Awards

Kashevnik A. – Diploma of the laureate of the All-Russian competition for the best scientific book of 2017 "Novel Design and the Applications of Smart-M3 Platform in the Internet of Things: Emerging Research and Opportunities".

Mikhailov S., Kashevnik A. – Best Demo Award "Smartphone Application for Tourist Assistance Based on OpenStreetMaps Data" on the conference of open innovation association FRUCT with support of Future Internet Joirnal.

Kashevnik A., Lashkov I. – Best Demo Award "DriveSafety: Mobile Application and Statistics Analysing Service" on the conference of open innovation association FRUCT.

Smirnov A. – Best Paper Award in the Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18), Sochi, Russia, September 17-21, 2018; the joint paper with Ford Motor Company "Context-Dependent Guided Tours: Approach and Technological Framework".

References

Papers prepared jointly with foreign organizations:

1. *Sandkuhl K., Wißotzki M., Smirnov A., Shilov N.* Digital Innovation Based on Digital Signage: Method, Categories and Examples // International Conference on Business Informatics Research. 2018. vol. 330. pp. 126–139. (WoS, Scopus).
2. *Reiz A., Sandkuhl K., Smirnov A., Shilov N.* Grass-Root Enterprise Modeling: Issues and Potentials of Retrieving Models from

Powerpoint // The Practice of Enterprise Modeling. 2018. vol. 335. pp. 55–70. (WoS, Scopus).
3. *Gusikhin O., Shah A., Makke O., Smirnov A., Shilov N.* Dynamic Cloud-Based Vehicle Apps Information Logistics in Disaster Response // Proceedings of the 4th International Conference on Vehicle Technology and Intelligent Transport Systems (VEHITS 2018). 2018. pp. 626–635. (Scopus).
4. *Smirnov A., Shilov N., Oroszi A., Sinko M., Krebs T.* Changing information management for product-service system engineering: customer-oriented strategies and lessons learned // International Journal of Product Lifecycle Management. 2018. vol. 11(1). pp. 1–18. (Scopus, SJR=0,33, Q2).
5. *Sandkuhl K.E.D, Smirnov A.V.* Knowledge Management in Production Networks: Classification of Knowledge Reuse Techniques // SPIIRAS Proceedings. 2018. vol. 1(56). C. 5–33. (Scopus, SJR=0,16, Q4).
6. *Sandkuhl K., Smirnov A.* Context-Oriented Knowledge Management in Production Networks // Applied Computer Systems. 2018. vol. 24. Issue 1. (WoS).
7. *Sandkuhl K., Smirnov A., Shilov N., Wißotzki M.* Targeted Digital Signage: Technologies, Approaches and Experiences // Internet of Things, Smart Spaces, and Next Generation Networks and Systems. 2018. vol. 11118. pp. 77–88. (Scopus).
8. *Sandkuhl K., Wißotzki M., Smirnov A., Shilov N.* Digital Innovation Based on Digital Signage: Method, Categories and Examples // International Conference on Business Informatics Research. 2018. pp. 126–139.
9. *Kim J., Sato K., Hashimoto N., Kashevnik A., Tomita K., Miyakoshi S., Takinami Y., Matsumoto O., Boyali A.* Impact of the Face Angle to Traveling Trajectory During the Riding Standing-Type Personal Mobility Device // Proceedings of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" - 2018 (ER(ZR)-2018). 2018. vol. 161. pp. 1–6. (WoS, Scopus).
10. *Smirnov A., Shilov N., Gusikhin O.* Context-Dependent Guided Tours: Approach and Technological Framework // Proceedings of the Third International Scientific Conference "Intelligent Information

Technologies for Industry" (IITI'18). 2018. vol. 874. pp. 43–50. (Scopus).

11. *Smirnov A., Sandkuhl K., Shilov N., Teslya N.* Service Self-Contextualization in Cyber-Physical Systems based on Context Modeling and Context Variation // The Joint Proceedings of the BIR 2018 Short Papers, Workshops and Doctoral Consortium co-located with 17th International Conference Perspectives in Business Informatics Research (BIR 2018). 2018. vol. 2218. pp. 94–105. (Scopus).
12. *Stepanenko V., Kashevnik A., Gurtov A*. Context-Oriented Competence Management in Expert Networks // SPIIRAS Proceedings. 2018. vol. 4(59). pp. 164–191. (In Russ.). (Scopus, SJR=0,16, Q4).

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13. *Smirnov A., Ponomarev A., Shilov N., Kashevnik A., Teslya N.* Ontology-Based Human-Computer Cloud for Decision Support: Architecture and Applications in Tourism // International Journal of Embedded and Real-Time Communication Systems (IJERTCS). 2018. vol. 9(1). pp. 1–19. (Scopus, SJR=0,18, Q3).
14. *Kashevnik A., Smirnov A., Teslya N.* Ontology-Based Interaction of Mobile Robots for Coalition Creation // International Journal of Embedded and Real-Time Communication Systems. 2018. vol. 9(2). pp. 63–78. (Scopus, SJR=0,18, Q3).
15. *Smirnov A., Levashova T., Kashevnik A.* Ontology-Based Resource Interoperability in Socio-Cyber-Physical Systems // Information Technology in Industry. 2018. pp. 19–25. (WoS).
16. *Kashevnik A., Teslya N.* Blockchain-Oriented Coalition Formation by CPS Resources: Ontological Approach and Case Study // Electronics. 2018. vol. 7(5). pp. 1–16. (WoS, Q1).
17. *Smirnov A., Ponomarev A., Levashova T., Teslya N.* Human-Machine Cloud Decision Support in Tourism // Scientific and Technical Information Processing. 2018. vol. 45(5). (Scopus, SJR=0,23, Q2).
18. *Smirnova O.* Situation Awareness for Navigation Safety Control // The International Journal on Marine Navigation and Safety of Sea Transportation. 2018. vol. 12. no. 2. pp. 383–388. (WoS).

19. *Smirnov A., Kashevnik A.* Semantic Interoperability for Coalition Creation by Mobile Robots and Humans: an Approach and Case Study // 16th IFAC Symposium on Information Control Problems in Manufacturing (INCOM 2018). 2018. vol. 51(11). pp. 1409–1414. (WoS, Scopus).
20. *Kashevnik A., Kalyazina D., Parfenov V., Shabaev A., Lashkov I., Baraniuc O., Khegai M.* Ontology-Based Human-Robot Interaction: An Approach and Case Study on Adaptive Remote Control Interface // Interactive Collaborative Robotics, Third International Conference on Interactive Collaborative Robotics (ICR 2018). 2018. LNAI 11097. pp. 116–125. (Scopus).
21. *Shilov N., Kashevnik A., Mikhailov S.* Context-Aware Generation of Personalized Audio Tours: Approach and Evaluation // Speech and Computer, 20th International Conference on Speech and Computer (SPECOM 2018). 2018. LNAI 11096. pp. 615–624. (Scopus).
22. *Smirnov A., Ponomarev A., Levashova T., Shilov N.* Platform-as-a-Service for Human-Based Applications: Ontology-Driven Approach // Proceedings - IEEE 7th International Symposium on Cloud and Service Computing (SC2). pp. 157–162. (Scopus).
23. *Mikhailov S., Kashevnik A.* Smartphone-Based Tourist Trip Planning System: a Context-Based Approach to Offline Attraction Recommendation // Proceedings of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" - 2018 (ER(ZR)-2018), 2018. vol. 161. pp. 1–6. (WoS, Scopus).
24. *Teslya N., Smirnov A.* Blockchain-Based Framework for Ontology-Oriented Robots' Coalition Formation in Cyberphysical Systems // Proceedings of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" - 2018 (ER(ZR)-2018). 2018. vol. 161. pp. 1–6. (WoS, Scopus).
25. *Teslya N., Ryabchikov I.* Ontology-Driven Approach for Describing Industrial Socio-Cyberphysical Systems' Components // Proceedings of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" - 2018 (ER(ZR)-2018). 2018. vol. 161. pp. 1–6. (WoS, Scopus).
26. *Fedotov A., Lashkov I., Kashevnik A.* Web-Service for Drive Safely System User Analysis: Architecture and Implementation //

Proceedings of the 22st Conference of Open Innovations Association FRUCT. 2018. pp. 40–47. (WoS, Scopus).
27. *Teslya N., Ryabchikov I.* Blockchain Platforms Overview for Industrial IoT Purposes // Proceedings of the 22st Conference of Open Innovations Association FRUCT. 2018. pp. 250–256. (WoS, Scopus).
28. *Petrov M., Kashevnik A., Stepanenko V.* Competence-Based Method of Human Community Forming in Expert Network for Joint Task Solving // International Conference on Digital Transformation and Global Society. 2018. vol. 858. pp. 24–38. (WoS, Scopus).
29. *Smirnov A., Teslya N., Ponomarev A., Kashevnik A.* Profiling Contributors in the Human-Computer Cloud // Proceedings of the 2018 IEEE International Conference on Smart Computing. 2018. pp. 37–42. (Scopus).
30. *Smirnov A., Ponomarev A., Shilov N.* Ontology-Driven Human-Computer Cloud for Decision Support // Proceeding of the 3rd Russian-Pacific Conference on Computer Technology and Applications (RPC). 2018. (Scopus).
31. *Smirnov A., Levashova T., Shilov N., Ponomarev A.* Human-Computer Cloud for Decision Support: Main Ontological Models and Dynamic Resource Network Configuration // Proceedings of the Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18). 2018. vol. 874. pp. 16–25. (Scopus).
32. *Teslya N., Ryabchikov I.* Ontology-based Semantic Models for Industrial IoT Components Representation // Proceedings of the Third International Scientific Conference "Intelligent Information Technologies for Industry" (IITI'18). 2018. vol. 874. pp. 138–147. (Scopus).
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34. *Kashevnik A., Fedotov A., Lashkov I.* Dangerous Situation Prediction and Driving Statistics Accumulation Using Smartphone // Proceedings

of the 2018 International Conference on Intelligent Systems (IS). 2018. (Scopus).

35. *Shilov N., Smirnov A., Petrov M., Parfenov V.* On-Board Dynamic Tour Support System: The Concept and Technological Infrastructure // Proceedings of the 23rd IEEE FRUCT Conference. 2018.
36. *Shchekotov M., Shilov N.* Semi-Automatic Self-Calibrating Indoor Localization Using BLE Beacon Multilateration // Proceedings of the 23rd IEEE FRUCT Conference. 2018. (Scopus).
37. *Smirnov A., Shchekotov M., Shilov N., Ponomarev A.* Decision Support Service Based on Dynamic Resource Network Configuration in Human-Computer Cloud // Proceedings of the 23rd IEEE FRUCT Conference. 2018. (Scopus).
38. *Kashevnik A., Lashkov I.* Decision Support System for Drivers & Passengers: Smartphone-Based Reference Model and Evaluation // Proceedings of the 23rd IEEE FRUCT Conference. 2018. pp. 166–171. (Scopus).
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40. *Petrov M., Kashevnik A.* Expert Group Formation for Task Performing: Competence-Based Method and Implementation // Proceedings of the 23rd IEEE FRUCT Conference. 2018. pp. 315–320. (Scopus).
41. *Ponomarev A.* Model and Method for Contributor's Quality Assessment in Community Image Tagging Systems // Information and Control Systems. 2018. vol. 4. pp. 45–51. (In Russ.). (Scopus).
42. *Lashkov I.* Smartphone-Based Approach to Determining Driving Style with On-Board Sensors // Information and Control Systems. 2018. vol. 5. pp. 2–12. (In Russ.). (Scopus).
43. *Shchekotov M.* The method of indoor localization and collaborative semi-automatical Wi-Fi radomap constraction // Information and Control Systems. 2018. vol. 6. (In Russ.). (Scopus).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

44. *Taramov A.A., Shilov N.G.* Recommender Systems for Driver Information Support: State-of-the-Art Review // Proceedings of

TUSUR. 2018. Issue 21. vol. 2. pp. 68–74. (In Russ.). (Impact factor – 0,399).
45. *Ponomarev A.* Ontology for Applications that Use Elements of Crowd Computing // Cybernetics and Programming. 2018. vol. 3. pp. 25–37. (In Russ.). (Impact factor–0,560).
46. *Levashova T., Pashkin M.* Model for Definition of Preferred Product Configuration // Proceedings of TUSUR journal. 2018. Issue 21. vol. 2. pp. 68–74. (In Russ.). (Impact factor – 0,399).
47. *Karpovich S., Smirnov A., Teslya N.* Text Documents Classification Based on Probabilistic Topic Model // Artificial Intelligence and Decision Making. 2018. Issue 3. pp. 69–77. (In Russ.). (Impact factor – 0,754).
48. *Smirnova O.* Situation Awareness to Safety Control // Journal on Informatization and Communication. 2018. vol. 2. pp. 130–7134. (In Russ.). (Impact factor – 0,399).
49. *Smirnov A.V., Kashevnik A.M.* Models and Method for Ontology-Oriented Interaction of Mobile Robots in Dynamically Forming Hybrid Coalitions // "Progress of Vehicles and Transport Systems". 2018. (In Russ.).
50. *Smirnov A., Kashevnik A., Teslya N., Shilov N.* System for Infomobile Tourist Support in Smart City Infrastructure // Proceedings of the XII all-Russian conference "Methodological problems of macro-system control". 2018. pp. 49–52. (In Russ.).

Other Publications:

51. *Kalyazina D., Kashevnik A.* Socio-Cyberphysical System Resource Semantic Interoperability: General Scenarios and Ontology // Proceedings of the 22st Conference of Open Innovations Association FRUCT. 2018. pp. 40–47. (In Russ.).
52. *Smirnov A., Shilov N.* Technological Infrastructure of Context-driven Car-based Tour Support System // International Conference on Intelligent Systems and Information Technologies (IS&IT'18). 2018. (In Russ.).
53. *Mikhailov S.* Smartphone Application for Tourist Assistance Based on OpenStreetMapsCache // Proceedings of the 23rd Conference of Open Innovations Association FRUCT (abstracts). 2018. pp. 566–568. (In Russ.).

Laboratory of Speech and Multimodal Interfaces

Head of the laboratory: Dr. Tech. Sci. Assoc.Prof. Alexey A. Karpov – development of speech and multimodal human-computer interfaces and systems, karpov@iias.spb.su, http://hci.nw.ru.

Laboratory staff: 11 members.

Research activities – research and development of methods for natural human-computer interaction. Automatic audio-visual speech recognition and understanding. Multimodal user interfaces. Intelligent rooms and spaces. Assistive information technologies and systems for disabled people. Russian sign language research. Computational paralinguistics. Psycho-emotional states recognition.

Research fellows and brief information of the research-work direction

Senior researcher, PhD – Irina S. Kipyatkova – methods for language and acoustic modeling based on artificial neural networks for automatic Russian speech recognition systems, kipyatkova@iias.spb.su.

Principal researcher, D.Sc. (Bio.), Prof. – Elena E. Lyakso – paralinguistic speech analysis, psycho-emotional states detection from speech, analysis of children's speech, lyakso@gmail.com.

Junior researcher – Denis V. Ivanko – audio-visual Russian speech recognition with the use of a microphone and a high-speed video camera, denis.ivanko11@gmail.com.

Junior researcher – Dmitry V. Ryumin – automatic recognition of gestures and elements of Russian sign language, dl_03.03.1991@mail.ru.

Junior researcher – Oksana V. Verkholyak – automatic recognition of speaker's emotional states using voice characteristics and tonality of the text of the statement, overkholyak@gmail.com.

Junior researcher – Alena N. Velichko – methods for automatic detection of destructive paralinguistic phenomena in colloquial speech, velichko.a.n@mail.ru.

Junior researcher – Ildar A. Kagirov – formal representation of Russian sign language grammatical structures, collection and annotation of Russian sign language databases, investigation of gesture based user interfaces in the area of service robotics, kagirov@iias.spb.su.

Programmers (master students)

Alexander Axyonov – visual features calculation methods for automatic lip-reading, a.aksenov95@mail.ru.

Maxim Markitantov – automatic gender and age recognition from speech, m.markitantov@yandex.ru.

Nikita Markovnikov – methods for end-to-end continuous Russian speech recognition, niklemark@gmail.com.

Grants and projects

Karpov A. – Agreement N 14.616.21.0095 (ID: RFMEFI61618X0095) with the Ministry of Science and Higher Education of the Russian Federation, Special federal programme "Research and development in priority areas of development of the scientific and technological complex of Russia for 2014-2020" (Event 2.2), project "Multi-modal interface based on gestures, speech, and sign language for control of an assistive mobile information robot - AMIR", foreign partner: The University of West Bohemia, Pilsen, Czech Republic, 2018-2020.

Karpov A. – Project of the Russian Science Foundation N 18-11-00145 "Development and research of an intelligent system for complex paralinguistic analysis of speech", 2018-2020.

Karpov A. – Grant of the President of the Russian Federation № MD-254.2017.8 "Development and research of an automatic system for recognition of human's natural emotions from speech", 2017-2018.

Kipyatkova I. – Grant of the President of the Russian Federation № MK-1000.2017.8 "Development of a neural network based acoustic model for a Russian speech-to-text conversion system", 2017-2018.

Karpov A. – Project of RFBR N 16-37-60100-mol_a_dk "Development of a universal assistive information technology based on multimodal human-computer interfaces", 2016-2019.

Kipyatkova I. – Project of RFBR N 18-07-01216-a "Development of an end-to-end continuous Russian speech recognition system using deep neural networks", 2018-2020.

Karpov A. – Project of RFBR N 18-07-01407-a "Automatic bimodal recognition of natural emotions in Russian speech", 2018-2020.

Ivanko D. – Project of RFBR N 18-37-00306-mol_a "Methods, models and algorithms of visual signals processing for lip-reading", 2018-2020.

Kipyatkova I. – Grant of the Committee on Science and Higher Education of the Government of St. Petersburg for young PhD researchers "Development and research of hybrid acoustic models based on artificial neural networks with long short-term memory for a system of continuous Russian speech recognition", 2018.

Verkholyak O. – Grant of the Committee on Science and Higher Education of the Government of St. Petersburg for young researchers "Automatic recognition of speakers" emotional states from voice features in the flow of a dialogue speech (based on long short-term memory artificial neural networks)', 2018.

Karpov A. – R&D contracts on "Development of voice control module software for a robotic exoskeleton for medical purposes" with the Volga State Technological University (VSTU, Yoshkar-Ola) within the framework of the integral project in the framework of the Government Statement No. 218, 2017-2019.

Karpov A. – R&D contract with Huawei Technologies Co. (Shenzhen, China), within the framework of the innovation research program HIRP Open, 2017-2018.

Karpov A. – R&D contract with "ASM Solutions" LLC. (Moscow), 2018.

University courses

ITMO University: Speech Recognition – A. Karpov.

SUAI University: Automated information management systems, Speech Recognition Technologies – I. Kipyatkova.

Scientific and organizational activity

Organization and holding of 20th international conference on Speech and Computer SPECOM-2018. http://specom.nw.ru/history/sites/2018. Leipzig, Germany, 18–22 September 2018 г. – A. Karpov (co-chairperson). Proceedings published in: Speech and Computer. Springer International Publishing Switzerland. A. Karpov et al. (Eds.): SPECOM 2018, LNAI 11096, 2018, 791 p. https://www.springer.com/de/book/9783319995786.

International cooperation

Joint research and organization of scientific events in cooperation with the University of West Bohemia (Czech Republic), Bogazici University (Turkey), Namık Kemal University (Turkey), Leipzig University of

Telecommunications (Germany), University of Patras (Greece), Dresden University of Technology (Germany), Ulm University (Germany), United Institute of Information Problems of the National Academy of Sciences of Belarus, University of Aizu (Japan), University of Hertfordshire (Great Britain), Huawei Technologies company (China).

Participation in conferences and exhibitions

20th International Conference "Speech and Computer" SPECOM-2018, 12-16 September 2018, Leipzig, Germany – Karpov A., Kipyatkova I., Ivanko D. (conference co-organization).

3rd International Conference on Interactive Collaborative Robotics ICR-2018, 18-22 September 2018, Leipzig, Germany – Ivanko D., Karpov A.

19th International Conference INTERSPEECH-2018, 2-6 September 2018, Hyderabad, India – Karpov A., Verkholyak O.

11th International Conference "Empirical Methods in Natural Language Processing" EMNLP-2018, 31 October – 4 November 2018, Brussels, Belgium – Verkholyak O.

Conference "Information Technologies in Control" (ITU-2018) (as a part of the 11th Multi-conference on Control Problems MKPU-2018), 2-4 October 2018, St. Petersburg – Karpov A., Kagirov I., Verkholyak O., Velichko A., Markitantov M., Markovnikov N., Kipyatkova I. (organization of the section "IT in HCI").

16th St. Petersburg International Conference "Regional Informatics" (RI-2018), 24-26 October 2018, St. Petersburg – Kagirov I.

Workshop "Emotion AI", 30 March 2018, St. Petersburg – Velichko A., Verkholyak O.

Membership in Russian and International societies, editorial boards, etc.

Karpov A. – expert of the RAS; member of the European Association for Signal Processing (EURASIP), EURASIP Local Liaison Officer in Russia, member of the International Speech Communication Association (ISCA), member of the International Association for Pattern Recognition (IAPR); Editorial board member of the journals "SPIIRAS Proceedings" (St. Petersburg), "Speech Technologies" (Moscow) and "Informatics" (Minsk); Guest editor of the Journal on Journal on Multimodal User Interfaces (Springer), Speech Communication (Elsevier), Journal of

Electrical and Computer Engineering (Hindawi); reviewer of several international journals IEEE/ACM Transactions on Audio, Speech and Language Processing; IEEE Transactions on Affective Computing; IEEE Transactions on Biomedical Engineering; IEEE Journal of Biomedical and Health Informatics; Neurocomputing; Computer Speech & Language; Speech Communication; IEEE Signal Processing Letters, Pattern Recognition Letters; Pattern Recognition; Language Resources and Evaluation; Soft Computing; Journal of Information Science; Acoustical Physics etc.; co-chair of the International Conference SPECOM series, technical/program committee member of the international conferences INTERSPEECH, ICASSP, ICPR, SLTU, SPECOM, Baltic HLT, HBU, SIU, DOGS, etc.

I. Kipyatkova – technical/programme committee member of the international conferences INTERSPEECH, ICASSP, SPECOM, ISNN, member of the organizing committee of the international conference SPECOM series; member of the International Speech Communication Association (ISCA).

O. Verkholyak – member of the International Speech Communication Association (ISCA), member of the Association for Computational Linguistics (ACL).

Intellectual property

Certificate on Software Registration № 2018662956 issued on 17 October 2018 by the Russian Federal Service for Intellectual Property. A. Velichko, V. Budkov, A. Karpov. "Software system for automatic identification of deceptive and true information in speech", https://rosrid.ru/rid/3XZ0PEQR3IJWC0CG1WED6BCR.

Recent Results

1. End-to-end models have been developed based on connectionist temporal classification (CTC) and attention-based encoder-decoder model with the use of convolutional neural networks, recurrent neural networks, long short-term memory models (LSTM), bidirectional LSTM-models, and residual convolutional networks; the end-to-end models were experimentally studied with the usage of different types of acoustic features and language models for Russian speech recognition; they demonstrate less memory consumption and higher recognition speed that makes it possible to use the designed models on mobile platforms. [13, 17].

2. A software system for automatic identification of deceptive and true information in the flow of speech has been developed, based on combining bagging-based data classification methods and k-nearest neighbors algorithm (kNN) and revealed the best results of deceptive speech detection (71.0% UAR – Unweighted Average Recall) on the data taken from Deceptive Speech Database and Real-Life Trial Deception Detection Dataset corpuses; the system can find good prospects in contact centers in order to prevent "telephone terrorism" actions, as well as in the banking sector when making a decision about a loan, during polygraph tests, etc. [15, 23].

3. A software system for cross-corpus speech emotion recognition has been developed based on recurrent neural networks with long short-term memory (LSTM), carrying out tasks of feature preprocessing, domain adaptation, training and prediction of emotional activation and valence; the system differs from analogous systems in that it combines several emotional speech corpora for system training on the segmental markup stage and its application for classification of whole spoken statements. [1, 4].

4. A geometric visual features extraction method has been developed in order to describe configuration of the speaker's lips on the basis of a set of 24 pairs of key points on the speaker's lips and mouth, which makes it possible to maximize the accuracy of tracking the speakers' lips movements and which is characterized by the use of continuous Russian speech video recordings obtained with a high-speed video camera that improves both accuracy and robustness of audio-visual speech recognition in acoustically noisy environments [3].

5. A multimedia database (MDB) of Russian sign language (St. Petersburg dialect) has been created; the database was collected with the use of Microsoft Kinect 2.0 sensor, includes gestures of 150 different lexical items; the recorded sign language data have been annotated based on a set of differential features (handshape, movement modality, localization) and divided into classes for a further teaching of automatic sign language recognition systems based on probabilistic neural networks [6].

Awards, certificates, scholarships

Certificate of the winner of a grant of the Government of St. Petersburg and Saint Petersburg Scientific Center of the Russian Academy of Sciences for outstanding academic results in science and technology in the

nomination "Technical and engineering sciences" – Euler Prize (for young scholars under the age of 35) – I. Kipyatkova.

Diploma of the winner of the St. Petersburg grant competition in 2018 for young PhD from the Government of St. Petersburg – I. Kipyatkova.

Diploma of the winner of the St. Petersburg grant competition in 2017 for young researchers from the Government of St. Petersburg – O. Verkholyak.

Publications

Papers prepared jointly with foreign organizations:

1. *Karpov A.* Efficient and Effective Feature Normalization Strategies for Cross-Corpus Acoustic Emotion Recognition // Neurocomputing. 2018. vol. 275. pp. 1028–1034. DOI: https://.org/10.1016/j.neucom.2017.09.049 (WoS, Q1; JCR=3,241, Scopus, Q1).
2. *Ivanko D. et al.* Multimodal Speech Recognition: Increasing Accuracy using High Speed Video Data // Journal on Multimodal User Interfaces. 2018. vol. 12. no. 4. pp. 319–328. DOI: https://doi.org/10.1007/s12193-018-0267-1. (WoS Q3 JCR=1,140, Scopus Q2).
3. *Karpov A., Mporas I.* Speech Communication Integrated with Other Modalities // Journal on Multimodal User Interfaces. 2018. vol. 12. no. 4. pp. 271–272. DOI: https://doi.org/10.1007/s12193-018-0275-1. (WoS Q3 JCR=1,140, Scopus Q2).
4. *Kaya H. et al.* LSTM based Cross-corpus and Cross-task Acoustic Emotion Recognition // Proc. 19th International Conference INTERSPEECH. 2018. pp. 521–525. DOI: https://doi.org/10.21437/Interspeech.2018-2298.
5. *Fedotov D., Kaya H., Karpov A.* Context Modeling for Cross-Corpus Dimensional Acoustic Emotion Recognition: Challenges and Mixup // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 155–165.
6. *Hlaváč M., Gruber I., Železný M., Karpov A.* LipsID Using 3D Convolutional Neural Network // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 209–214.
7. *Ivanko D., Ryumin D., Axyonov A., Železný M.* Designing Advanced Geometric Features for Automatic Russian Visual Speech

Recognition // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 245–254.
8. *Gruber I., Ryumin D., Hrúz M., Karpov A.* Sign Language Numeral Gestures Recognition using Convolutional Neural Network // International Conference on Interactive Collaborative Robotics. Springer. 2018. vol. 11097. pp. 70–77.
9. *Kanis J., Ryumin D., Krňoul Z.* Improvements in 3D Hand Pose Estimation using Synthetic Data // International Conference on Interactive Collaborative Robotics. 2018. vol. 11097. pp. 105–115.
10. *Ivanko D., Fedotov D., Karpov A.* Accuracy increase for automatic visual Russian speech recognition: viseme classes optimization // Scientific and technical journal of information technologies, mechanics and optics. 2018. Issue 18. vol. 2. pp. 346–349. https://doi.org/10.17586/2226-1494-2018-18-2-346-349. (In Russ.).

Papers published in editions, indexed by WoS, Scopus:

11. *Karpov A.A., Yusupov R.M.* Multimodal Interfaces of Human-Computer Interaction // Herald of the Russian Academy of Sciences. Springer. 2018. vol. 88. no. 1. pp. 67–74. DOI: https://doi.org/10.1134/S1019331618010094. (WoS, JCR=0,472, Q3; Scopus, SJR = 0.23, Q2).
12. *Verkhodanova V., Shapranov V., Kipyatkova I., Karpov A.* Automatic detection of vocalized hesitations in Russian speech // Topics in the Study of Language. 2018. vol. 6. pp. 104–118. DOI: https://doi.org/10.31857/S0373658X0002022-3. (In Russ.). (WoS ESCI, Scopus Q2).
13. *Markovnikov N., Kipyatkova I.* An Analytic Survey of End-to-End Speech Recognition Systems // SPIIRAS Proceedings. 2018. Issue 3. vol. 58. pp. 77–110. http://proceedings.spiiras.nw.ru/ojs/index.php/sp/article/view/3714. (In Russ.). (Scopus, JSR = 0.13, Q4).
14. *Velichko A., Budkov V., Kagirov I., Karpov A.* Comparative Analysis of Classification Methods for Automatic Deception Detection in Speech // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 737–746.
15. *Kipyatkova I.* Improving Russian LVCSR Using Deep Neural Networks for Acoustic and Language Modeling // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 291–300.

16. *Markovnikov N., Kipyatkova I., Lyakso E.* End-to-End Speech Recognition in Russian // International Conference on Speech and Computer. Springer. 2018. vol. 11096. pp. 377–386.
17. *Kryuchkov B., Usov V., Ivanko D., Kagirov I.* Cognitive Components of Human Activity in the Process of Monitoring a Heterogeneous Group of Autonomous Mobile Robots on the Lunar Surface // International Conference on Interactive Collaborative Robotics. Springer. vol. 11097. pp. 148–158.
18. Verkholyak O., Karpov A. Combined feature representation for emotion classification from Russian speech // International Conference on Artificial Intelligence and Natural Language. Springer. 2018. vol. 789. pp. 68–73.
19. *Markovnikov N., Kipyatkova I., Karpov A., Filchenkov A.* Deep neural networks in Russian language recognition // International Conference on Artificial Intelligence and Natural Language. Springer. 2018. vol. 789. pp. 54–67. http://ceur-ws.org/Vol-2233/Paper_7.pdf.
20. *Kipyatkova I., Karpov A.* Language Modeling for Continuous Russian Speech Recognition Systems // Proc. of the R. Piotrowski's Readings in Language Engineering and Applied Linguistics. 2018. vol. 2233. pp. 64–74. http://ceur-ws.org/Vol-2233/Paper_7.pdf. (In Russ.).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

21. *Karpov A.A., Yusupov R.M.* Multimodal interfaces of human-computer interaction // Herald of the Russian Academy of Sciences. 2018. Issue 88. vol. 2. pp. 146–155. DOI: 10.7868/S0869587318020056. (In Russ.).
22. *Velichko A., Budkov V., Karpov A.* Study of classification methods for automatic truth and deception detection in speech // Science Bulletin of Novosibirsk State Technical University (NSTU). 2018. vol. 3(72). pp. 21–32. DOI: 10.17212/1814-1196-2018-3-21-32. (In Russ.).
23. *Ivanko D., Fedotov D., Karpov A.* Accuracy increase for automatic visual Russian speech recognition: viseme classes optimization // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. Issue 18. vol. 2. pp. 346–349. DOI: 10.17586/2226-1494-2018-18-2-346-349. (In Russ.). (Impact factor – 0,465).

24. *Kagirov I., Karpov A.* Analytical overview of multimodal user interfaces for robotic systems // Manned Spaceflight. 2018. vol. 29. no. 4. (In Russ.). (Impact factor – 0,235).
25. *Markovnikov N., Kipyatkova I.* Inquiry of methods for end-to-end Russian speech recognition systems construction // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 518–525. (In Russ.).
26. *Axyonov A., Ryumin D., Ivanko D.* Development of a geometric features system for automatic visual Russian speech recognition // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 526–533. (In Russ.).
27. *Velichko A., Karpov A., Budkov V.* Analytical survey of speech corpora for deception detection systems // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 534–538. (In Russ.).
28. *Markitantov M., Karpov A*. An analytical review of approaches for automatic speaker's age recognition // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 539–542. (In Russ.).
29. *Verkholyak O.* An analytical review of textual corpora in Russian for automatic sentiment analysis // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 548–553. (In Russ.).
30. *Kagirov I.* Analytical overview of robotics systems with multimodal user interfaces // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 563–571. (In Russ.).
31. *Kryuchkov B., Usov V., Ivanko D.* Prospects for the use of smart spaces for information support of a human – operator at remote monitoring a group of mobile robots on the Lunar surface // Proc. Conference "Information Technologies in Control" (ITU-2018). 2018. pp. 572–581. (In Russ.).
32. *Kagirov I.* Basic concept of a robotic shopping cart enabling speech and Russian hand language recognition // Regional Informatics and Information Security (RIIB-2018). 2018. vol. 5. pp. 273–277. (In Russ.).

Other Publications:

33. *Kagirov I.* Salient features of a multimodal user interface enabling Russian (sign) language recognition within a framework of development a robotic shopping // Proceedings of XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 307–308. (In Russ.).

Laboratory of Research Automation

Head of the laboratory: Dr. Tech. Sci. Sergey V. Kuleshov – associative-ontoilogical approach to Internet-content analysis, data processing, digital software defined infocommunication systems, kuleshov@iias.spb.su.

Laboratory staff: 10 members.

Research activities – semantic analysis of audio-, video data and texts within the framework of digital programmed infocommunication theory. Software defined reconfigurable infocommunication systems. The methods of energy effective optimization for program defined digital data transmission channels. Active data, distributed virtual machines. Associative-ontological approach to Internet content analysis, information analysis systems developing, automated monitoring of Internet environment. The basis for theory and methods of digital technologies for cognitive programming of complex spatial forms and their 3D prototyping. The application of mathematical methods for digital signal processing.

Research fellows and brief information of the research-work direction

Chief researcher, Dr. Sci. (Tech) Honored Scientist of Russian Federation, Laureate of John von Neumann prize, laureate of Russian Federation government prize in science and technology field Prof. – Victor V. Alexandrov – algorithmic models, digital programmed infocommunication, informatics, infology, epistemology of growing infocommunication systems, NBICS technologies, alexandr@iias.spb.su

Leading Researcher, Dr.Sci (Tech) – Sergey F. Svinyin – application of modern mathematical methods in digital processing of multidimensional signals, svinyins@mail.ru.

Senior Researcher, PhD (Tech) – Alexandra A. Zaytseva – big data processing methods and technology, cher@iias.spb.su.

Researcher, PhD (Tech) – Pavel P. Kokorin – infology information systems, kokorin@list.ru.

Researcher, PhD (Edu), Associate Professor – Valeria V. Alexandrova – technologies of cognitive programming, methods of 3D modeling and 3D prototyping of complex spatial forms, alexandr@iias.spb.su.

Researcher, PhD (Tech) – Alexey J. Aksenov – digital signal processing, methods of scanned 3D data processing and compression, a_aksenov@mail.iias.spb.su.

Post graduated students and competitors

Konstantin V. Nenausnikov "Development of methods and algorithms of semantic text analysis for the application in question answering systems" – supervisor Sergey V. Kuleshov.

Ilia O. Shalnev "The development of the distributed virtual machine for reconfigurable systems design" – supervisor Sergey V. Kuleshov.

Grants and projects

Alexandrov V., Kuleshov S., Zaytseva A., Aksenov A. – scientific research contract No.122/18, 2018-2019.

Alexandrov V. – RFBR project N 16-29-09482-ofi_m "Prediction of the network-based terrorist threats appearance and elaboration of countermeasures in metropolises", 2016–2018.

Kuleshov S., Zaytseva A., Aksenov A. – RFBR project N 16-29-12965-ofi_m "The development of methodology and algorithms for creation of empirical model of innovation activity strategic control based on intellectual processing of big data and machine learning", 2016-2018.

Scientific and organizational activity

4-rd International Scientific Conference "Technological perspective within the frame of Eurasian space: new markets and points of economical growth", Saint-Petersburg, December 13-15, 2018 –Zaytseva A., Kuleshov S.

Participation in conferences and exhibitions

4-rd International Scientific Conference "Technological perspective within the frame of Eurasian space: new markets and points of economical growth", Saint-Petersburg, December 13-15, 2018 – Alexandrov V., Aksenov A., Zaytseva A., Kuleshov S., Nenausnikov K., Svinyin S., Shalnev I.

XVI Saint Petersburg International Conference "Regional Informatics 2018" ("RI-2018") Saint-Petersburg, October 24-26, 2018 – Alexandrov V., Aksenov A., Zaytseva A., Kuleshov S., Nenausnikov K, Svinyin S., Shalnev I.

I Scientific and technical conference of young scientists "Questions of radio electronics: technology of television", Saint-Petersburg, September 19-20, 2018 – Aksenov A., Zaytseva A., Kuleshov S.

The XXI International Conference on Soft Computing and Measurement (SCM'2018), Saint-Petersburg, May 23-25, 2018 – Aksenov A., Zaytseva A., Kuleshov S.

7th Computer Science On-line Conference 2018 (CSOC 2018), Czech Republic, April 25-28, 2018 – Aksenov A., Zaytseva A., Kuleshov S.

XIII Russian Science and practical conference "Perspective systems and control tasks", Vladivostok, April 2-6, 2018 – Zaytseva A., Kuleshov S.

Conference "Artificial intelligence: problems and solutions", Moscow, March 14-15, 2018 – Kuleshov S.

Scientific and technical conference "Technical vision in control systems – 2018', Moscow, March 13-15 – Zaytseva A., Kuleshov S.

Membership in Russian and International societies, editorial boards, etc.

Victor V. Alexandrov – active member of Russian Academy of Natural Sciences. Editorial board member of "Scientific instrumentation" journal.

Sergey F. Svinyin – member of Saint-Petersburg Assotiation of Scientists scientific council, chairman of Saint-Petersburg department of Lomonosov's foundation, member of international scientific Euroscience.

Sergey V. Kuleshov – Expert of RAS, member of program committee of MICSECS 2018 international conference.

Recent results

1. Developed methods for automatic selection of question-answer pairs, characterized by the use of an associative-ontological approach to the processing of texts in natural language to isolate meaningful sentences through semantic text reduction, designed to create an add-in as an open QA system for natural language man-machine interaction, allowing to extend the narrow subject thesaurus [3, 4].

2. The technology for data channel organization in a networks with mobile nodes based on conception of Active Data (AD) was developed, which extends the range of possible operations for the group of small UAV's by the ability of active "on the fly" adaptation to changing conditions. The software component of the AD being executed on the mobile nodes is analyzing communication environment to make a decision on data routing. This technology is intended for providing data channels in regions with problematic ground based nodes placement and emergency situations [2, 6].

3. The formal model for the system of processing and storing of factual information obtained via electronic sources and transformed into the form of the ontology of potential economy growth topic and the software for automatic data acquisition for further automated ontology data base generation by semantic analysis of annotated text documents in order to

reveal causal relationships between target macro economy indicators and to generation of individual elements of empirical prognostic model of Russian Federation economy potential growth [3].

References

Papers published in editions, indexed by WoS, Scopus:

1. *Kuleshov S.V., Zaytseva A.A., Aksenov A.Y.* The conceptual view of unmanned aerial vehicle implementation as a mobile communication node of active data transmission network // International Journal of Intelligent Unmanned Systems. 2018. vol. 6. no. 4. pp. 174–183. DOI: 10.1108/IJIUS-04-2018-0010. (Scopus, SJR = 0.27, Q3).
2. *Korableva O.N., Kalimullina O.V., Zaytseva A.A., Larionov A.I.* Elaboration of Database for the Subject Domain of Innovation and Economic Growth Potential // (IBIMA) – Innovation Management and Education Excellence through Vision 2020. vol. SI -XI pp. 6065–6073.

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

3. *Nenausnikov K.V., Kuleshov S.V., Zaytseva A.A.* Analysis of Approaches to Creation of the Basis Data Question-answer Systems Based on Automatic Treatment Natural Language Texts // *Information Technology and Communications*. 2018. Issue 6. vol. 1. pp. 92–101. (In Russ.). (Impact factor – 0,470).
4. *Ronzhin A.L., Zaytseva A.A., Kuleshov S.V., Nenausnikov K.V.* Methods of Speech and Text Databases Development for QA-Systems // "Bulletin of the South Ural State University", series "Mathematics. Mechanics. Physics". 2018. Issue 10. vol. 3. pp. 59–66. (In Russ.). (Impact factor – 0,184).
5. *Kuleshov S.V., Zaytseva A.A.* The Variants of Implementation of Computer Vision Systems for UAS Auto-takeoff and Auto-landing Procedure // Izvestiya SFedU. Engineering Sciences. 2018. vol. 01. DOI: 10.23683/2311-3103-2018-1-284-293.
6. *Aleksandrov V.V.* Infocommunacation, Information Security and Digital Inequality: Organizational and Technical Aspects // Informatization and communication. 2018. vol. 3. pp. 13–17. (In Russ.). (Impact factor – 0,278).
7. *Kuleshov S.V., Zaytseva A.A., Aksenov A.Yu.* Technical means of processing DVB-transport streams // Issues of radio electronics. 2018. vol. 4. pp. 4–8. (In Russ.).

8. *Nenausnikov K.V.* Approaches to Building Associative Dictionaries to Improve the Accuracy of Analysis of Natural Language Texts // Proceedings of the conference "Information technologies in management" (ITU-2018). 2018. pp. 543. (In Russ.).
9. *Kuleshov S.V., Zaytseva A.A., Aksenov A.Y., Korableva O.N., Kalimullina O.V.* Tools for Assessing Innovation Activity Based on Semantic Analysis of Informational Texts // International Conference on Soft Computing and Measurements. 2018. Is. 1. S. 1-3. pp. 341–344.
10. *Kuleshov S.V., Nenausnikov K.V.* Legal Tech Direction and NLP Approaches for the Analysis of Legal Documents // "Technological Perspective: New Markets and Points of Economic Growth". 2018.
11. *Shalnev I.O.* Approach to building distributed systems based on balancing the amount of executable code between nodes // Proceedings of the 4th International Interuniversity Scientific-practical Conference "Technological Perspective: New Markets and Points of Economic Growth". 2018. (In Russ.).
12. *Zaytseva A.A., Aksenov A.Y.* Algoritmy vyyavleniya trendov razvitiya predmetnoy oblasti na primere innovatsionnykh tekhnologiy putem sravneniya grafov assotsiativnykh ontologiy // Proceedings of the 4th International Interuniversity Scientific-practical Conference "Technological Perspective: New Markets and Points of Economic Growth". 2018 (In Russ.).
13. *Aleksandrov V.V., Zaytseva A.A.* Algorithms for identifying trends in the development of the subject area on the example of innovative technologies by comparing graphs of associative ontologies // Proceedings of the 4th International Interuniversity Scientific-practical Conference "Technological Perspective: New Markets and Points of Economic Growth". 2018 (In Russ.).
14. *Svinyin S.F.* The tasks of forming discrete samples of signals of finite duration and the theory of functions with integrable square // "Technological Perspective: New Markets and Points of Economic Growth". 2018. (In Russ.).

Other publications:

15. *Kuleshov S.V., Zaytseva A.A., Kryuchkov B.I., Usov V.M.* Features of human-machine interfaces for the advanced implementation of the cognitive functions of the operator of ground control systems of the UAV // Technical vision in control systems. 2018. 96 p. (In Russ.).

Laboratory of Computer Security Problems

Head of laboratory: Dr. Tech. Sc., Prof. Igor V. Kotenko – information security, including security policy management, access control, authentication, network security analysis, intrusion detection, firewalls, deception systems, malware protection, analysis of security protocols and systems, software protection against hacking and digital right management, modeling, simulation and visualization technologies for counteraction to cyber terrorism; artificial intelligence, including multi-agent frameworks and systems, agent-based modeling and simulation, soft and evolutionary computing, machine learning, data mining, data and information fusion; telecommunications, including decision making and planning for telecommunication systems; big data; cyber-physical systems. ivkote@comsec.spb.ru, ivkote@mail.iias.spb.su, http://comsec.spb.ru/ kotenko.

Laboratory staff: 19 mambers and 3 PhD students.

Research activities – information security, including security information and event management systems, security policy management, access control, authentication, network security analysis, intrusion detection, firewalls, deception systems, malware protection, analysis and verification of security protocols and systems, software protection against hacking and digital right management, modeling, simulation and visualization technologies for counteraction to cyber terrorism, intellectualization of services for protection of critical infrastructures, modeling and attacks impact analysis on cyber-physical systems.

Artificial intelligence, including multi-agent systems, soft and evolutionary computing, machine learning, data mining, data and information fusion, intellectual decision support systems, processing of incomplete and contradictory information.

Telecommunication systems and Internet of things, including decision making and planning for telecommunication systems, analysis and synthesis of protected multiservice networks. Modeling of the processes of the industrial systems of the Internet of things in the application to the cyber security systems, energy and water supply systems, railway transport systems, mobile self-organizing networks systems, etc.

Geographical information systems (GIS), including the development of methods and models of applying the GIS for solving applied problems, access control in GIS.

Research fellows and brief information of the research-work direction

Leading Researcher PhD Dr.Tech. Sci. Prof. – Igor B. Saenko – computer-based systems, information security, data processing and communications, modeling theory and mathematical statistics, information theory. ibsaen@comsec.spb.ru, http://comsec.spb.ru/saenko.

Leading Research Scientist, Ph.D., Doctor of Technical Sciences, Professor – Igor B. Parashchuk – computer network security, automated information systems, data storage and processing, control theory, simulation theory and mathematical statistics, information theory, methods for quality and effectiveness analyzing of network information security systems, parashchuk@comsec.spb.ru, http://comsec.spb.ru/ru/staff/parashchuk.

Leading Researcher PhD – Sergej A. Ageev – computer network security, automated information systems, data storage and processing, control theory, modeling theory and mathematical statistics, information theory, methods for analyzing the quality and effectiveness of computer network information security systems. ageevserg123_61@mail.ru.

Leading Researcher PhD – Andrey A. Chechulin – computer network security, intrusion detection, virus, security analysis, network worm protection, programming. chechulin@iias.spb.su, http://comsec.spb.ru/chechulin/.

Senior Researcher PhD – Vasily A. Desnitsky – computer network security, anti-tamper techniques, security policies, Internet of Things, modeling and analysis of computer attacks. desnitsky@comsec.spb.ru, http://comsec.spb.ru/desnitsky/.

Senior Researer PhD – Evgenia S. Novikova – computer network security, cryptography, authentication, visualization of security information, programming. novikova@comsec.spb.ru, http://comsec.spb.ru/novikova/ novikova@comsec.spb.ru, http://comsec.spb.ru/novikova.

Senior Researcher, PhD – Elena V. Doynikova – computer network security, in-formation security risk analysis methods, risk management. doyniko-va@comsec.spb.ru, http://comsec.spb.ru/doynikova/.

Researcher, PhD – Olga V. Tushkanova – data mining, ontologies, computer network security. tushkanova@comsec.spb.ru, http://comsec.spb.ru/tushkanova.

Researcher – Lidia A. Vitkova – information security, analysis of social networks, big data, artificial intelligence systems. vitkova@comsec.spb.ru.

Junior Researcher, PhD – Alexander A. Branitskiy – computer network security, intrusion detection systems, neural networks, immune

system and interpolation polynomials. branits-kiy@comsec.spb.ru, http://comsec.spb.ru/branitskiy/.

Junior Researcher, PhD student – Andrey V. Fedorchenko – computer network security, methods of correlation of security events, vulnerability analysis of computer networks. fedorchen-ko@comsec.spb.ru, http://comsec.spb.ru/fedorchenko/.

Junior Researcher, PhD student – Maxim V. Kolomeec – distributed system security, security visualisation, kolomeec@comsec.spb.ru, http://comsec.spb.ru/kolomeec/.

Junior Researcher, PhD student – Dmitry S. Levshun – distributed system security, embedded devices, event correlation, levshun@comsec.spb.ru, http://comsec.spb.ru/levshun/.

Junior Researcher, PhD student – Alexei G. Kushnerevich – big data, data analysis, kushnerevich@comsec.spb.ru, http://comsec.spb.ru/kushnerevich/, research advisor – I. Saenko.

PhD student – Nickolay A. Komashinsky – computer network security, intrusion detection, malware. koma-shinsky@comsec.spb.ru, http://www.comsec.spb.ru/komashinsky/, research advisor – I. Kotenko.

PhD student – Eugene S. Merkushev – security in cloud computing. merkushev@comsec.spb.ru, http://comsec.spb.ru/merkushev/, research advisor – I. Kotenko.

PhD student – Anton A. Pronoza – computer network security, big data, visualization techniques. pronoza@comsec.spb.ru, http://www.comsec.spb.ru/pronoza/, research advisor – I. Kotenko.

PhD student, developer – Yurii E. Bakhtin – cyberphysical system security, industrial network communication protocols, semi-natural modeling. bakhtin@comsec.spb.ru, http://comsec.spb.ru/bakhtin, research advisor – A. Chechulin.

PhD student, developer – Kseniia N. Zhernova – visualization of the security data, human-computer interaction, cryptography, block ciphers. zhernova@comsec.spb.ru, http://comsec.spb.ru/zhernova, research advisor – A. Chechulin.

Thesis defense

Alexander A. Branitsky, spec. 05.13.19, theme "Detection of anomalous network connections based on hybridization of computational intelligence methods", the defense took place in SPIIRAS on October, 9, 2018. (Scientific advisor – I. Kotenko).

Grants and projects

Saenko I. – Grant of Russian Science Foundation № 18-11-00302 "Intelligent digital network content processing for effective detection and counteraction of inappropriate, dubious and harmful information", 2018-2020.

Chechulin A. – Grant of Russian Science Foundation № 18-71-10094 "Monitoring and counteraction to malicious influence in the information space of social networks", 2018-2021

Kotenko I. – "Monitoring and identification of destructive information impacts and negative personal tendencies of the younger generation when interacting with the Internet space on the basis of methods of neurocomputer and neural network processing of Internet content" Research grant # 18-29-22034 of Russian Foundation of Basic Research, 2018-2021.

Kotenko I. – "Research, development and application of Augmented Reality technology for cyber and cyberphysical systems security data visualization" Research grant # 18-37-20047 of Russian Foundation of Basic Research, 2018-2020.

Saenko I. – "Models and methods of analysis, structural optimization and verification of access control systems for cloud infrastructures of critical information systems, based on the creation and application of artificial intelligence means". Research grant # 18-07-01369-a of Russian Foundation of Basic Research, 2018-2020.

Chechulin A. – "Research, development and application of Augmented Reality technology for cyber and cyberphysical systems security data visualization" Research grant # 18-37-20047 of Russian Foundation of Basic Research, 2018-2020.

Desnitsky V. – Russian Federation Presidential Grant № MK-5848.2018.9 "Modeling and analysis of cyber-physical energy exhaustion attacks on Internet of Things devices", 2018-2019.

Chechulin A. – President's of Russian Federation Grant № MK-314.2017.9 "Methods, models and algorithms for the construction and usage of a hybrid data warehouse for analytical processing of the information and security events", 2017-2018.

Kotenko I. – NIR-FUND of ITMO University № 717075 "Methods, Models, Methods, Algorithms, Protocols and Applications for ensuring Information Security of Cyber-Physical Systems", 2017-2018.

University courses

SUT: dep. SCS: "Cloud computing and telecommunication security" – I. Kotenko.

SUT: dep. SCS "Information security technology" (lectures and practice); "Big data security" (lectures and practice); "Digital forensics" – Chechulin A.

SUT: dep. SCS, "Building secure architecture of cloud computing information security" – Desnitsky V.

SPbPU: dep. CIT, ICST: "Intellectual data analysis", "Information systems design", "Methods and algorithms for data analysis" –Tushkanova O.

SUT: dep. SCS: "Information security risk management", "Basics of Information Security Management", "Technology for big data information security" – Vitkova L.

SPbSUITD: dep. ISIS: "Basics of Information Security Management", "Organizational and legal support of information security", "Technical information security", "Complex information security in the enterprise" – Vitkova L.

Scientific and organizational activities

The 5th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2019)". October, 2019 – Kotenko I. (chair of the conference).

The 13th International Symposium on Intelligent Distributed Computing (IDC'2019), St. Petersburg, Russia, October 7-9, 2019 https://idc2019.ru/ – Kotenko I. (co-chair of the conference).

The 8th International Conference on Mathematical Methods, Models and Architectures for Computer Networks Security (MMM-ACNS-2019).August, 2019, Vilnius, Lithuania – Kotenko I. (co-chair of the conference).

Special Session Advanced research in cybersecurity, The 21th Conference "RusCrypto 2019" on Cryptology, Steganography, Digital Signature and Security Systems. 19-21 March 2019 – Kotenko I. (session moderator).

Special Session Security in Parallel, Distributed and Network-Based Computing (SPDNS 2019) on 27th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2019). Pavia, Italy,

February 13-15, 2019 http://www.comsec.spb.ru/spdns19/ – Kotenko I. (chair of the conference).

The 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018)". October 23-25, 2018, http://www.comsec.spb.ru/imctcpa18/ – Kotenko I. (chair of the conference).

The 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018), Cambridge, UK, March 21-23, 2018. http://www.pdp2018.org/ – Kotenko I. (co-chair of the conference).

Special Session Security in Parallel, Distributed and Network-Based Computing (SPDNS 2018) on 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018). http://www.comsec.spb.ru/spdns18/ – Kotenko I. (chair of the conference).

Special Session "Information technology security in management", Conference on Information Technologies in Control (ITC), October 2-4, 2018 – Kotenko I., Saenko I., Chechulin A. (co-chairs of the conference).

Special Session Information security, XVI Anniversary Saint-Petersburg International Conference "Regional informatics-2018 (RI-2018) – Kotenko I., Saenko I. (co-chairs of the conference).

Special Session Advanced research in cybersecurity, The 20th anniversary scientific-practical conference "RusCrypto 2018", March 20—23 2018.https://www.ruscrypto.ru/accociation/archive/ rc2018.html – Kotenko I. (session moderator).

International cooperation

International Cooperation with the following organizations: Council of National Research (CNR) of Italy (Consiglio Nazionale delle Ricerche) (Italy), University of Torino (Politecnico di Torino) (Italy), University of Murcia (Universidad de Murcia) (Spain), University of Trento (Universita di Trento) (Italy), Fraunhofer Institute for Secure Information Technology (Fraunhofer-Institut für Sichere Informations-Technologie in Darmstadt) (Germany), Blekinge Institute of Technology (BTH) (Karlskrona, Sweden), Wroclav University of Technology (WTU) (Wroclaw, Poland), University of Latvia (UOL) (Riga, Latvia), The German Federal Criminal Police Office (BKA) (Wiesbaden, Germany), Consorzio Interuniversitario Nazionale per L'in-Formatica (Italy), Fundacao da Faculdade de Ciencias da

Universidade de Lisboa (Portugal), Institut Telecom (France), Universidad Politecnica de Madrid (Spain), Linkopings Universitet (Sweden), Universidad de Malaga (Spain), Queensland University of Technology - Qld Qut (Aus-tralia), Kharkiv National University of Radio Electronics (KhNURE) (Kharkov, Ukraine), State University of Telecommunications (SUT) (Kiev, Ukraine), Lviv Polytechnic National University (LPU) (Lviv, Ukraine), Ukrainian Information Security Group (NGO UISG) (Kiev, Ukraine), AIESEC Ukraine (Kiev, Ukraine), Kharkiv state center for information security (KhRCIP) (Kharkov, Ukraine), Scientific production association «Radio and Telecom Systems' (RTS) (Kharkov, Ukraine), Ministry of Education and Science, Youth and Sports of Ukraine (MON) (Kiev, Ukraine), F-Secure (Helsinki, Finland), Atos Origin Sociedad Anonima Espanola (Spain), EPSILON S.R.L (Italy), France Telecom sa (France), Open Source Security Information Management, S.L. (Spain), T-Systems South Africa (PTY) LTD (South Africa), 6CU RE SAS (France), ASCOM (SCHWEIZ) AG (Switzerland), Infineon Technologies AG (Germany), Search-Lab Security Evaluation Analysis and Research Laboratory, LTD (Hungary), Mixed Mode Gmbh (Germany), Telefonica Investigacion y Desarrollo sa (Spain), Paul Sabatier University, Toulouse III (France), Euromicro Association (Germany), University of Cambridge (UK), etc.

Participation in conferences and exhibitions

The 2018 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (ElConRus 2018), January 29 – February 1, 2018, St. Petersburg, Russia – Novikova E., Desnitsky V., Kotenko I.

3th Interuniversity scientific and practical conference Problems of technical support of troops in modern conditions, February 16, 2018, St. Petersburg, Russia – Parashchuk I.

7th Problems of information security in the conditions of information confrontation. VII International Conference on Advanced Info-Telecommunication (ICAIT 2018), February 28 – March 2, 2018, St. Petersburg, Russia, – Kotenko I., Branitskiy A., Desnitsky V., Kolomeec M., Chechulin A., Vitkova L., Doynikova E., Pronoza A., Fedorchenko A.

The 21th Conference "RusCrypto 2018" on Cryptology, Steganography, Digital Signature and Security Systems, March 20-23, 2018,

Solnechnogorsk, Russia – Kotenko I., Branitskiy A., Desnitsky V., Chechulin A., Fedorchenko A.

The 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018), March 21-23, 2018, Cambridge, United Kingdom – Kotenko I., Fedorchenko A., Saenko I., Kushnerevich A., Doynikova E.

The International Grand Forum "Around the Cloud. Around the data center. Around Data. Around IoT. Around IP.ProAV" (BIT-2018)", April 11, 2018, St. Petersburg, Russia –Parashchuk I.

St.Petersburg Digital Forum 2018, April 18-19, 2018, St. Petersburg, Russia – Parashchuk I.

The Conference "information security Code", April 26, 2018, St. Petersburg, Russia – Parashchuk I.

The 1st IEEE International Conference on Industrial Cyber-Physical Systems (ICPS2018), May 15-18, 2018, St. Petersburg, Russia – Kolomeec M., Chechulin A., Kotenko I., Levshun D.

The XXI International Conference on Soft Computing and Measurements (SCM-2018), May 23-25, 2018, St. Petersburg, Russia – Parashchuk I., Desnitsky V., Kotenko I.

The 8th international forum on practical security Positive Hack Days (PHD8), May 23-24, 2018, Moscow, Russia – Kotenko I.

The 3rd Saint-Petersburg Algorithm Workshop (SPbAW-2018), Huawei Technologies, May 28, 2018, St.Petersburg, Russia – Kotenko I.

The 3rd Annual International Conference on Information System and Artificial Intelligence (ISAI2018), 22-24 June 2018, Suzhou, China – Kotenko I., Parashchuk I., Kolomeyets M.

The 2018 Third International Conference on Human Factors in Complex Technical Systems and Environments (ERGO) and Environments (ERGO), July 4-7, 2018, St. Petersburg, Russia – Novikova E.

The European Community Action Scheme for the Mobility of University Students (ERASMUS 2018), July 6 2018, St. Petersburg, Russia – Levshun D.

The Fifth ACM Workshop on Genetic and Evolutionary Computation in Defense, Security, and Risk Management (SecDef'2018). In conjunction with the ACM Genetic and Evolutionary Computation Conference (GECCO), 15-19 July, Kyoto, Japan – Kotenko I., Saenko I.

The 10 International Workshop on Resilient Network Design and Modeling (RNDM 2018), August 27-29, 2018, Longyearbyen, Norway – Kotenko I., Saenko I.

The 13th International Conference on Availability, Reliability and Security (ARES 2018), 27-30 August 2018, Hamburg, Germany – Doynikova E., Fedorchenko A., Kotenko I.

The 3rd International Symposium on Mobile Internet Security (MobiSec 2018), August 29 - September 1, 2018, Cebu, Philippines – Kotenko I., Saenko I., Branitskiy A., Kolomeyets M., Levshun D., Chechulin A.

The 4th Workshop on the Security of Industrial Control Systems & of Cyber-Physical Systems (CyberICPS 2018), September 3-7, 2018, Barcelona, Spain – Kolomeyets M., Chechulin A., Kotenko I.

The 11th International Conference on Security of Information and Networks (SIN 2018), September 10-12, 2018, Cardiff, Wales – Kotenko I., Ageev S., Saenko I., Branitskiy A.

The International Russian Automation Conference (RusAutoCon-2018), September 9-16, 2018, Sochi, Russia – Kotenko I., Parashchuk I.

The 2018 IEEE Northwest Russia Conference on Mathematical Methods in Engineering and Technology (MMET NW 2018), September 10-14, 2018. St. Petersburg, Russia –Parashchuk I., Desnitsky V., Kotenko I.

The International Conference on Modern Trends in Manufacturing Technologies and Equipment 2018 (ICMTME 2018), September 10-14, 2018. Sevastopol, Russia –Kotenko I., Saenko I., Branitskiy A., Desnitsky V.

The IV interregional scientific and practical conference "Perspective directions of development of domestic information technologies". September 18-22, 2018, Sevastopol, Russia – Parashchuk I., Kotenko I., Saenko I., Ageev S., Bakhtin Yu., Chechulin A., Desnitsky V.

The 3rd International Scientific Conference "Intelligent information technologies for industry" (IITI'18). September 17-21, Sochi, Russia – Kotenko I., Saenko I., Ageev S., Pronoza A., Vitkova L., Chechulin A..

The 27th Technical Science Conference "Methods and technical means of ensuring the security of information". 24-27 September, 2018, Russia, St. Petersburg, – Saenko I., Chechulin A., Vitkova L., Kushnerevuch A., Branitskiy A.

The International Conference "Quality Management, Transport and Information Security, Information Technologies". September 24–28, 2018, St. Petersburg – Novikova E.

The 10th Social Informatics conference (SocInfo2018). September 25–28, St. Petersburg, Russia, – Kotenko I., Saenko I., Chechulin A., Desnitsky V., Vitkova L., Pronoza A.

The 17th International Conference on Intelligent Software Methodologies, Tools, and Techniques (SOMET 18). September 26-28, 2018, Granada, Spain – Kotenko I., Saenko I., Ageev S.

The Conference "Information technologies in management" (ITU-2018), October 2-4, 2018, St.Petersburg, Russia –Kotenko I., Saenko I., Parashchuk I., Desnitsky V., Chechulin A., Doynikova E., Branitskiy A., Fedorchenko A., Vitkova L., Bakhtin Yu., Rudavin N., Kushnerevuch A., Levshun D., Kolomeec M., Tushkanova O., Ageev S.

The 12th International Symposium on Intelligent Distributed Computing (IDC'2018), 15-17 October, Bilbao, Spain – Kotenko I., Saenko I., Desnitsky V., Rudavin N.

The Workshop "Advanced Technologies in Aerospace, Mechanical and Automation Engineering", "MIST: Aerospace". October 19-21, 2018, Krasnoyarsk, Russia – Doynikova E., Kotenko I.

The XIII-th International Symposium "Intelligent Systems", INTELS'18. October 22-24, 2018, St. Petersburg, Russia – Novikova E.

The Fourth International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018), October 23-25, 2018, St. Petersburg, Russia. http://www.comsec.spb.ru/imctcpa18/ – Kotenko I., Doynikova E., Desnitsky V., Chechulin A., Branitskiy A., Vitkova L., Novikova E., Kolomeec M., Levshun D.

The 2nd International Scientific-Practical Conference Fuzzy Technologies in the Industry (FTI 2018), October 23–25, 2018, Ulyanovsk, Russia – Kotenko I., Parashchuk I., Kolomeec M., Chechulin A.

The XVI Anniversary Saint-Petersburg International Conference "Regional informatics-2018 (RI-2018)". October 24-26, 2018, St. Petersburg, Russia – Saenko I., Fedorchenko A., Parashchuk I., Kotenko I., Chechulin A., Doynikova E., Branitskiy A., Kolomeec M., Levshun D., Vitkova L., Ageev S., Desnitsky V., Rudavin N., Kushnerevuch A.

The Russian scientific and technical conference on theoretical and applied problems of development and improvement of automated control systems for special purposes 2018. October 30, 2018, Moscow, Russia – Parashchuk I., Saenko I.

The 2018 International Conference on Internet of Things and Intelligence Systems (IoTaIS 2018). November, 1-3, 2018, Bali, Indonesia – Kotenko I., Saenko I., Ageev S., Chechulin A.

Membership in International Societies, Editorial Boards

Kotenko I. – Member of Russian and European Associations of Artificial Intelligence, Senior member of IEEE and Computer Society, member of Association for Computing Machinery (ACM), Institute for Systems and Technologies of Information, Control and Communication (INSTICC), the Series Editor of Springer's Communications in Computer and information Science; member of board of directors of International scientific, engineering and educational organization dedicated to advancing the arts, sciences and applications of Information Technology and Microelectronics (Euromicro); member of editorial board of scientific journals: "Problems of Informatics", "Vestnik RGUPS", "Artificial Intelligence Research Journal", "International Journal of Computing", "The Open Bioinformatics Journal", "The Open Automation and Control Systems Journal", "The FTRA Journal of Convergence", "International Journal of u- and e- Service, Science and Technology"; the reviewer of the scientific journals: "Information technologies and computer systems", "ACM Transactions on Internet Technology", "ACM Transactions on Multimedia Computing, Communications, and Applications", "IEEE Software", "IEEE Access", "IEEE Computer", "IEEE Transactions on Dependable and Secure Computing", "Security and Communication Networks", "Transactions on Systems, Man, and Cybernetics", "Computer Standards & Interfaces", "Recent Patents on Computer Science", "The International Journal for the Computer and Telecommunications Industry", "Data Mining and Knowledge Discovery", "International Journal of Computer Science Applications", "Informatica", "Security and Communication Networks", "Telecommunication Systems Journal", "Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications", etc.; chair of the program committees of the 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018) and the 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018), chair of the section of 1st IEEE International Conference on industrial Cyber-Physical

Systems (ICPS-2018); member of the program committees of 32 international conferences and workshops.

Saenko I. – Member of Arctic Academy of Sciences, Section of Information Technologies; Corresponding Member of Russian Academy of Natural Sciences; the member of editorial board of scientific journals "Information and space" and "Telecommunication technologies"; the member of program committee of 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018), CCIS-PP-MobiSec17, the 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018).

Parashchuk I. – the member of Scientific council on informatization at the Government of Saint Petersburg; the member of the Joint educational and methodical Council for the direction 09.02.04 – "Information systems" of Federal educational and methodical association in the higher education system of the Ministry of Education and Science of the Russian Federation on the enlarged groups of specialties and the directions of preparation 09.00.00 "Informatics and computer facilities", the full member of the International academy of authors of discoveries and inventions (IAADI).

Chechulin A. – Advisory Board member of EU Horizon 2020 research project Yaksha; the member of program committees of the Special Session on Security in Parallel, Distributed And Network-Based Computing of the 26th Euromicro International Conference on Parallel, Distributed and Network-Based Computing (SPDNS-2018), epy international symposium on security of the mobile Internet (MobiSec 2018), the 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018), the 1st IEEE International Conference on industrial Cyber-Physical Systems (ICPS-2018).

Desnitsky V. – the member of program committees of 26th Euromicro International Conference on Parallel, Distributed and network-based Processing (PDP 2018), the 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018).

Doynikova E. – the member of the program committee of the 4th International scientific school "Incident management and countering targeted cyber-physical attacks in distributed large-scale critical systems" (IM&CTCPA 2018).

Novikova E. – the member of the program committees of Special Session on Security in Parallel, Distributed And Network-Based Computing of the 26th Euromicro International Conference on Parallel, Distributed and Network-Based Computing (SPDNS-2018) and the international symposium on security of the mobile Internet (MobiSec 2018).

Intellectual property

1. Patent No. 2656736. Information retrieval device. Desnitsky V., Kotenko I., Parashchuk I., Saenko I., Chechulin A. Registered in the State Register of Inventions of the Russian Federation on 06.06.2018.
2. Monitoring of graphic images in the global Internet. Certificate No 2018662641. Registered in the Computer Program Registry 12.10.2018. Zhuvikin A., Vitkova L., Chechulin A., Soldatova Y.
3. Component for interaction with a hybrid data storage of heterogeneous objects of a social network. Certificate No 2018663493. Registered in the Computer Program Registry 29.10.2018. Pronoza A., Chechulin A.
4. Software for imitation modeling of processes for collecting and preprocessing unwanted information. Certificate No 2018663494. Registered in the Computer Program Registry 29.10.2018. Saenko I., Parashchuk I., Branitskiy A.
5. Component of automated typization of heterogeneous information objects for analysis of unwanted information. Certificate No 2018663495. Registered in the Computer Program Registry 29.10.2018. Fedorchenko A., Doynikova E., Saenko I.
6. Modeling unwanted information flows in information systems. Certificate No 2018663496. Registered in the Computer Program Registry 29.10.2018. Desnitsky V., Rudavin N., Saenko I.
7. Module of analysis of unwanted information flows in information systems. Certificate No 2018663497. Registered in the Computer Program Registry 29.10.2018. Desnitsky V., Kotenko I.
8. Component for visualization of communication graphs of social network objects using augmented reality technology. Certificate No 2018663594. Registered in the Computer Program Registry 31.10.2018. Kolomeec M., Chechulin A., Kotenko I.
9. Component for definition of web page categories on the base of text features. Certificate No 2018663639. Registered in the Computer Program Registry 01.11.2018. Chechulin A., Kotenko I.

10. Component for analytical modeling of attacks in a computer network on the base of the use of a hybrid ontological security data repository. Certificate No 2018663641. Registered in the Computer Program Registry 01.11.2018. Chechulin A.

11. Component for ranking measures to counter remote information in the Internet. Certificate No 2018663642. Registered in the Computer Program Registry 01.11.2018. Doynikova E., Fedorchenko A., Kotenko I.

12. Firmware of a node of a Smart City sensor network to model energy exhaustion attacks. Certificate No 2018662696. Registered in the Computer Program Registry 12.10.2018. Desnitsky V., Chechulin A.

13. Detection of energy exhaustion attacks on the base of rules in wireless mesh networks. Certificate No 2018662817. Registered in the Computer Program Registry 16.10.2018. Desnitsky V., Chechulin A.

14. Component for correlation of information with static content on the base of the use of hybrid ontological security data repository. Certificate No 2018663644. Registered in the Computer Program Registry 01.11.2018. Fedorchenko A.

15. Component for security assessment with the use of ontological security data repository. Certificate No 2018663646. Registered in the Computer Program Registry 01.11.2018. Doynikova E.

16. Control for governing an unmanned aerial vehicle to model energy exhaustion attacks. Certificate No 2018662871. Registered in the Computer Program Registry 17.10.2018. Desnitsky V., Chechulin A.

17. Component for visualization of communication graphs of social network objects using augmented reality technology. Certificate No 2018663594. Registered in the Computer Program Registry 31.10.2018. Kolomeec M., Chechulin A., Kotenko I.

18. The module of human-computer interaction with the information panel of the computer network visualization system. Certificate No 2018663862. Registered in the Computer Program Registry 06.11.2018. Kolomeec M., Chechulin A., Kotenko I.

19. Component of vulnerabilities classification based on their informal characteristics to identify weaknesses of information systems. Certificate No 2018664027. Registered in the Computer Program Registry 08.11.2018. Doynikova E., Fedorchenko A.

20. Component of traffic generation for cyber-physical systems based on I2C protocol. Certificate No 2018664325. Registered in the Computer Program Registry 14.11.2018. Levshun D.

Expertise

Igor Kotenko – the member of the expert commission of the Russian Foundation of Basic Research, the expert of the Foundation for Advanced Research, the expert of the Russian Science Foundation, the expert of the Russian Academy of Sciences and the expert of the Federal Service for Supervision in the Sphere of Education and Science.

Igor Saenko – the expert of the Federal Service for Supervision in the Sphere of Education and Science.

Andrey Chechulin – the expert of the Russian Science Foundation, the advisory board member of the European Union research project Cybersecurity Awareness and Knowledge Systemic High-level Application (YAKSHA), Nr. 780498, 2018-2020.

Recent results

1. Conceptual foundations of creation and functioning of the intellectual systems of analytical processing of digital network content based on methods of machine learning and Big Data parallel processing intended for identification and counteraction of inappropriate, dubious and harmful information are developed [5].

2. Conceptual foundations of development of models and methods of the analysis, structural optimization and verification of access control systems for information in cloud infrastructures of the crucial information systems providing coordination of target criteria to access control requirements, using measures of proximity of required and real access schemes and applying the bio-inspired optimization methods (in particular, genetic algorithms) are developed [8].

3. The general approach to classification of web pages based on use of hybrid hierarchical architecture of the classification system and machine learning methods, combining the qualifiers working with various aspects of web pages and allowing to increase efficiency of counteraction to socio-cultural threats, terrorism and ideological extremism in information space of the Internet is developed [12].

4. The complex of data models and algorithms of collecting, preprocessing, analyzing and storing data from social networks based on the distributed infrastructure with use of such data presentations as graph, ontological and NoSQL differing on the possibility of detection not only the fact of emergence of inappropriate information objects in a social network,

but also evaluating the source, audience and distribution channels for this object, what is actual for finding and counteracting to socio-cultural threats, manifestations of terrorism and ideological extremism in information space of social networks, is developed [17].

5. New models, algorithms and techniques of collecting initial data, attack modeling, the analysis of security and visualization of the received results which differ by ability to operate in conditions of need of processing continuous stream of large volumes of diverse initial data and allow us to carry out monitoring of cyber-physical systems of crucial infrastructures and increase security of crucial infrastructures to the technogenic threats in conditions of realization of the attacks in the mode close to real time and, as a result, to recommend to the operator ways of change of security policy of a system of protection of a cyber-physical system for limited time, are developed [18].

6. The integrated technique of secure systems design on the basis of the built-in devices representing association of the following solutions is developed: techniques of secure software development, a technique of design of the protected built-in devices, and techniques of design of the protected data transmission mediums steady against attacks at a design stage, considering that the component structure of a system and its elements will be rational or optimum in terms of qualifying standards to security, the prices, the sizes, etc., is developed [23].

7. Simulation models of the attacks like Denial-of-Sleep and analytical model of the violator with selection of four main kinds of the attacks of exhaustion of energy resources in the systems of Internet of things differing by a specific set of the target indicators oriented to use in the mobile wireless networks are created [25].

8. The models and methods for detection of abnormal network connections on the basis of hybridization of methods of a computational intelligence, including the model of the artificial immune system on the basis of evolutionary approach for classification of network connections, an algorithm of genetic-competitive training of Kokhonen network for detection of abnormal network connections, a technique of hierarchical hybridization of binary classifiers for detection of abnormal network connections, and also the architecture and the program implementation of the distributed system of detection of the attacks constructed on the basis of hybridization of a computational intelligence methods and the signature analysis are developed [28].

9. An approach to automatic counteraction to cyber-attacks in the computer networks, due to development of a technique of the choice of counter-measures with use of a new integrated indicator of the choice of counter-measures is offered; an approach to automatic creating and choosing security features in the computer network based on classification of the found vulnerabilities and the subsequent comparison to them threats and security features with use of machine learning methods allowing to increase protection from cyber-attacks and also to increase efficiency of assets inventory and vulnerabilities monitoring is proposed [31].

10. The ontology of security metrics including security assessment objects, data sources, and security metrics allowing to display integrated security metrics on the base of available data with use of primary security metrics and to compare initial data with the possible purposes of cyber- attacks and malefactor profiles, what allows us to increase the accuracy of definition of the cyber-attack targets and forming the malefactor profile, is developed [37].

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1. *Gonzalez-Granadillo G., Doynikova E., Kotenko I., Garcia-Alfaro J.* Attack Graph-Based Countermeasure Selection Using a Stateful Return on Investment Metric // Lecture Notes in Computer Science. Springer. 2018. vol. 10723. pp. 293–302. DOI: https://doi.org/10.1007/978-3-319-75650-9_19. (WoS, Scopus, JSR = 0.29, Q2).
2. *Gonzalez-Granadillo G., Garcia-Alfaro J., Kotenko I., Doynikova E.* Hypergraph-driven Mitigation of Cyber-Attacks // Internet Technology Letters. 2018. vol. 1. no. 3. 6 p. DOI: https://doi.org/10.1002/itl2.38. (WoS).
3. *Kolomeets M., Chechulin A., Kotenko I., Chevalier Y.* A visual analytics approach for the cyber forensics based on different views of the network traffic // Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications. 2018. vol. 9. no. 2. pp. 57–73. (Scopus, SJR = 0.28, Q3).
4. *Kalameyets M., Chechulin A., Kotenko I., Shtreker M.* Voronoi Maps for planar sensor networks visualization // Communications in Computer and Information Science. 2018. vol. 971. (WoS, Scopus, SJR = 0.17, Q3).
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of weighted steganalysis in the spatial domain of natural images under small payloads // Communications in Computer and Information Science. 2018. vol. 971. (WoS, Scopus, SJR = 0.17, Q3).
6. *Levshun D., Chevalier Y., Kotenko I., Chechulin A.* Secure Communication in Cyber-Physical Systems // The 3rd International Symposium on Mobile Internet Security. 2018. 9 p. http://isyou.info/conf/mobisec18/mobisec18-book-ver1.pdf.
7. *Berger I., Rieke R., Kolomeets M., Chechulin., Kotenko I.* Comparative study of machine learning methods for in-vehicle intrusion detection // 4th Workshop On The Security Of Industrial Control Systems & Of Cyber-Physical Systems – Conjunction with the European Symposium on Research in Computer Security (ESORICS). 2018. https://www.researchgate.net/publication/327511384_Comparative_study_of_machine_learning_methods_for_in-vehicle_intrusion_detection.
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Papers published in editions, indexed by WoS, Scopus:

9. *Kotenko I., Saenko I., Branitskiy I.* Framework for Mobile Internet of Things Security Monitoring based on Big Data Processing and Machine Learning // IEEE Access. 2018. vol. 6. 10 p. DOI: 10.1109/ACCESS.2018.2881998. (WoS; Scopus, SJR = 0.55, Q1).
10. *Kotenko I., Doynikova E.* Selection of countermeasures against network attacks based on dynamical calculation of security metrics // Journal of Defense Modeling and Simulation. 2018. vol. 15. no. 2. pp. 181–204. DOI: 10.1177/1548512917690278. (WoS; Scopus, SJR = 0.21, Q3).
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12. *Kotenko I., Doynikova E., Fedorchenko A., Chechulin A.* An Ontology-based Hybrid Storage of Security Information //

Information Technology and Control. 2018. no. 4. pp. 655–667. (WoS; Scopus, SJR = 0.24, Q3).
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29. *Kotenko I., Chechulin A., Bulgakov M.* Intelligent Security Analysis of Railway Transport Infrastructure Components on the base of Analytical Modeling // International Scientific Conference on

Intelligent information technologies for industry (IITI 2017). 2017. pp.178–188. (WoS, Scopus). DOI: 10.1007/978-3-319-68324-9_20.
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Research activities – corporate user systems; parallel and distributed data processing; dynamic automata networks and high performance computer systems on the basis of the latter; GRID technologies; cloud computing; neural networks; computer modeling; mathematical modeling; risk analysis and modeling for information systems; information security; network security monitoring; object oriented programming; software engineering; artificial intelligence; cognitive technologies; software design automation.

Research fellows and brief information of the research-work direction

Chief Researcher, Dr. Eng., Prof. – Vladimir I. Vorobiev – modeling and design of information protection systems, automation of parallel and distributed programming, cluster and GRID-technologies, e-document circulation, vvi@iias.spb.su.

Chief Researcher, Dr. Eng. Sc., Prof. – Victor V. Nikiforov – real-time operating systems, embedded real-time software systems, nik@iias.spb.su.

Senior researcher, Ph.D. – Vladimir M. Shishkin – information security, security and risk modeling and analysis, social technology systems security, vms@iias.spb.su.

Senior researcher, Ph.D. – Rosa R. Fatkieva – information security, information systems modeling, rrf@iias.spb.su.

Senior researcher, Ph.D. – Elena L. Evnevich – cloud and distributed computations, cognitive technologies, eva@iias.spb.su.

Senior researcher, Ph.D. – Natalia A. Zhukova – cognitive monitoring, automated synthesis of observed objects models, software engineering, nazhukova@mail.ru.

Researcher – Dmitry K. Levonevsky – information security, corporate information systems, mathematical and computer modeling, dl@iias.spb.su.

Junior researcher, Ph.D. – Sergey A. Podkorytov – theory of fractals, 3D modeling, neural networks, podkorytovs@gmail.com.

Programmers

Leading programmer, Mikhail Yu. Petrov, miha@iias.spb.su.
Leading programmer, Igor V. Tsarev, civ@mail.iias.spb.su
Leading programmer, Olga L. Smirnova, olsmirnova17@mail.ru
Programmer, Tatiana B. Petrova, tbr@iias.spb.su
Programmer, Mikhail Yu. Uzdyaev, m.yuzdiaev@gmail.com
Programmer, Sergey R. Ryzhkov, 79516601106@ya.ru

Post-graduate students

Uzdyaev M.Yu. "Models and Methods of Robotic Control by Neural Networks", research advisor – Osipov V.Yu.

Miloserdov D.I. "Optimization of Soft-Hardware Implementation for Cognitive Machine Intelligent Cores on Neural Network Basis", research advisor – Osipov V.Yu.

Obrezkov D.V. "Performance Maintenance of Hard- Software System for Inertial Satellite Navigation under Obstructing Interference", research advisor –Fatkieva R.R.

Ryzhkov S.R. "Cloud Computing Security", research advisor – Vorobiev V.I.

Vasyukov V.A. "Models and Methods of Automated Computer Network User Protection from Destructive Reflective Control", research advisor – Shishkin V.M.

Kolesnikov K.E. "Modeling of Conflicting Systems Dynamics for Solution of Interaction Control Problems", research advisor – Shishkin V.M.

Grants and projects

Osipov V.Yu., Fatkieva R.R., Shishkin V.M., Levonevsky D.K. – RFBR grant 16-29-09482 "Forecasting of Information Network Terrorist Threats and Substantiation of Respective Countermeasures in Megapolises". 2017-2019.

University courses

Saint Petersburg State Electrotechnical University (LETI): department of Information Security": Protection of Computer Networks and Telecommunications" – Fatkieva R.R.

Saint Petersburg State Electrotechnical University (LETI), department of Computer Software and Applications, "Decision Making Theory" – Zhukova N.A.

SUAI: Saint Petersburg State University of Aerospace Instrumentation, department of Computer Science and Applied Mathematics, "Intelligent Systems and Technologies", "Intelligent data analysis", "Project management", "Machine learning" – Zhukova N.A.

SUAI: Saint Petersburg State University of Aerospace Instrumentation, department of Information Protection Technologies, "Basics of Information Security" – Shishkin V.M.

PEIPK: Saint Petersburg Power Industry Institute for Postgraduate Training, department of Communication Systems, Telemechanics and Information Networking Technologies "Risks and Regulations of Information Security Assurance at Power Industry Enterprises" – Shishkin V.M.

Scientific and organizational activities

City seminar "Informatics and Automation", attached to Scientific Council on Saint Petersburg Informatization, http://conference.spiiras.nw.ru/seminar_ICT – Osipov V.Yu. (deputy supervisor).

IV International Scientific and Practical Conference "Problems of Information Security", February 15-17, 2018, Simferopol-Gurzuf, Russia – Shishkin V.M. (member of the organizing committee).

XXVII All-Russia Scientific School Conference "Intellectual Renaissance", Saint Petersburg, April 28, 2018, Saint Petersburg, Russia – Shishkin V.M. (section supervision, jury participation).

XVI Saint Petersburg International Conference "Regional Informatics (RI-2018)", October 24-26, 2018, Saint Petersburg, Russia – Vorobiev V.I., Petrov M.Yu., Fatkieva R.R., Shishkin V.M. (program committee membership).

Shishkin V.M. (section secretary); Vorobiev V.I., Fatkieva R.R., Shishkin V.M., Petrov M.Yu. (section work programs development, section organization, section reports creation).

International cooperation

Academy of the Ministry of Home Affaires, Institute of National Security, National Academy of Science of the Republic of Belarus – issues of information security.

Conferences

IV International Scientific and Practical Conference "Problems of Information Security", February 15-17, 2018, Simferopol-Gurzuf – Shishkin V.M., Vorobiev V.I., Evnevich E.L., Fatkieva R.R., Petrov M.Yu.

13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings" (ER(ZR)-2018), April 18-21, 2018, Saint Petersburg, Russia – Levonevsky D.K.

Russian International Energy Forum (RIEF-2018), Round table discussion "Security of Critical Information Infrastructure of Fuel and Energy Complex (TEK)", April 25-27, 2018, Saint Petersburg, Russia – Shishkin V.M.

XXVII All-Russian Scientific School Conference "Intellectual Renaissance", Aprli 28, 2018, Saint Petersburg, Russia – Shishkin V.M.

XXI IEEE International Conference on Soft Computing and Measurements (SCM'2018), May 23-25, 2018, Saint Petersburg, Russia – Zhukova N.A., Levonevsky D.K.

I All-Russian Scientific and Practical Conference with International participation "Development Trends in Internet and Digital Economy", May 29-31, 2018, Simferopol-Alushta, Russia – Vorobiev V.I., Evnevich E.L., Petrov M.Yu., Fatkieva R.R., Shishkin V.M.

15-th International Symposium on Neural Networks, ISNN 2018, June 25-28, 2018, Belarus – Osipov V.Yu., Nikiforov V.V.

International Russian Automation Conference (RusAutoCon), September 9-16, 2018, Sochi, Russia – Fatkieva R.R., Vorobiev V.I., Evnevich E.L.

XXXI International Scientific Conference "Mathematical Methods on Technics and Technologies" (MMTT-31), September 10-14, 2018, Saint Petersburg, Russia – Levonevsky D.K.

11th International Conference on Security of Information and Networks (SIN-2018), September 13-15, 2018, Cardiff, UK – Levonevsky D.K.

3nd International Conference on Interactive Collaborative Robotics (ICR-2018), September 18-22, 2018, Leipzig, Germany – Levonevsky D.K.

20th International Conference on Speech and Computer (SPECOM-2018), September 18-22, 2018, Leipzig, Germany – Levonevsky D.K.

IV Interregional Science and Practice Conference "Perspective Directions of National Information Technologies Development", September 19-22, 2018, Sevastopol – Shishkin V.M.

XII International School-Symposium "Analysis, Modeling, Control, Development of Social and Economical Systems" (AMUR-2018), September 14-27, 2018, Simferopol-Sudak – Shishkin V.M.

11th Russian Multiconference on the Problems of Control. Conference "Information Technologies In Control" (ITC-2018), October 2-4, 2018, Saint-Petersburg, Russia, Concern "Electropribor" – Osipov V.Yu., Nikiforov V.V., Zhukova N.A., Levonevsky D.K., Fatkieva R.R., Shishkin V.M.

4-th International Scientific School "Incident Management and Counteraction to Target Cyber-Physical Attacks to Distributed Large-Scale Systems of Critical Importance" (IM&CTCPA 2018), October 22-25, 2018, Saint Petersburg, Russia – Shishkin V.M.

XVI Saint Petersburg International Conference "Regional Informatics (RI-2018) ", October 24-26, 2018, Saint Petersburg, Russia – Osipov V.Yu., Zhukova N.A., Shishkin V.M., Vorobiev V.I., Evnevich E.L., Fatkieva R.R., Petrov M.Yu., Ryzhkov S.R., Uzdyaev M.Yu., Podkorytov S.A.

International Research and Practice Conference "Information Revolution and Challenges of a New Era – Incentives for the Formation of Modern Approaches to Information Security"–November 29-30, 2018, "Institute of National Security of the Republic of Belarus", Minsk – Shishkin V.M.

The IV International Interuniversity Scientific and Practical Conference "Technological Prospect: New Markets and Points of Growth", December 13-15, 2018, Saint Petersburg, Russia – Levonevsky D.K.

Membership in Russian and International Societies, Editorial Boards, etc.

Fatkieva R.R. – reviewer in the journal "Mathematics and Statistics" (ISSN: 2332-2144).

Levonevskiy D.K. – Member of the IEEE (Institute of Electrical and Electronics Engineers), personal Id 93879031.

Recent Results

1. Methods and models of space-time signal coupling in recurrent neural networks with controlled elements, which allow to take into account the space-time and new associative properties used in the development of promising neurochips and neural network cognitive machines of various applied directivity, have been eveloped [2, 3].

2. A dynamic model of conflict interaction based on a system of differential equations with variable parameters, which expands the possibilities of predicting complex conflicts and identifying stable patterns that help prevent the risks of conflicts, has been developed [5].

3. A model and method of adaptive protection against unreliable information was developed using a set of rules for reconfiguring a protection profile and an ontological model, including logical rules, semantic links between resource metadata and class keywords, which allow assessing risks of financial and reputational losses in the operation of enterprises and ensuring measures protection and implementation of the operational management of information security of transport infrastructure and other facilities [8].

Intellectual Property

Osipov V.Yu., Zhukova N.A., Klimov N.V. Computer Program for Automated Multilevel Synthesis of Intelligent Machine Activities // Certificate № 2018664168 of computer program state registration. Date of registration 12.11.2018. RosRid AAAA-Г18-618121000025-8.

Awards, Diploma, Scholarships

Vorobiev V.I. Certificate of Honour of FASO Russia. Order record № 12п of April 27, 2018.

References

Monographs

1. *Osipov V.Yu., Kalmatsky A., Vodyaho A.I., Zhukova N.A., Glebovsky P.A.* Cognitive Monitoring of Telecommunication Networks // SPSETU "LETI" Publishers. 2018. 204 p. (In Russ.).

Papers published in editions, indexed by WoS, Scopus:

2. *Osipov V., Osipova M.* Space-time signal binding in recurrent neural networks with controlled elements // Neurocomputing. 308 (2018). pp. 194–204. (Scopus, SJR=1,07, Q1).
3. *Osipov V., Nikiforov V.* Formal Aspects of Streaming Recurrent Neural Networks // International Symposium on Neural Networks. 2018. LNCS 10878. pp. 29–36. (Scopus).

4. *Kupriyanov M., Vodyaho A., Zhukova N., Kurapeev D., Lushnov M., Osipov V.* Mathematical Methods of Biological System Models Synthesis from the Medical Data // IEEE Northwest Russia Conference on Mathematical Methods in Engineering and Technology (MMET NW 2018). 2018. pp. 512–515. (Scopus).
5. *Levonevskiy D., Vatamaniuk I., Saveliev A.* Processing models for conflicting user requests in ubiquitous corporate smart spaces // MATEC Web of Conferences. 2018. vol. 161. Article no. 3006. 5 p. (Scopus).
6. *Zhukova N., Vodyaho A., Levonevskiy D., Simonenko A.* The method of data transformation for modeling technical objects // Proceedings of the XXI IEEE International Conference on Soft Computing and Measurements (SCM'2018). 2018. pp. 450–453. (Scopus).
7. *Levonevskiy D., Fedorchenko L., Afanasieva I., Novikov F.* Architecture of the Software System for Adaptive Protection of Network Infrastructure // Proceedings of the 11th International Conference on Security of Information and Networks (SIN-2018). 2018. Article no. 17. 4 p. (Scopus).
8. *Levonevskiy D., Vatamaniuk I., Saveliev A.* Providing Availability of the Smart Space Services by Means of Incoming Data Control Methods. // Interactive Collaborative Robotics (ICR-2018). 2018. LNAI 11097. pp. 170–180. (Scopus).
9. *Vorobiev V., Fatkieva R., Evnevich E.* Security Assessment of a Robotic System with Inter-Machine Interaction. // Proceedings of International Russian Automation Conference (RusAutoCon). 2018. pp. 1–7. (Scopus).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

10. *Levonevskiy D., Vatamaniuk I., Malov D.* Ensuring the availability of services of the corporate intellectual space by controlling the flow of input data // Software Engineering. 2018. (In Russ.). (Impact factor – 0,338).
11. *Osipov V.Yu., Vodyaho A.I., Tristanov A.B., Zhukova N.A., Lukovenkova O.O.* Model Synthesis of the Objects of Nature by Data of Observation // Bulletin KRASEC. Physical & Mathematical Sciences. 2018. vol. 4(24). pp. 1–12. DOI: 10.18454/2079-6641-2018-24-4-1-12. (In Russ.). (Impact factor – 0,410).

12. *Zhukova N.A., Podkorytov S.A., Vodyaho A.I., Tristanov A.B., Klimov N.V.* The Program of Multi-level Synthesis of Cognitive Monitoring Processes // KSTU News Scientific Journal. 2018. vol. 51. pp. 161–173. (In Russ.). (Impact factor – 0,140).
13. *Navrotskiy M.A, Zhukova N.A., Mouromtsev D.I., Mustafin N.G.* Design, Development and Maintenance Methodology of Domain Semantic Portals of Scientific and Technical Information // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. Issue 18. vol. 2. pp. 286–298. DOI: 10.17586/2226-1494-2018-18-2-286-298. (In Russ.). (Impact factor – 0,465).
14. *Vodyaho A.I., Nikiforov V.V.* Ontology Models for Real Time Systems // Ontology of Designing. 2018. Issue 8. vol. 2(28). pp. 240–252. DOI: 10.18287/2223-9537-2018-8-2-240-252. (In Russ.). (Impact factor – 0,913).
15. *Vorobiev V.I., Monakhova T.V.* Protection of Metadata in XML Format // Ontology of Designing. 2018. Issue 8. vol. 2(28). pp. 253–264. (In Russ.). (Impact factor – 0,338).
16. *Fatkieva R.R.* Modeling of Automated Technological Processes under Conditions of Information Threats // Science Bulletin of the NSTU. 2018. vol. 70. no. 1. pp. 167–176. DOI: 10.17212/1814-1196-2018-1-167-176. (In Russ.). (Impact factor – 0,334).
17. *Vorobiev V.I., Soldatkina A.A.* Method of Ontological Analysis of a Web-Resource Based on Metadata // Science Bulletin of the NSTU. 2018. vol. 3(72). pp. 43–58. DOI: 10.17212/1814-1196-2018-3-43-58. (In Russ.). (Impact factor – 0,334).
18. *Tsarev I.V.* A System for Simulation Modeling of Dynamic Automata Networks // Science Bulletin of the NSTU. 2018. vol. 70. no. 1. pp. 107–120. DOI: 10.17212/1814-1196-2018-3-107-120. (In Russ.). (Impact factor – 0,334).
19. *Livshitz I.I., Fatkieva R.R.* The Integrity Management System for Security Ensuring for Complex Facilities // Cybersecurity Issues. 2018. vol. 1(25). pp. 64–71. (In Russ.). (Impact factor – 1,117).
20. *Evnevich E.L.* Analysis of Trends in Artificial Cognitive Systems Development // Scientific and Practical Journal Modern Science: Actual Problems of Theory & Practice. Series "Natural & Technical Sciences". 2018. vol. 6. pp. 45–51. (In Russ.). (Impact factor – 0,123).

21. *Zhukova N., Vodyaho A., Levonevskiy D., Simonenko A.* The method of data transformation for modeling technical objects // XXI International Conference on Soft Computing and Measurement (SCM'2018). 2018. pp. 450–454. (In Russ.).
22. *Osipov V.Yu., Nikiforov V.V.* Streaming recurrent neural networks with guided elements // Proceedings of the 11th MultiConference "Information Technologies in Control" (ITU-2018). "Concern "Elektropribor". 2018. pp. 244–253. (In Russ.).
23. *Osipov V.I., Zhukova N.A., Chervontsev M.A., Vodyaho A.I., Klimov N.V.* Cognitive technologies in monitoring // Proceedings of the 11th MultiConference "Information Technologies in Control" (ITU-2018), St.Petersburg: "Concern "Elektropribor", 2018. pp. 39 – 48. (In Russ.). (Impact factor – 0,338).
24. *Afanasieva I., Levonevskiy D., Novikov F., Fedorchenko L.* Formal model and methods for the system description with complex behavior on principles of generalized automata // Proceedings of the 11th MultiConference "Information Technologies in Control" (ITU-2018). "Concern "Elektropribor". 2018. pp. 96–100. (In Russ.).
25. *Fatkieva R.R., Konstantinova K.S.* Application of Design Activities to the University Teaching // Proceedings of the 11th MultiConference "Information Technologies in Control" (ITU-2018). "Concern "Elektropribor". 2018. pp. 712–716. (In Russ.).
26. *Shishkin V.M., Kolesnikov K.E.* Proceedings of the 11th MultiConference "Information Technologies in Control" (ITU-2018). St.Petersburg: "Concern "Elektropribor". 2018. pp. 184–192. (In Russ.).
27. *Shishkin V.M., Kolesnikov K.E.* Dynamic Model of Tripartite Confrontation // Regional Informatics and Information Security. 2018. vol. 5. pp. 177–182. (In Russ.).
28. *Vodyaho A., Osipov V., Chervontsev M., Zhukova N.* Cognitive GIS Monitoring Systems // Regional Informatics and Information Security. 2018. vol. 5. pp. 23–28. (In Russ.).

Other publications:

29. *Shishkin V.M.* Models of Complex Assessment of Risk Factors and Threat Dynamics of Terrorist Orientation // Theoretical and Applied Problems of Information Security: Proceedings of International Scientific and Practical Conference. 2018. pp. 185–188. (In Russ.).

30. *Fatkieva R.R.* Issues of Optimization of Production Activities and Construction of Unified Digital Platforms // Guide of Russian Business in Saint Petersburg. Chamber of Trade and Industry of the Russian Federation. 2018. vol. 2(7). pp. 28. (In Russ.).
31. *Shishkin V.M.* Information Security of Critical Important Assets – Targeted Approach // Problems of Information Security: Proceedings of IV International Theoretical and Practical Conference. 2018. pp. 26–28. (In Russ.).
32. *Vorobiev V.I., Evnevich E.L.* Public Security and Privacy in the Frames of Big Data Technology // Problems of Information Security: Proceedings of IV International Theoretical and Practical Conference. 2018. pp. 9–11. (In Russ.).
33. *Fatkieva R.R.* Creation of a Multilevel System of Security Indicators of the Enterprise Information and Computing System // Problems of Information Security: Proceedings of IV International Theoretical and Practical Conference. 2018. pp. 58–59. (In Russ.).
34. *Vorobiev V.I., Petrov M.Yu., Evnevich E.L.* Methods of Efficient Storage of Big Semi-Structured Data // Development Trends in Internet and Digital Economy: Proceedings of I All Russia Theoretical and Practical Conference with International Participation. 2018. pp. 25–26. (In Russ.).
35. *Vorobiev V.I., Fatkieva R.R.* Assessment of Quantitative and Qualitative Characteristics of Internet Security // Development Trends in Internet and Digital Economy: Proceedings of I All Russian Theoretical and Practical Conference with International Participation. 2018. pp. 27–28. (In Russ.).
36. *Shishkin V.M.* Goals and Risks in the Development of "Digital Economy" // Development Trends in Internet and Digital Economy: Proceedings of I All Russia Theoretical and Practical Conference with International Participation. 2018. pp. 269–270. (In Russ.).
37. *Vorobiev V.I., Evnevich E.L., Petrov M.Yu.* Metadata Application to Assessment and Protection of Web-content // Perspective Directions of Development of National Information Technologies. 2018. pp. 251–252. (In Russ.).
38. *Shishkin V.M.* The Target Approach to Information Security Analyzers of Critical Infrastructures // Perspective Directions of

Development of National Information Technologies. 2018. pp. 263–264. (In Russ.).
39. *Shishkin V.M., Kolesnikov K.E.* Integration of the Differential Model of Confrontation with the Safety Management Systems of Real Time // Perspective Directions of Development of National Information Technologies. 2018. pp. 261–262. (In Russ.).
40. *Shishkin V.M., Kolesnikov K.E.* Dynamic Model of the Confrontation with Exchange of Resources // Proceedings of the XII International Symposium AMUR-2018. 2018. pp. 508–514. (In Russ.).
41. *Yusupov R.M., Vorobiev V.I., Petrov M.Yu.* Digital Description and Structuring of SPIIRAS History Museum Collection // Regional Informatics (RI-2018). XVI St. Petersburg International Conference. 2018. pp. 354. (In Russ.).
42. *Podkorytov S.* Modeling Base Elements of Neural Networks // Regional Informatics (RI-2018). XVI St. Petersburg International Conference. 2018. pp. 47–48. (In Russ.).
43. *Uzdyaev M.* Aspects of Implementation of Streaming Recurrent Neural Networks with Controlled Elements on the Computational Structures // Regional Informatics (RI-2018). XVI St. Petersburg International Conference. 2018. pp. 48–49. (In Russ.).
44. *Vorobiev V.I., Evnevich E., Fatkieva R.R.* Protection Design for Robotic Systems with Machine-to-Machine Interaction // Regional Informatics (RI-2018). XVI St. Petersburg International Conference. 2018. pp. 240-242. (In Russ.).
45. *Ryzhkov S.* Modeling of Information Security in the Cloud Environment // Regional Informatics (RI-2018). XVI St. Petersburg International Conference. 2018. pp. 348–349. (In Russ.).

Information Systems Security Laboratory

Head of the laboratory: PhD Roman Sh. Fahrutdinov – research and development of the algorithms and means for information protection, certificate testing, computer-technical expertise.

Laboratory staff – 6 researches and 1 Ph.D. student.

Research activities – information and computer security, applied cryptography, finite non-commutative algebras.

Research fellows and brief information of the research-work direction

Chief Researcher, Dr. Sci. (Tech.) – Alexander A. Moldovyan – cryptographic protocols, hardware and software means for information protection. maa1305@yandex.ru.

Chief Researcher, Dr. Sci. (Tech.) – Nikolay A. Moldovyan – protocols of the digital signature and authentication, algorithms of the public and psedo-probabilistic encryption, block and stream ciphers, finite algebras as carriers of the public-key cryptoschemes, post-quantum cryptography. nmold@mail.ru.

Senior Researcher, PhD. – Anatoliy Yu. Mirin – research and development of the algorithms and means for information protection, certificate testing, computer- technical expertise. mirin@cobra.ru.

Senior Researcher, PhD. – Ilia I. Livshitz – research and development of the methods and of the algorithms for audit of information security management systems. livshitz.il@yandex.ru.

Researcher – Anna A. Kostina – research and development of the algorithms and means for information protection, certificate testing, computer- technical expertise. anya@hotbox.ru.

Graduated dissertations

Defens of Iliya Iosifovich Livshitz's doctoral thesis "Models and Methods of Auditing the Information Security of Integrated Control Systems for Complex Industrial Facilities" (speciality 05.13.19 – Methods and systems for information protection, information security) on November 11, 2018. (research advisor Moldovyan A.A.).

Grants and projects

Moldovyan N.A. – RFFR grant № 18-07-00932-a "New types of finite algebras and post-quantum-cryptography protocols on their base", 2018-2020.

Moldovyan N.A. – RFFR grant № 18-57-54002-Viet_a "Method for pseudoprobabilistic encryption, algorithm and protocols for providing information security of the information-telecommunication systems", 2018-2019.

Moldovyan A.A. – serial software supply contracts of Information Security System "Aura 1.2.4", "Aura" и "SGU-2".

University courses

Military Space Academy: Cryptographic protocols – Moldovyan N.A.

SPSEEU: Protection of the operation systems and Data-base management systems – Moldovyan A.A.

Admiral Makarov State University of Maritime and Inland Shipping: Cryptographic methods for information protection. Foundations of Cryptography – Moldovyan N.A.

Complex information security of the management systems – Moldovyan A.A.

International cooperation

Institute of Mathematics and Computer Science of the Academy of Sciences of Moldova, Academy of Cryptography Technique, Hanoi, Vietnam.

L.N.Gumilyov ENU, Kazakhstan. Reception of master Bibigul Tailak for an internship.

Participation in conferences and exhibitions

Eleventh Conference on Fundamental and Applied IT Research – FAIR'11,Vietnam, Hanoi, 9-10th August – Moldovyan N.A. (invited plenary report).

Conference on Mathematical Foundations of Informatics MFOI2018, July 2-6, 2018, Chisinau, Republic of Moldova – Moldovyan N.A. (sectional report).

International Conference on Mathematics, Informatics, and Information Technologies MITI 2018, April 19-21, 2018, Baltsi, Republic of Moldova – Moldovyan N.A. (sectional report).

"Scientific and technical problems in industry". St.Petersburg, October 2 – 4, 2018 – Moldovyan N.A. (sectional report).

The XVI St. Pertersburg International Conference Regional Informatics (RI-2018), October 24-26, 2018. St. Pertersburg – Fahrutdinov R.Sh. (sectional report).

Membership in Russian and International organizations, editorial boards of journals

Moldovyan N.A. – member of the editorial board of the journals "SPIIRAS Proceedings" and "Journal of Computer Science and Cybernetics" (Hanoi, Vietnam).

Research results

1. The forms for assigning a computationally complex discrete logarithm problem in a finite cyclic group contained in a finite noncommutative algebra with an associative multiplication operation are proposed that are of interest as a basic cryptographic primitive used to build post-quantum cryptographic algorithms and public-key protocols, using irreversible elements and local ones unit elements of noncommutative algebras as basic parameters of the formulated problem [6].

2. Method for specifying finite noncommutative algebras with an associative multiplication operation for the case of arbitrary even dimensions exceeding 4, expanding the set of potential carriers of the hidden discrete logarithm problem and providing new possibilities in the construction of post-quantum algorithms and public-key protocols has been developed. For cases of dimension 2 and 4, the method leads to the construction of commutative associative algebras, and for the four-dimensional case, non-commutative algebras can be specified due to asymmetric distributions of structural coefficients, leading to a finite quaternion algebra as a special case [5].

3. The concept of pseudo-probabilistic encryption using a shared secret key has been developed as joint encryption of two independent messages with the formation of a ciphertext that is computationally indistinguishable from a ciphertext obtained by probabilistic encryption of one of these two messages, providing information protection against unauthorized access [1].

4. A new method of using block ciphers is proposed - cryptocoding mode, which provides the possibility of correcting errors that occur when transmitting a ciphertext over a channel with noise, characterized by the combination of procedures for error-correcting coding and information protection within a single data conversion procedure, where particular variants of crypto-coding mode provide the possibility of simultaneous correction of errors of different nature (bit inversion, skipping and insertion of bits) [15].

References:

Papers prepared jointly with foreign organizations:

1. *Nguyen H.N., Nguyen D.T., Nguyen M.H., Moldovyan N.A.* New Blind Signature Protocols Based on Finite Subgroups with Two-Dimensional Cyclicity // Iranian Journal of Science and Technology, Transactions of Electrical Engineering. 2018. pp. 1–11 DOI: https://doi.org/10.1007/s40998-018-0129-6. (Scopus, SJR=0,12, Q4).
2. *Moldovyan N.A., Moldovyan A.A., Nguyen D.T., Nguyen N.H., Nguyen H.M.* Pseudo-probabilistic block ciphers and their randomization // Journal of Ambient Intelligence and Humanized Computing. 2018. 8 p. DOI:https://doi.org/10.1007/s12652-018-0791-6. (Scopus, SJR=0,35, Q2).
3. *Nguyen N.H., Moldovyan N.A., Shcherbacov A.V., Nguyen H.M., Nguyen D.T* .No-Key Protocol for Deniable Encryption // Proceedings of the Fourth International Conference on Information Systems Design and Intelligent Applications (INDIA 2017). 2018. vol. 672. pp. 96–104. DOI 10.1007/978-981-10-7512-4_10. (Scopus).
4. *Moldovyan N.A., Moldovyan A.A., Nguyen D.T., Nguyen N.H., Nguyen H.M.* Method for Pseudo-probabilistic Block Encryption // International Conference on Industrial Networks and Intelligent Systems. 2017. pp. 321–331. DOI 10.1007/978-3-319-74176-5_28. (Scopus).
5. *Moldovyan N.A., Al-Majmar N.A., Nguyen D.T., Nguyen N.H., Nguyen H.M.* Deniability of Symmetric Encryption Based on Computational Indistinguishability from Probabilistic Ciphering // Proceedings of the Fourth International Conference on Information Systems Design and Intelligent Applications (INDIA 2017). 2018. vol. 672. pp. 209–218. DOI 10.1007/978-981-10-7512-4_21. (Scopus).

Papers published in editions, indexed by WoS, Scopus:

6. *Moldovyan A.A., Moldovyan N.A.* Methods and Algorithms for Pseudo-probabilistic Encryption with Shared Key // *SPIIRAS Proceedings*. 2018. vol. 6(61). pp. 119–146. (In Russ.). (Scopus, SJR=0,16, Q4).

7. *Moldovyan A.A., Moldovyan N.A.* Post-quantum signature algorithms based on the hidden discrete logarithm problem // Computer Science Journal of Moldova. 2018. vol. 26. no. 3(78). pp. 301–313. (Scopus).
8. *Moldovyan D.N., Moldovyan N.A., Shcherbacov V.A.* Non-commutative finite associative algebras of 3-dimensional vectors // Quasigroups and related systems. 2018. vol. 26. no. 1. pp. 109–120. (Scopus, SJR=0,45, Q3).
9. *Moldovyan A.A.* General Method for Defining Finite Non-commutative Associative Algebras of Dimension m>1 // Buletinul Academiei de Stiinte a Republicii Moldova. Matematica. 2018. vol. 2(87). pp. 95–100. (Scopus, SJR=0,22, Q4).
10. *Moldovyan N.A.* Unified Method for Defining Finite Associative Algebras of Arbitrary Even Dimensions // Quasigroups and Related Systems. 2018. vol. 26, no. 2. pp. 263–270. (Scopus, SJR=0,45, Q3).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

11. *Moldovyan N.A., Vaichikauskas M.A.* Generarion of the cubc congruencies as a method for public encryptionand protocol for deniale encryption // Intellectual Technologies on Transport. 2018. Issue 1. vol. 13. pp. 32–37. (In Russ.). (Impact factor – 0,328). (In Russ.).
12. *Moldovyan A. A., Tatchina Ya.A.* Deniable-encryption Methods Based on Block Ciphers // Intellectual Technologies on Transport. 2018. Issue 1. vol. 13. pp. 25–31. (Impact factor – 0,328). (In Russ.).
13. *Moldovyan N.A., Budchan D.S.* Cryptographic protocols on the base of solving cubic equations // Proceedings of Saint Petersburg Electrotechnical University Journal. 2018. vol. 4. pp. 21–26. (Impact factor – 0,123). (In Russ.).
14. *Abrosimov I.K., Moldovyan D.N., Moldovyan N.A.* Finite n0n-commutative associative algebra with compressing multiplication operation // Proceedings of Saint Petersburg Electrotechnical University Journal. 2018. vol. 5. pp. 23–27. (Impact factor – 0,123). (In Russ.).

15. *Moldovyan A.A., Muravyov A.V. Moldovyan D.N.* Method for Block Encryption in the Error Correcting mode // Proceedings of Saint Petersburg Electrotechnical University Journal. 2018. vol. 6. pp. 21–26. (Impact factor – 0,123). (In Russ.).
16. *Lifshitz I.I., Neklyudov A.V.* Cibersecurity – a novel notion or well foggoten present? // Industrial automation. 2018. vol. 7. pp. 32–35. (Impact factor – 0,278). (In Russ.).
17. *Lifshitz I.I., Fatkieva R.R.* Model of the integrated management system for providing security of complex objects // Items of Cibersecurity. 2018. vol. 1(25). pp. 64–71. (Impact factor – 1,117). (In Russ.).
18. *Fahrutdinov R*. Using low-speed devices to video data confidentiality // Procedings of the XVI St. Pertersburg International Conference Regional Informatics (RI-2018). 2018. pp. 171–174. (In Russ.).

Other publicaions:

19. *Moldovyan A.A., Moldovyan N.A., Shcherbacov V.A.* Non-commutative 6-dimensional associative algebras of two different types // Proceedings of the Conference on Mathematical Foundations of Informatics (MFOI2018). 2018. pp. 154–163. URL: http://mfoi2018.math.md/proceedings.html.
20. *Moldovyan N.A., Moldovyan A.A.,* Shcherbacov V.A. Error-correcting block ciphers // Proceedings of the International Conference on Mathematics, Informatics, and Information Technologies (MITI 2018). pp. 60–61. URL: http://www.miti2018.usarb.md.
21. *Kostina A.A., Moldovyan N.A., Morozova E.V.* Method for Cryptocoding with Two Redundacy Labeles // Procidings of the conference "Scientific and technical problems in industry". 2018. pp. 42–43. (In Russ.).

Laboratory of Autonomous Robotic Systems

Head of the laboratory – PhD Anton I. Saveliev – development of mathematical models, cross-platform software and mobile services for the surrounding cyber-physical space, saveliev.ais@yandex.ru.

Laboratory staff: 17 members.

Research activities – development of mathematical models, software and hardware for autonomous robotic systems, including methods of modular, swarm, cloud and anthropomorphic robotics, and prototyping of robots, cyber-physical modules and specialized calculators.

Research fellows and brief information of the research-work direction

Principal researcher, Dr. Tech. Sci., Prof., Professor of the Russian academy of sciences – Andrey L. Ronzhin – interaction of autonomous robotic systems and users in a cyber-physical environment. ronzhin@iias.spb.su.

Senior researcher, PhD – Viktor Yu. Budkov – methods and models of audio-visual signal processing in onboard calculators, budkov@iias.spb.su Researcher, Nikita A. Pavliuk – construction of ground-based robotic systems and individual mechatronic nodes, antei.hasgard@gmail.com.

Junior researcher – Irina V. Vatamaniuk – methods, algorithms and architectures of robotic and information control systems, vatamaniuk@iias.spb.su.

Junior researcher – Alexander V. Denisov – methods and software for controlling the movement of a robot with an anthropomorphic kinematic scheme, sdenisov93@mail.ru.

Junior researcher – Konstantin D. Krestovnikov – methods and constructive solutions for wireless power transmission, open56it@gmail.com.

Junior researcher – Dmitriy A. Malov – methods for organizing the transmission of data between devices in IoT-networks, machine learning methods, malovdmitrij@gmail.com.

Junior researcher – Daniil I. Michalchenko – onboard robot control systems, tekatodsham@gmail.com.

Junior researcher – Petr A. Smirnov – design and prototyping of robotic systems, petruha.smirnov.1994@gmail.com.

Junior researcher – Olga O. Shumskaya – digital signal analysis techniques and algorithms, shumskaya.oo@gmail.com.

Junior researcher – Roman N. Yakovlev – architecture of big data models and cyber-physical systems, iakovlev.r@mail.ru.

Ph.D. students

Irina V. Vatamaniuk – Architectures, methods and algorithms for interaction of heterogeneous means of cyber-physical intellectual space when serving users (research advisor – A. Ronzhin), vatamaniuk@iias.spb.su.

Alexander V. Denisov – Methods and software tools for the motion control of robot with anthropomorphic kinematics (research advisor – A. Ronzhin), denisov@iias.spb.su.

Arseniy G. Ivin – Mathematical models, algorithms and software for implementing combined movements of anthropomorphic robots (research advisor – V. Budkov), arssivka@yandex.ru.

Daniil I. Michalchenko – Algorithms and software for decision making based on sensory systems data of anthropomorphic robots (supervisor – A. Ronzhin), tekatodsham@gmail.com.

Dmitriy A. Malov – Architectures, algorithms and software of self-organizing technical systems (research advisor – A. Ronzhin), malovdmitrij@gmail.com.

Nikita A. Pavliuk – Software tools and structural-functional models of network interaction of nodes of anthropomorphic robots (research advisor – A. Ronzhin), antei.hasgard@gmail.com.

Petr A. Smirnov – Development of algorithms and software based on machine learning approaches for control of n-link mechanisms (research advisor – A. Ronzhin), petruha.smirnov.1994@gmail.com.

Olga O. Shumskaya – Algorithmic models and software for digital data processing in the onboard computer of robotic systems (research advisor – A. Ronzhin), shumskaya.oo@gmail.com.

Grants and projects

Saveliev A. – Grant of the President of the Russian Federation MK-383.2018.9 "Development of a system for user localization and navigation in cyber-physical space, based on probabilistic machine learning methods", 2018-2019.

Ronzhin A. – Project of RSF No. 16-19-00044 "Principles for the allocation of tasks between service robots and means of cyber-physical intelligent environment for the multimodal user support", 2016-2018.

Ronzhin A. – Project of RFBR No. 18-58-76001 ERA_a "Strategies for joint activities of heterogeneous robots, controlled by intuitive human-machine interfaces, when solving agricultural tasks", 2018-2021.

Budkov V.Y. – Project of RFBR No. 17-58-04110_Bel_mol_a Modeling and development of energy-efficient solutions for kinematics and dynamics of walking robots, 2017-2019.

Ronzhin A. – Project of RFBR No. 16-29-04101_ofi Techniques for controlling pairwise linkages of homogeneous robots when configuring a robotic swarm into three-dimensional forms, 2016-2019.

Ronzhin A. – Project of RFBR No. 16-08-00696 "Modeling automated robotic means for transporting victims", 2016-2018.

Budkov V.Y. – Project of RFBR No. 16-37-60085-mol_a_dk "Development of methods and software for estimating deception of transmitted voice messages', 2016-2018.

Ronzhin A. – "Group control of mobile robots in the intelligent space", Program of the Presidium I.40P "Current problems of robotics", 2015-2017. (Jointly with the Laboratory of Integrated Automation systems headed by Dr. Tech. Sci. Smirnov A.V.).

University courses

SPSUAI: "Electric drives of aerospace robotic systems"; "Design of robots and robotic systems"; "Fuzzy controls in robotic systems"; "Sensor systems in mechatronics and robotics"; "Computer technology modeling and design of electro-mechanical devices"; "Electromechatronica" – A. Saveliev.

SPSUAI: "Optimal systems"; "Control robots and robotic systems"; "Microprocessor technology in mechatronics and robotics"; "Local control systems"; "Neural networks and neurocontrollers" – N. Pavliuk.

Scientific and organizational activity

Organization of the 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings – 2018" (ER(ZR)-2018), http://confs.guap.ru/zav-read. St. Petersburg, Russia, April 18-21, 2018. Proceedings published online: MATEC Web of Conferences, Volume 161 (2018) – A. Ronzhin and V. Shishlakov (Eds.), eISSN: 2261-236X.

Organization of the 3rd International Conference "Interactive Collaborative Robotics' ICR-2018. http://specom.nw.ru/icr. Leipzig (Germany), September 18-22, 2018 – A. Ronzhin (co-chair). Proceedings published: Interactive Collaborative Robotics - Springer International

Publishing Switzerland. A. Ronzhin et al. (Eds.): ICR-2018, LNCS 11097, LNAI 11097, 2018, 302 p. DOI https://doi.org/10.1007/978-3-319-99582-3.

International cooperation

Joint research and organization of scientific events in collaboration with the University of West Bohemia in Pilsen (Czech Republic), Bogazici University in Istanbul (Turkey), Dresden University of Technology, Karlsruhe Institute of Technology (Germany), Belarusian State University of Informatics and Radioelectronics (Belarus), United Institute of Information Problems of the National Academy of Sciences of Belarus, Universidad Nacional Autonoma de Mexico (Mexico).

Participation in conferences and exhibitions

13th International Conference "Zavalishin's Readings – 2018" (ER(ZR)-2018) – St. Petersburg, Russia, April 18-21, 2018 –Saveliev A., Smirnov P., Vatamaniuk I., Pavliuk N., Malov D.

3rd International Conference "Interactive Collaborative Robotics' (ICR-2018) – Leipzig, Germany, September 18-22, 2018 – Ronzhin A., Saveliev A., Malov D., Pavliuk N., Vatamaniuk I., Budkov V., Krestovnikov K.

First International Conference "Business Management in the Digital Economy" – St. Petersburg, Russia, March 22-23, 2018 – Yakovlev R., Vatamaniuk I., Saveliev A.

XVIII International Youth Conference "Systems of design, technological preparation of production and management of the stages of the life cycle of an industrial product (CAD / CAM / PDM-2018)" – Moscow, IPU RAS, October 16-18, 2018 – Shumskaya O, Smirnov P.

Interdisciplinary School-Conference "Information Technologies and Systems" (ITaS) – Kazan, September 25 - 30, 2018 – Denisov A., Saveliev A.

International Scientific-Technical Conference "Automation" - Sochi, September 16-23, 2018 – Malov D., Mikhalchenko D., Smirnov P.

International scientific conference MMET NW 2018 – St. Petersburg, Russia, September 10-14, 2018 – Vatamaniuk I., Malov D., Yakovlev R.

International scientific-practical conference "Progress of vehicles and systems - 2018", Volgograd, October 9-11, 2018 – Pavliuk N., Michalchenko D., Ronzhin A.

International Conference "Digital Industry: Current State and Development Prospects 2018", November 13-15, 2018, Chelyabinsk, Russia – Ronzhin A.L. (plenary report).

Simposio Internacional de Procesamiento Digital de Señales, November 21-23, 2018, Mexico City, Mexico – Ronzhin A.L. (plenary report).

International Conference Models of Thinking and Integration of Information Control Systems (MMIUS - 2018), December 4-9, 2018, Terskol, Russia – Ronzhin A.L. (plenary report).

Membership in Russian and International societies, editorial boards, etc.

Ronzhin A.– RAS expert, Member of the Scientific Council on Robotics and Mechatronics of the Russian Academy of Sciences, Member of the sub-committee on Eastern Europe of the International Speech Communication Association (ISCA), Member of the Academy of Navigation and Motion Control, General Conference Co-Chair of the International Conference "Speech and Computer" SPECOM, Co-Chair of the international conference "Interactive Collaborative Robotics" ICR, Member of the International Programming Committee of the International Scientific Conference MMET NW 2018; Associate Editor of the International Journal of Intelligent Unmanned Systems, member of the editorial board of the scientific journal System Engineering and Information Technologies, member of the editorial board of the scientific journal Speech Technologies, deputy chief editor of the journal Trudy SPIIRAN, member of the expert council of the Higher Attestation Commission on Computer Science and computing.

Saveliev A. – Member of the Committee of the Semifinal of the Contest "Participant of the Youth Scientific and Innovation Contest" ("UMNIK") of the Foundation for Assistance to the Development of Small Forms of Enterprises in the Scientific and Technical Sphere.

Intellectual property

Certificate of state registration of computer programs №2018614015 from 27.03.2018: I. Vatamaniuk, N. Pavliuk "The system for modeling the reconfiguration process of the distributed mobile cyber-physical means". Registration number in rosrid: AAAA-Г18-618052190033-2. https://rosrid.ru/rid/OORSYBNH7RBMMSXLB1JHLOW1.

Certificate of state registration of the invention: A. Ronzhin, A. Saveliev "The method to distribute tasks between service robots and cyber-physical intellectual space tools with multi-modal user service". Registration number in rosrid: №AAAA-Г18-618061390003-5. https://rosrid.ru/rid/DKEKK5PGLPUO71HYB1HPIQNA.

Recent results

1. Structural-functional model of the proactive user localization system of cyber-physical intellectual space, which allows predicting the activity of the monitored object based on the recurrent neural network model with long-term short-term memory (LSTM) and a virtual environment for simulating user behavior inside the intellectual space in the Unity3D environment have been developed [13, 23].

2. Structures of the video conferencing module with the implementation of private and controlled public accounts, providing the possibility of its integration into the cyber-physical system have been developed, where network interaction is presented in the form of three separate layers responsible for managing the network connection to the server, the user connection, and the connection for transferring multimedia data conferencing participants [19].

3. A multi-criteria model for assessing the quality of perception of cyber-physical intellectual space services has been developed, which allows analyzing key system performance indicators and correcting requirements for them based on historical data on objective parameters of user service quality during the development of cyber-physical intellectual space [17].

4. A computer model and a prototype of a homogeneous modular autonomous reconfigurable system (MARS) were developed using the magnetic-mechanical connector as a mechanism for connecting modular robots used for basic modular architectures: serpentine and walking, formed by autonomous MARS units using the minimum possible number of modules [15].

5. The architecture of the wireless energy transfer system and the method of designing of wireless charger for robotics have been developed, as well as a prototype of a wireless charger for a mobile robotic platform with the maximum power of which is 110 W with an efficiency of at least 60%, is created [16].

6. A constructive and functional models of a ground-based robotized platform have been developed that performs the functions of transporting and maintaining unmanned aerial vehicles (UAV), allowing the UAV to land for recharging / replacing the battery in automatic mode [6, 8, 10].

Awards, diplomas, scholarships

Budkov V.Y. – Grant-subsidy of the Committee on Science and Higher Education of the Government of St. Petersburg for young PhD "Algorithms for

checking the trajectory correctness of the biotechnical device for recording and assessing the correctness of patient's physical load", 2018.

Pavliuk N.A. – Grant-subsidy Committee on Science and Higher Education of the Government of St. Petersburg for students of universities located in St. Petersburg, graduate students of universities, industry and academic institutions located in St. Petersburg "Device for diagnostics vestibular apparatus of the patient based on the registration of changes in position and pressure of the feet", 2018.

Pavliuk N.A – The winner of competitive selection for obtaining scholarships of the Government of the Russian Federation in priority areas of training for the 2018/2019 academic year.

References

Articles prepared jointly with foreign organizations:

1. *Heilig A., Mamaev I., Hein B., Malov D.* Adaptive particle filter for localization problem in service robotics // MATEC Web of Conferences. 2018. vol. 161. Article no. 01004. 6 p. DOI: https://doi.org/10.1051/matecconf/201816101004. (WoS, Scopus).
2. *Vu Q., Raković M., Delic V., Ronzhin A.* Trends in Development of UAV-UGV Cooperation Approaches in Precision Agriculture // International Conference on Interactive Collaborative Robotics. 2018. pp. 213–221. (Scopus).
3. *Shumskaya* O.O., Zelezny M. Adaptive algorithm of replacement-based embedding of data into compressed JPEG images // Information and Control Systems. 2018. vol. 5. pp. 44–56. (In Russ.) DOI: https://doi.org/10.31799/1684-8853-2018-5-44-56. (Scopus).
4. *Ronzhin A.L., Zelezny M.* Digitalization of Management Processes in Scientific and Educational Organizations // Administrative Consulting. 2018. vol. 10(118). pp. 109-117. (In Russ.) DOI: https://doi.org/10.22394/1726-1139-2018-10-109-117.

Papers published in editions, indexed by WoS, Scopus:

5. *Vatamaniuk I.V., Budkov V.Y., Kipyatkova I.S., Karpov A.A.* Methods and Algorithms of Audio-Video Signal Processing for Analysis of Indoor Human Activity // Computer Vision in Control Systems-4. 2018. pp. 139–173. DOI: https://doi.org/10.1007/978-3-319-67994-5_6.
6. *Nguyen V., Solenaya O., Smirnov P.* Issues of physical interaction of unmanned aircraft manipulators with ground objects // MATEC Web

of Conferences. 2018. vol. 161. Article no. 03021. 5 p. DOI: https://doi.org/10.1051/matecconf/201816103021. (WoS, Scopus).
7. *Vu Q., Kuzov M., Ronzhin A.* Hierarchical classification of robotic grippers applied for agricultural object manipulations // MATEC Web of Conferences, 2018. vol. 161. Article no. 03015. 6 p. DOI: https://doi.org/10.1051/matecconf/201816103015. (WoS, Scopus).
8. *Pavliuk N.A., Krestovnikov K.D., Pykhov D.E.* Mobile Autonomous Reconfigurable System // Problems of regional energy. 2018. vol. 1(36). pp. 125–135. (In Russ.) DOI: 10.5281/zenodo.1217296.
9. *Vu Q., Nguyen V., Solenaya O., Ronzhin A., Mehmet H.* Algorithms for joint operation of service robotic platform and set of UAVs in agriculture tasks // 2017 5th IEEE Workshop on Advances in Information, Electronic and Electrical Engineering (AIEEE). 2017. pp. 1–-6. DOI: 10.1109/AIEEE.2017.8270525. (Scopus).
10. *Zhukovskiy Y., Malov D.* Concept of Smart Cyberspace for Smart Grid Implementation // Journal of Physics: Conference Series. 2018. vol. 1015. no. 4. Article no. 042067. DOI: 10.1088/1742-6596/1015/4/042067. (Scopus, SJR=0,24, Q3).
11. *Mikhalchenko D., Ivin A., Malov D.* Obtaining depth map from 2D non stereo images using deep neural networks // International Journal of Intelligent Unmanned Systems. 2018. vol. 6(3). pp. 134–146. DOI: https://doi.org/10.1108/IJIUS-03-2018-0007. (Scopus, SJR=0,27, Q3).
12. *Saveliev A., Malov D., Edemskii A., Pavliuk N.* Proactive Localization System Concept for Users of Cyber-Physical Space // International Conference on Interactive Collaborative Robotics. 2018. pp. 233–238. (Scopus).
13. *Levonevskiy D., Vatamaniuk I., Saveliev A.* Providing Availability of the Smart Space Services by Means of Incoming Data Control Methods // International Conference on Interactive Collaborative Robotics. 2018. pp. 170–180. (Scopus).
14. *Pavliuk N., Krestovnikov K., Pykhov D., Budkov V.* Design and Operation Principles of the Magnetomechanical Connector of the Module of the Mobile Autonomous Reconfigurable System // International Conference on Interactive Collaborative Robotics. 2018. pp. 202–212. (Scopus).
15. *Denisov A., Saveliev A.* Comparative analysis of wireless data exchange technologies for IoT-system realization // Information technologies and systems. 2018. pp. 422–429. (Scopus).

16. *Vatamaniuk I.V., Malov D.A., Levonevskii D.K.* Modeling the QoE Estimation for Services of the Cyberphysical Intelligent Space // Proc. of the 2018 IEEE Northwest Russia Conference on Mathematical Methods in Engineering and Technology (MMET NW). 2018. pp. 436–439. (Scopus).
17. *Mamajev N., Marusenko M., Piotrowska X., Ronzhin A.* Burrows's Delta in Authorship Attribution of Russian Literary Texts // Proc. of the R. Piotrowski's Readings in Language Engineering and Applied Linguistics (LE & AL'2017). 2018. vol. 2233. pp. 107–119. URL: http://ceur-ws.org/Vol-2233/Paper_9.pdf. (Scopus).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

18. *Karasev E.Yu., Vatamaniuk I.V., Saveliev A.I., Ronzhin A.L.* Architectural Solutions for Integrating a Video Conferencing Module into Cyberphysical Intelligent Space // Information and Control Systems. 2018. vol. 1. pp. 2–10. (In Russ.). DOI:10.15217/issn1684-8853.2018.1.2. (Scopus).
19. *Ronzhin A., Nguyen V., Solenaya O.* Analysis of problems in developing unmanned aerial manipulators and the physical interaction of UAVs with ground targets // Trudy MAI. 2018. vol. 98. 26 p. (In Russ.). (Impact factor – 0,445).
20. *Pavliuk N.A.* Modeling the supporting structure of the pelvic mechanism of the anthropomorphic robot ANTARES // Extreme Robotics. 2017. vol. 1. pp. 155–160.
21. *Shumskaya O.O., Budkov V.Y.* Comparative study of classification methods in the stegoanalysis of digital images // Scientific Herald NSTU. 2018. vol. 3(72). pp. 121–134. DOI: 10.17212/1814-1196-2018-3-121-134. (In Russ.). (Impact factor – 0,334).
22. *Ivin A., Mikhalchenko D.* Software platform for designing multi-module systems of robotic systems with asynchronous multithreaded control // Actual problems of information and telecommunications in science and education. 2017. Issue 3. pp. 243–247. (In Russ.). (Impact factor–0,445).
23. *Duboysky I.V., Pavlyuk N.A., Yakovlev R.N.* Device for diagnostics of the vestibular patient apparatus // Izvestia Tula State University. Technical science. 2018. vol. 10. pp. 233–239. (In Russ.) (Impact factor – 0,222).

24. *Saveliev A.I, Edemskij A.Yu., Malov D.A, Kudrin D.R., Chuhno V.D.* Transmission of service and multimedia data in IoT-networks using hybrid communication devices for proactive localization and user navigation in cyber-physical space // 13th International Scientific-Technical Conference on Electromechanics and Robotics "Zavalishin's Readings". 2018. pp. 195–204. (In Russ.).
25. *Yakovlev R., Vatamaniuk I., Saveliev A*. Analysis of existing solutions for managing big data architecture // First International Conference "Business Management in a Digital Economy": a collection of abstracts of presentations. 2018. pp. 527–530. (In Russ.)
26. *Shumskaya O.O., Ishakova A.O.* The use of digital watermarks in the problem of covert transmission of a control signal in a multi-agent robotic system // Systems of design, technological preparation of production and management of the stages of the life cycle of an industrial product (CAD/CAM/PDM-2018). 2018. pp.66–70. (In Russ.).
27. *Smirnov P.A.* Development of motor-wheels with integrated magnetic-mechanical interface for mobile reconfigurable system MARS // Design systems, technological preparation of production and management of the stages of the industrial product life cycle (CAD/CAM/PDM-2018). 2018. pp. 245–249. (In Russ.).
28. *Ronzhin A., Pavlyuk N., Mikhalchenko D.* The design and principles of operation of the magnetic-mechanical connectors of modular robot // Materials of the reporting event RFBR of the "ofi-m" competition (theme 604) in the framework of the international scientific-practical conference "Progress of vehicles and systems - 2018". 2018. pp. 9–11. ISBN 978–5–9948–3085– 7. (In Russ.).

Other Publications

29. *Shumskaya O.O., Ishakova A.O.* The use of digital watermarks in the problem of covert transmission of a control signal in a multi-agent robotic system // Systems of design, technological preparation of production and management of the stages of the life cycle of an industrial product (CAD/CAM/PDM–2018). 2018. pp. 28. (In Russ.).
30. *Krestovnikov K.D., Kondratkov A.V., Saveliev A.I.* Investigation of the ESP32-WROOM microprocessor module // Zavalishin readings-18. 2018. pp. 130–141. (In Russ.).
31. *Parshin A.D., Krestovnikov K.D.* The use of a wireless charger for UAV // Zavalishin readings-18. 2018. pp. 388–391.

Intelligent Systems Laboratory

Head of laboratory – Dr. Tech. Sc., Prof. Ilya S. Lebedev – methods and models of information and computer security of transport systems, methods of monitoring information security,multi-agent modeling,intelligent data analysis and applied big data models,semantic data models.isl_box@mail.ru.

Laboratory staff: 5 members.

Research activities – multi-agent system technology, Multi-agent logistics, Self-organized B2B Networks, Distributed and P2P Data Mining and Machine Learning, Intelligent Data Analysis, Data and Information Fusion, Knowledge Discovery from Data, Intelligent Transportation Systems, Big Data Analysis, Teamwork of agents, 3G Recommending Systems, Mobile document images enhancement.

Research fellows and brief information of the research-work direction

Senior Researcher Ph.D. – Oleg V. Karsaev – Artificial Intelligence, Multi-agent Systems and Software Tools, Multi-agent Applications in Transportation Logistics, Intelligent Planning and Scheduling, Air Traffic Control, P2P architectures and protocols, Small satellite control. ok@iias.spb.su.

Researcher – Vakhtang V. Kislyakov – Artificial Intelligence, Ontology Design Automation, Intelligent Planning and Scheduling, Programming, Data Bases. vakh@iias.spb.su.

Junior Researcher – Viktor V. Semenov – Information Security, Machine Learning, Decision Making Methods, Recommending Systems, Intelligent Methods For Processing and Analyzing Multidimensional Data. vksemenov@gmail.com.

Junior Researcher – Kseniya I. Salakhutdinova –Information Security, Data Processing, Theory of Probability and Mathematical Statistics, Machine Learning. kainagr@mail.ru.

Grants and projects

Lebedev I.S – Project no.0073-2018-0007of the RAS PresidiumProgram "Development of scalable sustainable algorithms for

constructing semantic models of big data and their use for solving applied problems of clustering and machine learning", 2018-2020.

Lebedev I.S. – Project no.0073-2018-0008of the RAS PresidiumProgram "Theory and distributed algorithms of self-organization of group behavior of agents in an autonomous mission", 2018-2020.

Karsaev O.V. – RFBR project no. 18-01-00840\18-офи_м "Development of a multi-agent model of team work for a group of small spacecraft in an autonomous mission", 2018-2020.

University courses

Saint Petersburg State University (SPbU): "Object oriented programming" – I. Lebedev.

National Research University "Higher School of Economics" (SPb): "Information support of logistics business processes in supply chains", "Research seminar", "Vocational orientation workshop" – I. Lebedev.

ITMO University: "Organization and management of information security service", "Digital video processing methods" – K. Salakhutdinova.

Participation in conferences and exhibitions

The 11th conference on Internet of Things and Smart Spaces ruSMART 2018. August 29-30, 2018. St.Petersburg, Russia – I. Lebedev.

27th Scientific and Technical Conference "Methods and Technical Tools of Information Security" (MTTIS 2018), September 24-27, 2018, St. Petersburg, Russia – Lebedev I.

XVISt. Petersburg International Conference "Regional Informatics-2018" ("RI-2018"), October 24 - 26, 2018, St. Petersburg, Russia – Lebedev I.

Recent results

1. A method of improving accuracy was proposed and software for automatic text classification was developed by using information about semantic-syntactic relations between words, a methodallows to select a variety of features that can be used either to train a separate classifier or added to statistical features and be used together [9].

2. An approach to use the gradient-boosting algorithm of decision trees was proposed as applied to the task of identifying software of Linux

operating systems in order to reduce the growth in the number of system vulnerabilities caused by installing unauthorized software by users [2, 5].

3. An algorithm for linear thematic classification of texts in natural language has been developed. It differs from the known ones by using semantic-syntactic features for classifying texts, based on identifying types of links between words, which allows taking into account not only the occurrence of the words in the text, but also their semantic role in the text [10].

References

Papers published in editions, indexed by WoS, Scopus:

1. *Semenov V.V., Sukhoparov M.E., Lebedev I.S.* An Approach to Classification of the Information Security State of Elements of Cyber-Physical Systems Using Side Electromagnetic Radiation // Internet of Things, Smart Spaces, and Next Generation Networks and Systems. 2018. LNCS 11118. pp. 289–298. (Scopus).
2. *Salakhutdinova K.I., Krivtsova I.E., Lebedev I.S., Sukhoparov M.E.* An Approach to Selecting an Informative Feature in Software Identification // Internet of Things, Smart Spaces, and Next Generation Networks and Systems. 2018. LNCS 11118. pp. 318–327. (Scopus).

Papers published in editions, indexed by Russian Science Citation Index (RCSI):

3. *Semenov V., Lebedev I., Sukhoparov M.* Identification of the state of individual elements of cyber-physical systems based on external behavioral characteristics // Journal of Applied Informatics. 2018. Issue 13. vol. 5(77). pp. 72–83. (In Russ.). (Impact factor – 0,410).
4. *Salakhutdinova K.I., Lebedev I.S., Krivtsova I.E.* Algorithm of gradient boosting of decision trees in the problem of software identification // Scientific and Technical Journal of Information Technologies, Mechanics and Optics. 2018. Issue 18. vol. 6(118). (In Russ.). (Impact factor – 0,465).
5. *Martynova L.A., Karsaev O.V.* The method of coordinating the behavior of a group of autonomous uninhabited underwater vehicles on a multi-agent basis during seismic survey // Izvestiya

SFedU. Engineering sciences. 2018. vol. 1(195). pp. 52–67. (In Russ.).
6. *Karsaev O.V.* Simulation modeling of autonomous control of a constellation of small satellites // Izvestiya SFedU. Engineering sciences. 2018. vol. 1(195). pp. 140–154. (In Russ.).
7. *Lapshin S.V., Spivak A.I., Lebedev I.S.* Automatic text classification using semantic-syntactic word links // Herald of computer and information technologies. 2018. vol. 12. pp. 28–35. (In Russ.). (Impact factor – 0,453).
8. *Lapshin S.V., Sukhoparov M.E, Spivak A.I., Lebedev I.S.* Classification of texts of scientific publications in the implementation of competitive intelligence in the field of high technologies // Information Security Problems. Computer Systems. 2018. vol. 3. pp. 83–88. (In Russ.). (Impact factor – 0,270).

Other Publications:

9. *Sukhoparov M.E., Semenov V.V., Lebedev I.S.* Monitoring of the information security of elements of cyber-physical systems using artificial neural networks // Methods and Technical Tools of Information Security: Proceedings of the 27th Scientific and Technical Conference. 2018. pp. 59–60. (In Russ.). (Impact factor – 0,410).
10. *Semenov V.V., Lebedev I.S.* Analysis of the state of information security of transport systems // XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. pp. 324–325. (In Russ.).

Department of Robotic end Embedded Systems Prototyping

Head of Department: PhD Vladimir P. Dashevsky – concepts and prototypes of embedded computers for autonomous robotic systems based on SMARC system modules, vladimir.dashevsky@gmail.com.

Department staff: 4 members.

Research areas: embedded computers and their applications. System-on-modules. Digital signal processing. Real-time systems. Software as a service (SaaS).

Research fellows and brief information of the research-work direction

Senior programmer – Alexander V. Myskin – Developing software for distributed computer systems with dynamic architecture. mys@iias.spb.su.

Senior programmer – Vasiliy G. Rzhimsky – Developing software for distributed computer systems with dynamic architecture. rzhimskiy.vasiliy@gmail.com

Senior engineer – Maxim M. Bizin – application of embedded systems for smart control of complex objects, bizin@iias.spb.su.

Post-graduate students

Gaponov S. Vitaly – research advisor –Dashevsky V.P.

Grants and projects

Dashevsky V.P. – "Poseidon MFAT" Contract No. 5 / SP-R / 2015 with LLC Ravelin Ltd., 2018 - 2019.

Membership in Russian and international organizations, editorial boards etc

Dashevsky V.P. – membership in national committee on standardization TK141 (ISO 299), Roborics, editing drafts of national standards.

Intellectual property

Certificate of state registration of computer program: 2018664593 – Web-application for viewing of printed circuit boards assembly drawings based on IDF files – Dashevsky V.P.

Certificate of state registration of computer program: 2018664232 – Run-time library for KOMPAS-3D mechanical CAD for building 3D-models of printed circuit boards – Dashevsky V.P.

Certificate of state registration of computer program: 2018664594 – Web-application for managing components supply for production of electronic devices – Dashevsky V.P.

Certificate of state registration of computer program: 2018665415 – Middleware service for integration of Gate access controllers with VideoNet access control system – Dashevsky V.P.

Certificate of state registration of computer program: 2018665416 – Middleware service for managing calls of IP-controlled intercom handset switch – Dashevsky V.P.

Certificate of state registration of utility model: "Actuator". RID registration number: №AAAA-Г18-618061390014-1– Ivanov V.P., Bizin M.M., Dashevsky V.P., Elyashevich G.M., Dmitriev I.Yu. https://rosrid.ru/rid/VEYQ9LUAFGSSVNJWCNAXSWRH.

Recent Results

1. New embedded software created for IP-controlled intercom handset switch IAC-PMUX based om SMARC system-on-module. The switch enables integration of IP-based intercom stations with 2-wire headsets widely used as default intercom devices. Using VoIP and SIP 2.0 greatly improves speech quality and simplifies arrangement of intercom device interconnect for high-rise buildings.

2. A new concept of serverless access control system has been proposed. According to this concept system is arranged as a distributed mesh of identical access controllers with large memory to contain full system configuration which is replicated among them. Each computer has a web-interface to login into the system and perform management actions. New access control controller hardware, SuperGate, based on SMARC system-on-module was developed using this concept.

3. A new hardware platform for multi-functional subscriber terminal has been developed based on SMARC system-on-module. The terminal includes wide 10-inch color display with capacitive touch screen, built-in audio system, HD camera with H.264 support, IR-filter and IR-LED backlight. Operating system kernel and applications are built based on Yocto project.

Laboratory of Information Technologies in System Analysis and Modeling

Head of the laboratory: Dr. Tech. Sc., Prof., Honored scientist, Laureate of the Russian Government in the field of science and technology, Boris V. Sokolov – fundamental and applied investigations in system modeling and in the theory of optimal control, development of mathematical models and methods for multi-objective decision making in complex technical-organizational systems under conditions of uncertainty. sokolv_boris@inbox.ru.

Laboratory staff: 29 members and 9 post-graduate students.

Research activities – development, research and implementation of methodological, methodical and technological bases of automation and intellectualization of processes of integrated modeling and simulation, proactive monitoring, control for complex objects at different stages of their life cycle.

Research fellows and brief information of the research-work direction

Leading Researcher, Dr. Tech. Sci., Professor – Vyacheslav I. Mironov – fundamental and applied investigations in system modeling, in the theory of optimal observation and dynamic-processes control, in calculus mathematics, in space-flight ballistics, and in statistical analysis as applied to characteristics of complex technical systems, mironuv@yandex.ru.

Leading Researcher, Dr. Tech. Sci., Professor, Honored scientist – Yury I. Ryzhikov – numerical approximation, queuing theory and simulation, inventory theory, educator of scientists, ryzhbox@yandex.ru.

Leading Researcher, Dr. Tech. Sci., Professor, Honored scientist – Alexander P. Kovalev – System analysis and modeling of complex space-rocket systems at different stages of their life cycle.

Leading Researcher, Dr. Tech. Sci. – Vladimir V. Mihailov – Modeling of populational, ecological, and ecological-economical systems, modeling of bioclimatic fields for ranges of populations, vvm@iias.spb.su.

Leading Researcher, Dr. Tech. Sci., Professor – Mikhail Yu. Okhtilev – fundamental approaches to structure-functional synthesis of intellectual information technologies and real-time monitoring systems as applied to complex technical objects in dynamic environment, oxt@email.ru.

Leading Researcher, Dr. Tech. Sci., Professor – Vyacheslav A. Zelentsov – Intellectual information technologies, integrated processing of aerospace information in monitoring and control systems servicing organizational-technical complexes, the theory of hierarchical systems, reliability and maintenance of complex systems, v.a.zelentsov@gmail.com.

Leading Researcher, Dr. Econom. Sci., Professor – Dmitry N. Verzilin – Modeling socio-economic systems and processes, verzilin@sv101000.spb.edu.

Leading Researcher, Dr. Tech. Sci., Professor – Felix M. Kulakov – supervisory control of robots, research automation of mechatronic and robotic systems, virtual and augmented reality. kul@iias.spb.su.

Leading Researcher, Dr. Tech. Sci., Professor – Alexander A. Musaev – Modeling and automation of control processes for complex technological objects, amusaev@technolog.edu.ru.

Leading researcher, Dr. Tech. Sci., Professor – Stanislav V. Mikoni – system analysis, intelligent technologies, decision-making theory, svm@sm4265.spb.edu.

Leading Researcher, Dr. Tech. Sci., Associate professor – Vadim V. Burakov – Methodology of software quality evaluation, refactoring of software, Burakov@eureca.ru.

Senior Researcher, Dr. Tech. Sci., Associate professor – Alexander N. Pavlov – Models and methods of multi-criteria decision making under uncertainty, pavlov62@list.ru.

Leading Researcher, Dr. Tech. Sci., Professor – Albert A. Vorobjev – fundamental and applied researches of management problems of complex organizational and technical systems at various stages of their life cycle. maestro265@yandex.ru.

Senior Researcher, PhD. – Semen A. Potriasaev – fundamental and applied problems of integrated modeling and control of dynamic systems with reconfigurable structure, the development of mathematical models and methods for decision support in complex organizational and technical systems under uncertainty and multi-criteria, semp@gmail.com.

Junior researcher, PhD. – Alexander Y. Kulakov – management of the structural dynamics of technical systems, control algorithms for the functioning of spacecraft. russ69@yandex.ru.

Senior researcher, PhD. – Alexander V. Spesivtsev – artificial intelligence, models and methods for making multi-criteria decisions in conditions of uncertainty, based on knowledge. sav250@gmail.com.

Junior researcher – Ilia Y. Pimanov – geographic information systems, web-cartography, remote sensing of the Earth from space. pimen@list.ru.

Senior Researcher, PhD. – Inna V. Trofimova – Research and development of models and methods for real-time correction of plans defining the use of information systems, isolovyeva@mail.ru.

Junior researcher –Maria R. Ponomarenro – M.Sc., Cartography and geoinformatics. pnmry@yandex.ru.

Senior researcher, PhD. – Olga L. Shestopalova – development and research of models and methods for the operational correction of information system application plans.

Final Qualification Works

Svetlana V. Ptukhova, graduate student, diploma topic "Model and algorithm of cargo delivery planning under conditions of random perturbations", HSE – research supervisor Sokolov B.V.

Sergey V. Bublikov, graduate student, diploma topic "Development of a block-chain platform", St. Petersburg SUAI – research supervisor Sokolov B.V.

Andrey Y. Yeremchenko, graduate student, diploma topic "Designing a decision support system with mixed logic for analyzing time series", St. Petersburg SUAI – supervisor Okhtilev M.Yu.

Sofiya A. Karavanova, undergraduate student, diploma topic "Model and Algorithm for Ensuring Data Backup in the Electronic Document Management System", St. Petersburg SUAI – research supervisor Michael Yu. Okhtilev.

Post-graduate students

Dmitri I. Nazarov – the topic of the thesis is "Models, Algorithms and Software for Operational Planning of Measuring and Computing Operations in the Automated Control System for Small Space Vehicles", research advisor – Sokolov B.V.

Alexey V. Krylov – the topic of the thesis is "Models and algorithms for the representation and processing of knowledge in the proactive management of complex organizational and technical objects", research advisor – Sokolov B.V.

Pavel A. Ohtilev – the topic of the thesis is "Models and algorithms for monitoring the structural states of complex organizational and technical objects in conditions of uncertainty", research advisor – Sokolov B.V.

Andrey S. Gnidenko – the topic of the thesis is "Models, algorithms and software for proactive control of complex technical objects with a tunable structure", research advisor – Burakov V.V.

Valery V. Zakharov – the topic of the thesis is "Logic-dynamic models and algorithms for solving problems of network planning in zotz", research advisor – Burakov V.V.

Vladislav A. Sobolevsky – the topic of the thesis is "Methods and technologies of automated development of neural networks", research advisor – Sokolov B.V.

Vitaly A. Ushakov – the topic of the thesis is "Methods and algorithms of operational multi-criteria evaluation and analysis of quality indicators of automated control systems for moving objects based on the construction of domains of attainability", research advisor – Sokolov B.V.

Ekaterina N. Rostov– the topic of the thesis is "Synthesis of algorithms and analysis of dynamic processes in biotechnical remote control systems for manipulating robots", research advisor – Sokolov B.V.)

Alexander E. Semenov – the thesis of the thesis is "software tools for integrated processing of spatial data in the tasks of managing the development of territories", research advisor – Zelentsov V.A.

Grants and projects

Zelentsov V.A. — RFBR Project #16-08-00510 "Development and research of the methodology and creation of automated information system prototype for the forecasting of Extreme North vegetation's state on the basis of integrated processing of multi- and hyperspectral ground-aerospace data and climatic information", 2016-2018

Burakov V.V. – RFBR Project #17-08-00797 "Research and development of methodological basis and technology of integrated modelling and simulation of complex technical objects proactive control system", 2017-2019.

Verzilin D.N. – RFBR Project #17-06-00108 "Research and development of scientific and methodological basis of multi-criteria evaluation and forecasting of socio-economic indicators of the ecological and economic objects in the Baltic Sea coastal zone", 2017-2019.

Mikoni S.V. – RFBR Project #17-01-00139 "Development of a methodology of structuring and analyzing the properties of complex technical systems", 2017-2019.

Sokolov B.V. – RFBR Project #17-29-07073-ofi_m_ "Theoretical and technological foundations of the formation and decentralized planning of the intellectual robots coalition behavior based on socio-inspired self-organization and smart contracts". (Together with the laboratory Smirnov A.V.)

Sokolov B.V. – RFBR Project #18-07-01272 "Development of theoretical and technological foundations of intelligent decision support in the area of integrated urban arterial transportation planning in metropolitan areas taking into account preferences of passengers of various social groups", 2018-2020.

Okhtilev M.Y. RFBR Project #18-08-01505 "Development and research of methods and algorithms of pro-active control of maintenance of onboard systems of complex dynamic objects at emergency situations", 2018-2020.

Sokolov B.V. – RSF Project #17-11-01254 "Methodology and service-oriented technology for the development and implementation of the system for integrated automated modeling of natural and natural-technological objects and its application for the operational forecasting of river floods", 2017-2019.

Zelentsov V.A. – Project "Development of the spatial data fund of the Leningrad region", the customer - JSC RNIC in the Leningrad region, 2018.

SokolovB.V. — "Development and research of intellectual information technologies of monitoring, multi-profile forecasting and the guaranteed anticipatory safety management of critical infrastructures in emergency situations with use of land and aerospace systems of the Russian Federation". he project is carried out with financial support of the Ministry of Education and Science of the Russian Federation, a state task № 2.3135.2017/K. (2017-2019) (Together with Volga State University of Technology.), 2017-2019.

Sokolov B.V. — International project "Technology-US" – "Development of methodological issues and software for ground and onboard functional modules aimed at restoration of satellite up state in emergency and critical onboard situations". Project customer: Space Systems Research and Development Institute (NII KS), Khrunichev State Research and Production Space Center, 2017-2019.

Sokolov B.V. "ERASMUS Mundus" - Innovative strategies for training engineers using simulation and open learning platforms ("Inmotion"). The international project is being implemented with the financial support of the European program ERASMUS Mundus, 2018-2019.

Sokolov B.V. – Experimental design work "Creation of screen forms of software and information support for the PTS COTR from the automated control system of the IC Vostok-A" Customer: CJSC SDB Orion.

Zelentsov V.A. – Project KS1309 "InnoForestView" of the South-East Finland – Russia CBC 2014-2020 programme Innovative information technologies for analysis of negative impact on the cross-border region forests.

University courses

SPbSUAU: Department of computer mathematics and programming. "Systems Analysis, Mathematical Methods and models of operations research" – Sokolov B.V.

SPbSPU: Department of political economy. "Mathematical methods in economics" – Verzilin D.N.

Mojaisky MSA: Department of computer-aided control systems. "Methods and technologies of control decision making"; "Systems analysis and organization of computer-aided control systems".

Mojaisky MSA: Inter-branch Institute for education and information: "Basics of System approach and systems analysis"; "Processes control" – Pavlov A.N.

Mojaisky MSA: Department for aircraft autonomic control systems. "Spacecrafts control systems" – Mironov V.I.

Saint Petersburg State University: faculty of Applied Mathematics and Control Processes. Elective course "Mathematical modeling of social and economic processes" – Trofimova I.V.

St. Petersburg State Technological Institute (technical university): Department of System Analysis. "Theory of probabilities and mathematical statistics", "Methodology of dissertation research' (for postgraduate students) – Musaev A.A.

Scientific and organizational activity

Sokolov B.V. – Deputy Chairman of the Program Committee of the 11th Russian Multi-Conference on Management Issues (11 RMCMI-2018).

International cooperation

Cooperation with the Institute of Informatics Problems of the National Academy of Sciences of Belarus: the exchange of trainees, requirements specification for the joint international program "Monitoring-SG."

Participation in the International project "Innovative teaching and learning atrategies in open modelling and simulation environment for student-centered engineering education" / InMotion' according to Programm ERASMUS.

Cooperation with partner organizations of the BalticSatApps project: University of Turku (Turku, Finland), Finnish Meteorological Institute (Helsinki, Finland), Turku Science Park (Turku, Finland), Tartu Technopark Union (Tartu, Estonia) , Technology Transfer Center of Krakow University of Technology (Krakow, Poland), Tartu Observatory (Tartu, Estonia), Institute of Geodesy and Cartography (Warsaw, Poland), Krakow Technopark (Krakow, Poland), State Administration of Space Research (Solna, Sweden).

Collaboration with Lappeenranta Technological University - organization of training courses for students, postgraduated students and lecturers of the State University of Aviation Instrumentation.

Participation in the CARMA International Project (Circum Arctic Rangifer Monitoring and Assessment).

Collaboration with the Center for Arctic Studies at the University of Northern Iowa within the framework of an agreement on scientific cooperation and the NSF grant "Taimyr Reindeer Migration Realaysis".

Participation in conferences and exhibitions

Circum Arctic Rangifer Monitoring and Assessment (CARMA-9), March 5-15, 2018, Whitehorse, Canada – Mikhailov V.V.

2nd Mapping Water Bodies from Space Conference (MWBS 2018), March 27-28, 2018, Frascati, Italy – Zelentsov V.A., Ponomarenko M.R.

The 8th International Scientific Conference "Tanaev Readings", March 28, 2018, Minsk, Belarus – Pavlov A.N., Sokolov B.V., Zakharov V.V.

XIV Big geographical festival. "Cartography and geodesy, GIS-technologies in geographical research, land management and cadastres", April 06-08, 2018, St. Petersburg, Russia – Pimanov I.Yu., Ponomarenko M.R.

International scientific-practical conference of students, graduate students and young scientists "Geography in the modern world: century-long progress and new priorities", dedicated to the 100th anniversary of the creation of Russia's first specialized geographical higher education institution – Geographical Institute, held as part of the XIV Big Geographical Festival, April 6-8, 2018, St. Petersburg, Russia – Pimanov I.Yu., Ponomarenko M.R.

The II All-Russian Scientific and Practical Conference "Problems of creation and use of spacecraft and robotic tools in the interests of the Armed Forces of the Russian Federation", April 12-13, 2018, St. Petersburg, Russia – Mironov V.I.

XVII International Scientific and Practical Conference "Logistics: Modern Development Trends", April 12-13, 2018, St. Petersburg, Russia – Sokolov B.V.

St. Petersburg Digital Forum, April 18-19, 2018, St. Petersburg, Russia – Zelentsov V.A.

The interdepartmental scientific and technical conference "Actual problems of using simulation in the interests of material and technical support of the Armed Forces of the Russian Federation", April 20, 2018, St. Petersburg, Russia – Vorobjev A.A.

7th Computer Science On-line Conference 2018 (CSOC2018), April 25–28, 2018 – Pavlov A.N., Sokolov B.V.

XXII International Scientific and Practical Conference "System Analysis in Design and Management", May 22-24, 2018, St. Petersburg, Russia – Mikoni S.V.

32nd European Conference on Modelling and Simulation ECMS 2018, May 22-25, 2018, Wilhelmshaven, Germany – Sokolov B.V.

XXI International United Conference "Internet and Modern Society, IMS-2018, May 30 – June 2, 2018, St. Petersburg, Russia – Mikoni S.V.

International Geoscience and Remote Sensing Systems Symposium (IGARSS 2018), 22–27 July, 2018, Valencia, Spain – Zelentsov V.A.

XX International Conference "Problems of Control and Modeling of Complex Systems", September 3-6, 2018, Samara, Russia) – Mikhailov V.V.

International scientific conference "Mathematical methods in engineering and technology" MMET NW 2018, September 10-14, 2018, St. Petersburg, Russia – Sokolov B.V., Zelentsov V.A., Kulakov A.Yu., Pimanov I.Yu., Musaev A.A.

The 6th International Workshop on Simulation for Energy, Sustainable Development& Environment (SESDE 2018), September 17-19, 2018, Budapest, Hungary – Zelentsov V.A.

20th International Conference on Harbor, Maritime & Multimodal Logistics Modelling and Simulation (HMS2018), September 17-19, 2018, Budapest, Hungary – Sokolov B.V., Sobolevskiy V.A.

30th European Modeling & Simulation Symposium (EMSS2018), September 17-19, 2018, Budapest, Hungary – Sokolov B.V.

IV Interregional Scientific and Practical Conference "Perspective Directions for the Development of Domestic Information Technologies", September 18–22, 2018, Sevastopol, Russia – Sokolov B.V., Mikoni S.V.

11th Russian Multiconference on Management Issues (11RMKPU-2018). Conference "Information Technologies in Management" (ITU-2018), October 2-4, 2018, St. Petersburg, Russia –Pavlov A.N., Sokolov B.V., Pozreyev S.A., Kulakov A.Yu., Musaev A.A.

University of Northern Iowa Geography Speakers Series, October 6–17 2018 – Mikhailov V.V.)

IV international scientific-practical conference "Informatization of engineering education" (INFORINO-2018), October 23-26, 2018, Moscow. Russia – Mikoni S.V.

Forum of Strategists, October 22-24, 2018, St. Petersburg, Russia – Zelentsov V.A.

XVI St. Petersburg International Conference "Regional Informatics (RI-2018)", October 24-26, 2018, St. Petersburg, Russia. – Sokolov B.V., Kulakov A.Yu., Mikoni S.V.

Sectoral scientific and practical conference "Problematic issues of material and technical support of the grouping of troops (forces) as a result of joint exercises and maneuvers" Vostok-2018", October 25, 2018, St. Petersburg, Russia – Vorobjev A.A.

XVII All-Russian Scientific and Practical Conference "Problems of Forecasting Emergencies", October 29-30, 2018 – Zelentsov V.A.

West Lakes Division of the American Association of Geographers (WLDAAG) 2018, Annual Meeting, November 1–3, 2018, University of Wisconsin-La Crosse, La Crosse, Wisconsin, USA – Mikhailov V.V.

Betancourt International Engineering Forum, November 13-15, 2018, St. Petersburg, Russia – Mikoni S.V.)

The All-Russian Scientific and Technical Conference "The Eighth Utkin Readings" November 13-14, 2018, St. Petersburg, Russia – Vorobjev A.A.

St. Petersburg Innovation Forum, November 28-30, 2018, St. Petersburg, Russia – Zelentsov V.A., Ponomarenko M.R.

International Scientific and Technical Conference "Digital Technologies and Robotic Technical Equipment for Agriculture", December 5-6, 2018, Moscow-Saint-Petersburg, Russia – Zelentsov V.A.

XIV All-Russian Scientific and Practical Conference and Exhibition "Prospects for the development of engineering surveys in construction in the Russian Federation", December 10-14, 2018, Moscow, Russia – Zelentsov V.A.

IV international interuniversity scientific-practical conference "Technological perspective: new markets and points of growth", December 13-15, 2018, St. Petersburg, Russia – Mikoni S.V.

Membership in Russian and International societies, editorial boards, etc.

Sokolov B.V. – The member of organizing committee of the International scientific school "Modeling and analysis of safety and risk in complex systems"; The member of program committee of Russian-German conference on logistics; The member of program committee of the conference "Cybernetics and Advanced Technologies of 21st Century"; deputy-chairman of the program committee of the conference "Simulation: Theory and Applications"; The member of the editorial boards of the journals "Logbook of Information of Higher School: Instrument-making", "Information Technologies"; The member of Cosmonautics federation; The full member of the International Academy of navigation and motion control; The member of the association "North-Wes"; The member of scientific-engineering committee for establishing International global airspace monitoring system; The academic board member of the library of the Russian Academy of Sciences; expert of the Russian Academy of Sciences, RFBR expert, in 2017, 10 projects were reviewed.

Mironov V.I. – Academician of International Academy of Integrated Security.

Mikhailov V.V. – Member of the National Society of simulation, Member of the Society "Russian scientists of socialist orientation (RSSO)". Chairman of majoring 230400.65, 230400.62. A member of the National Society of simulation.

Musaev A.A. – Member of American Mathematical Society (AMS).

Ohtilev M.Yu. – The member of editors of the journal "Aerospace instrument-making"; The full member of the International Academy of navigation and motion control.

Ryzhikov Yu.I. – The member of the program committee of the conference "Simulation: Theory and Applications".

Mikoni S.V. – Member of the Russian Association of Artificial Intelligence.

Verzilin D.N. – The member of program committee of the conference "Simulation: Theory and Applications".

Intellectual Property

Zelentsov V.A., Pozryayev S.A., Pimanov I.Yu., Semenov A.E.: System for Automated Order of Space Shooting (SAZKS) Certificate No. 2014612740. Registered in the registry of computer programs 02.26.2018. (Assigned Internet Number:AAAA-G18-618121100052-3; The date of assignment of the Internet number: 11/12/2018).

Zelentsov V.A., Potareyev S.A., Pimanov I.Yu.: A system for automating the detection of changes in territories according to remote sensing data of the Earth. Certificate №2018612655. Registered in the registry of computer programs 03/21/2018. (Assigned Internet number: AAAA-G18-618121100053-0; Date of assignment of Internet number: 12/12/2018).

Research Results

1. The methodology, methodology supporting documentation and the technologies of multiple-criteria evaluation, analysis and situation-based selection of most suitable models and polymodel complexes describing the functioning of complex objects of any kind have been developed. This has become the foundation for a new applied theory – qualimetry of models and polymodel complexes. The application of this theory in the space rocket industry, for example, allows more reasonable decisions of better quality in projects on the development of mathematical applications and software for spacecraft control systems, and, also, lowers the costs of these projects [9].

2. The practical use of the first version of the model-oriented information system for monitoring and forecasting of river floods, which enables gathering and processing of heterogeneous ground and aerospace data, its multi-time analysis, the integration of distributed information

resources, including the complex of hydrological and hydrodynamical models, the interpretation of results and giving recommendations to users have been developed and tested. This is developed in accordance with the demands of the governments of Arkhangelsk and Vologda regions and scalable to be applied in other RF regions [11, 12].

3. Technical requirements and polymodel description of the processes of configuration and reconfiguration of onboard systems in lightweight spacecraft, and also combined methods and algorithms for solving the tasks of proactive control of structure dynamics of onboard systems in lightweight spacecraft and means of land-based control complex have been developed [1, 2].

4. The prototype of a hardware-software stand for the software-modeling complex with the aim of testing the methods and algorithms of monitoring, forecasting and dynamic control of multifunctional groups of dynamic objects; have tested the full control cycle, from building a BMPN diagram to the implementation on the complex of full-scale models of robots with consideration of the impact of network delays and external disturbances have been developed. The feedback with receiving the telemetry from the complex of full-scale models of robots, and also the technology of backward call for the control of prolonged operations, including the operations with unpredictable execution time have been implemented. [6].

5. A new classification of two-person games with zero sum and a finite number of strategies was developed, the rules for a purposeful improvement of decisions and for obtaining the most preferred deterministic strategy in matrix games, describing "defense-attack" conflict situations, were formulated through the application of the strategic reflection and experimental studies; A new indicator for estimating the accuracy of the solution was proposed to be applied directly in the course of the iterative process for significant improvement of the known a priori estimates within Brown-Robinson iterative method [20].

6. A multi-stage procedure was developed for a multicriteria structural-functional synthesis of different-type models, describing at different levels of detailing various aspects of the proactive management system handling a set of complex technical objects (CTO) in a dynamically changing environment, which can be specified by stochastic, interval, and fuzzy source data; this procedure allowed to quantify the robustness and stability of proactive CTO control programs at a constructive level through

the construction and approximation of reachability areas of logical-dynamic models describing structural dynamics of the considered CTOs [3, 4].

7. Methodological, methodological and technological basics, as well as a software prototype of a decision support system (DSS) were developed with the aid of combined logical-dynamic models, methods and algorithms of proactive (advanced) monitoring and control, providing for distributed situational centers (DSC), firstly, real-time processing of extremely large volumes of incoming data and information on the state of forces and means in the presence of incorrect, inaccurate and contradictory information and, secondly, the development of timely and reasonable control actions [9].

References

Papers prepared jointly with foreign organizations:

1. *Dolgui A., Ivanov D., Sokolov B.* Ripple effect in the supply chain: an analysis and recent literature // International Journal of Production Research. 2018. vol. 56. no. 1-2. pp. 414–430. DOI: 10.1080/00207543.2017.1387680.
2. *Sokolov B., Ivanov D., Dolgui A.* Optimal Control Algorithms and Their Analysis for Short-Term Scheduling in Manufacturing Systems // Algorithms. 2018. vol. 11. pp. 57. DOI: https://doi.org/10.3390/a11050057.
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25. *Ryzhikov Y.* Calculation of the Closed Multi-channel Queueing Systems // Computer Science On-line Conference. 2018. vol. 3. pp. 125–132.
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29. *Grigoreva O., Mochalov V., Zelentsov V.* Hyperspectral Data Processing And Adaptive Modelling For The Natural Objects Properties Detection // International Workshop on Simulation for Energy, Sustainable Development& Environment (SESDE). 2018. pp. 7–14.
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66. *Mikoni S.V., Sokolov B.V., Yusupov R.M.* Qualimetry of models and multi-model complexes: the current state and promising directions of development // Collection of materials for reports of participants of the RI-2018 conference. XVI St. Petersburg International Conference "Regional Informatics (RI-2018)". 2018. (In Russ.).
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86. *Mironov A.N., Zagorny S.V., Shestopalova O.L.* On the issue of ensuring environmental safety in the operation of refueling complexes for space rockets // Ecology and development of society. 2018. Issue 1. vol. 24. pp. 52–56. (In Russ.).

Laboratory of Information Technologies in Transport

Head of laboratory – Dr. Tech. Sc., Prof. Yury M. Iskanderov, automation and informatization of large complex dynamic systems, system analysis and integration of information resources, formalization of decision-making processes, knowledge engineering, intelligent transport systems, iskanderov_y_m@mail.ru.

Laboratory staff: 7 members.

Research activities – integration of information resources of transport systems. Global information transport systems. Intelligent support for transport management processes.

System analysis and structuring of information resources of transport systems. Informatization and automation of transport systems of regions and urban agglomerations.

Information and computer security of transport systems. Specialized information retrieval systems.

Informatization and automation of transport infrastructure. Information processing systems in transport systems. Intelligent data analysis.

Systems for collecting, receiving and presenting spatial data on the state and functioning of transport systems, including using geoinformation technologies.

Research fellows and brief information of the research-work direction

Leading Researcher, Dr.Tech.Sci, Assoc. Prof. – Vladimir V. Barabanov – system analysis, intelligent decision support systems, automation of dynamic system management, methods for optimizing network structures, vlbar@yandex.ru.

Leading Researcher, Dr.Tech.Sci, Prof. – Yan A. Ivakin – methods and models for the collection and presentation of spatial data on the state and functioning of transport systems, the intellectualization of geoinformation systems, the qualification of software and information systems, the automation of substantive humanitarian research, ivakin@oogis.ru.

Senior researcher, PhD, Assoc. Prof. – Michael B. Laskin – methods and models of information processing in transport systems, data mining, methods of strategic planning of the development of transport and logistics infrastructure, laskinmb@yahoo.com.

Senior researcher, PhD – Sergey N. Potapychev – intellectual geoinformation systems, modern methods of visualization of complex spatial objects in three-dimensional form, modeling of transport-logistical processes with the use of geoinformation systems, potapychev@oogis.ru

Grants and projects

Ivakin Ya. – RFBR project № 16-07-00127-A "Intellectual support for decision-making in the geospatial reconstruction of the dynamics of historical and geographical processes", 2016-2018.

Potapychev S. – RFBR project № 18-07-00437-A "Theoretical and technological bases of intellectual decision support in the dispatching of geospatial processes", 2018-2020.

Iskanderov Yu. – The project under the contract with LLC "Innovative Technologies", "Development of the concept of an intelligent information system for collecting, processing and transmitting transport and logistics information", 2018.

University courses

National Research University "Higher School of Economics" (SPb): "Information support of logistics business processes in supply chains", "Innovative transport technologies in logistics", "Research seminar", "Vocational orientation workshop" – Yu. Iskanderov.

National Research University "Higher School of Economics" (SPb): "Information support of logistics business processes in supply chains", "Innovative transport technologies in logistics", "Research seminar"– I. Lebedev.

National Research University "Higher School of Economics" (SPb): "Vocational orientation workshop" – M. Laskin.

National Research University "Higher School of Economics" (SPb): Scientific practical seminar "Strategic Planning of Logistics Infrastructure Development" – V. Barabanov, M. Laskin.

ITMO University: "Technologies and methods of programming", "Expert systems for the integrated assessment of the security of information and telecommunications systems", "Hardware and software for information security', "Programming information security tools", "Information security of computer systems", "Designing of information-analytical security systems" – I. Lebedev.

State University of Aerospace Instrumentation (SPb): Computer technologies in quality management, Computer technologies in innovative sphere – Ya. Ivakin.

Scientific and organizational activity

Yu. Iskanderov – Member of the Program Committee, co-chair of the section "Information Technologies in Transport" of the International Conference "Regional Informatics (RI-2018)".

M. Laskin – Member of the Program Committee, Scientific Secretary of the section "Information Technologies in Transport" of the International Conference "Regional Informatics (RI-2018)".

Ya. Ivakin – Member of the Program Committee, chair of the section "GIS" of the International Conference "Regional Informatics (RI-2018)".

International cooperation

Cyprus University of Technology (Cyprus, Limassol) – agreement on scientific and technical cooperation and exchange of young researchers.

Participation in conferences and exhibitions

Strategic Logistics Management Winter School, February 17-18, 2018, St. Petersburg, Russia – Iskanderov Yu., Laskin M.

II Russian-Chinese Economic Forum "Eastern Perspective of the Russian Economy", February 28 - March 2, 2018, St. Petersburg, Russia – Iskanderov Yu., Laskin M.

Exhibition of transport and logistics services and technologies "TransRussia / TransLogistica", April 17-19, 2018, Moscow, Russia – Iskanderov Yu.

XVII International Scientific and Practical Conference "Logistics: Modern Development Trends", April 12-13, 2018, St. Petersburg, Russia – Iskanderov Yu., Laskin M., Barabanov V., Svistunova A.

II International Scientific and Practical Conference "Evaluation activity in the conditions of innovative development", May 17-18, 2018, Minsk, Russia – Laskin M.

3rd International Scientific Conference "Intellectual Information Technologies in Engineering and in Production" (IITI-2018), September 17-21, Sochi, Russia – Iskanderov Yu.

11th Russian Multiconference on Management Issues, Conference "Information Technologies in Management" (ITU-2018). October 2-4, 2018, St. Petersburg, Russia – Iskanderov Yu., Ivakin Ya., Potapychev S.

XVIII St. Petersburg Interregional Conference "Regional Informatics (RI-2018)", October 24-27, 2018, St. Petersburg, Russia – Iskanderov Yu., Laskin M., Lebedev I., Ivakin Ya., Potapychev S., Svistunova A.

XVI International Conference of the Association "History and Computer", October 26-28, 2018, Moscow-Zvenigorod, Russia –Ivakin Ya., Potapychev S.

I International Transport Infrastructure Forum, St. Petersburg, Russia November 27-30, 2018 – Iskanderov Yu.

European Conference on Electrical Engineering & Computer Science (EECS 2018), December 20-22, 2018, Bern, Switzerland – Laskin M.

Membership in International Societies, Editorial Boards

Iskanderov Yu. – Chairman of the Board of the main educational programs of the baccalaureate "Business Informatics" and the Master's Degree "Information Business Analytics" of the St. Petersburg State University; Head of the basic department "Information Technologies in Logistics" SPIIRAS in the Higher School of Economics (St. Petersburg); member of the editorial board of the scientific journal "Bulletin of the Admiral Makarov State University of Maritime and Inland Shipping "; full member of the Russian Transport Academy.

Lebedev I. – Expert of competitive projects of the FTP "Research and development in priority areas of development of the scientific and technological complex of Russia for 2014-2020".

Laskin M. – Member of the Scientific and Methodological Council of the Self-Regulating Organization of Appraisers "Community of Assessment Professionals", St. Petersburg, Russia.

Ivakin Ya. – member of the editorial board of the journal "Vestnik of the St. Petersburg University of Technology and Design. Natural and technical sciences".

Recent Results

1. An approach is proposed to identify objectively justified pricing regularities that affect the cost estimate of stationary elements of large complex dynamic systems and developed a stochastic model of data mining model, which eliminates the problem of choosing objects of comparison when determining market value and forming of representative sample, as well as the lack of information content in terms of maximally taking into account pricing factors [5, 7].

2. A method of geo-information support solutions has been developed for dispatching spatial processes in conditions of environmental variability, allows to determine the characteristics of the current situation for the information support of the decision maker on the dispatching of traffic flows in conditions of natural inconsistency of the current situation [9, 10].

3. The methodology of geochronological tracking as a specialized research tool for the integration of spatial-coordinated, heterogeneous information based on GIS was developed and tested, allows to introduce new opportunities for the use of quantitative, in particular, probabilistic measures, to evaluate the hypotheses of historical, graphic and other retrospective studies conducted using geoinformation technologies [3, 8].

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Participation in conferences and exhibitions

The 2-nd International Scientific Conference "Models of thinking and Integration of Management Information Systems (MMIIUS – 2018), on December 4-9, 2018, Terskol, Russia – Salukhov V.I.

The XVI St. Petersburg International Conference "Regional Informatics (RI-2018)", on October 24-26, 2018, St. Petersburg, Russia – Kasatkin V.V., Salukhov V.I.

The IV Interregional Scientific and Practical Conference "Perspective Directions of Development of Domestic Information Technologies", on September 18-22, 2018, Sevastopol, Russia – Kasatkin V.V., Salukhov V.I., Motienko A.I.

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Recent results

The methodology of expansion of functionality of the centers of competence is developed for their use in education. Essential advantage and novelty of such approach is the close interrelation of educational process with operational work of local public authorities [12].

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Abbreviations

BSTU	Baltic State Technical University
DNTIT RAS	Departament of Nano Technologies and Information Technologies
FAR	Foundation for Advanced Research
FASO Russia	Federal Agency for Scientific Organizations
FRP	Fundamental Research Program
FTP	Federal Target Program
ITMO University	The University of Information Technologies, Mechanics and Optics
Minobrnauki of Russia	Ministry of Science and Higher Education of the Russian Federation
MAPE	Medical Academy of Postgraduate Education
NMRU	National Mineral Resources University
PFSPSMU	Pavlov First St. Petersburg State Medical University
PSTU	Petersburg State Transport University
RSPU	Russian State Pedagogical University
SPIIRAS	St.Petersburg Institute for Informatics and Automation of the Russian Academy of Sciences
SPSAEE	St.Petersburg State Academy of Engineering and Economy
SPSEEU	St.Petersburg State Electrical Engineering University
SPSMTU	St. Petersburg State Marine Technical University
SPSPTU	St.Petersburg State Polytechnical University
SPSRCRAS	St.Petersburg Scientific Research Center of the Russian Academy of Sciences
SPSU	St.Petersburg State University
SPSUACE	St.Petersburg State University of Architecture and Civil Engineering
SUAI	St.Petersburg State University of Aerospace Instrumentation
SPSWU	St.Petersburg Water Communications University

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